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Regional Analysis of Sanitation Facilities in Uttar Pradesh

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Abstract: *The present paper is an attempt to analyze the spatial variations of improved sanitation in terms of latrine facilities like piped sewer, septic tank, improved pit, other system and unimproved sanitation like open pit, night soil disposed into open drain, night soil removed by human, night soil serviced by animal, public latrine and open latrine among the households of the districts in the state of Uttar Pradesh. The study is based on secondary sources of data obtained from Census of India publications (2011), New Delhi. The districts of Uttar Pradesh have been taken as the unit of study. The study reveals that availability of improved sanitation is high in the districts of northern, northwestern to central part, forming a contiguous region. Except few pockets in eastern part, the accessibility of improved sanitation is decreasing towards southern and eastern parts of the state. The availability of unimproved sanitation is high in western, central and eastern parts of the state where they are forming contiguous regions. Moreover, there is a declining pattern of unimproved sanitation in southern and eastern parts.*

Keywords: *Improved sanitation, Unimproved sanitation, Districts, Uttar Pradesh*.

I. Introduction

With the transformation of society from pre-industrial to industrial one, basic necessities of humans like food, cloth and shelter have also increased with addition of education, health and hygiene. Sanitation as one of the basic needs of human beings has a direct relationship with health, nutrition and social well-being.Withoutsanitation or with poor sanitation our life will be clutched with fatal diseases and will create a havoc situation. So 'access' to sanitation is crucial for human survival. The word sanitation is derived from the Latin word 'sanitas' which means health, hygiene or relating to health (Nagendra, S. and Suresh, M.).Sanitation is associated with proper disposal of liquid and solid waste, clean drinking water and hygienic environment. "On 28th July 2010, through Resolution 64/292, the United Nations General Assembly explicitly recognized the human right to water and sanitation and acknowledge that clean drinking water and sanitation asre essential to the realization of all human rights" (Dasra Report on Sanitation in India, 2012). The increase in population creates an unbalancing situation for government. There are number of people, especially children and women dying every year due to diarrhea and cholera because of unhygienic environment. "Proper sanitation along with clean water is among the most powerful medicines for reducing child mortality. They are to diarrhea what immunization is to measles and polio." (Mukherji, D.). To make sanitation awareness globally sound and to combat with future jeopardy, United Nations has listed it as one of the goals under the Millennium Development Goals. "The Millennium Development Goal7 (MDG7) Target 10 is to halve by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation."(International Decade for Action 'Water for Life' 2005-2015). And as per the Millennium Development Goals, India is also bound to provide improved sanitation to at least half of its urban population by 2015 and 100 percent access by 2025. (Bhagat, R.B)

In recent times, world organizations like UNICEF and WHO have identified sanitation under two types; drinking water and toilets and have also categorized those into improved and unimproved facilities. The Joint Monitoring Programme for Water Supply and Sanitation (JMP) which monitors progress toward the target, defines "improved sanitation" in terms of service levels. This includes a private flush or pour-flush toilet or latrine connected to a piped sewer system or septic system, a simple pit latrine with a slab, a ventilated improved pit latrine or composing toilet. Pour-flush latrine or any other flush, an open pit latrine, bucket latrine, a hanging latrine or open defecation is "unimproved" and not scored toward the Millennium Development Goal Target (WHO/UNICEF JMP, 2013). So here, this paper deals with sanitation in terms of improved and unimproved toilet facilities.

Coming to the question of open defecation, India leads the world with around 550 million defecating in open every day (Mukherji, 2014). So to overcome this situation we need to place toilets in rural as well as in urban areas wherever it is lacking. Toilet is the part of infrastructure which is necessary for people, as it provides them better health and hygiene, privacy, safety and dignity. Sanitation is a need for longevity and safe life and it is being neglected in poor and marginalized sections of the society. The reasons behind this may be unawareness, unaffordability to basic facilities etc. The attitude of the people in India towards maintaining

hygiene is a biggest problem in itself. Defecating in open is an outcome of lack of infrastructure on one hand and an issue of culture, custom and attitude of people on the other. The problem is moreaggravated when it comes to matter of water supply, as lack of water can never make toilets functional and most of the times improper water supply create an outflow from drains due to choked drainage system. Hence, in these cases there is a need to focus and adopt the holistic approach because sanitation is not all about creating and providing toilets, but also to keep them clean and functional.

Generally less educated societies consider sanitation as a cost oriented subject and do not associate hygiene with health. Basic sanitation includes ' the lowest-cost option for securing sustainable access to safe, hygienic and convenient facilities and services for excreta and sullage disposal that provide privacy and dignity, while at the same time ensuring a clean and healthful living environment both at home and in the neighbourhood of users' (UNO Millennium Project,2005). But WHO (2014) also states "basic sanitation is the lowest-cost technology ensuring hygienic excreta and sullage disposal and a clean and healthful living environment both at home and neighbourhood of the users. Access to basic sanitation includes safety and privacy in the use of these services." So, there is a need to let them know that maintaining hygiene is a low cost effort which would certainly bring them a healthy and sustainable environment.

II. Objective

The present study is an attempt to analyze inter-district variations of availability of sanitation facilities in terms of improved and unimproved sanitation conditions in the state of Uttar Pradesh.

III. Study area

Uttar Pradesh as a whole has been chosen as a study area for the present research work and the district boundary has been considered as a smallest unit of study.The state is comprised of 71 districts (Census of India, 2011). The mainland extends from 23°52'N to 31°28'N latitudes and from 77°30'E to 84°39'E longitudes.Its geographical area is about 243,286 km^2, which is equal to 6.88% of the total area of India, and is the fourth largest Indian state by area. The state is bordered by Rajasthan to the west, Haryana and Delhi to the northwest, state of Uttarakhand and country of Nepal to the north, Bihar to the east, Jharkhand to the southeast, Chhattisgarh to the south and Madhya Pradesh to the southwest. According to Census of India 2011, the total population of the state is 199.58 million, out of which 77.73% is rural and remaining 22.27% is classified as urban. Density of the state is 828 persons per square kilometer. The sex ratio of the state is 912 females for each 1000 males, which is below than national average of 940 as per 2011 census.The percentage of literacy inthe state is 69.72 percent out of which male literacy stands at 77.28 percent and female literacy at 51.36 percent.

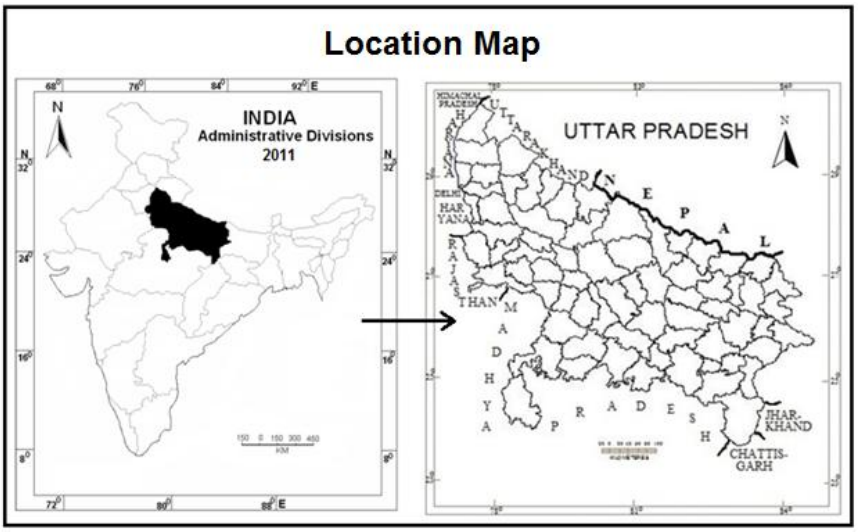

Figure 1

There is a serious and pressing need for prevention and solution of sanitation inside the state. Majority of people residing in villages, fringe areas and towns are unaware about basic sanitation, hygiene and cleanliness.This research paper is an effective means to highlight the scenario. This paper is an attempt in this regards.

IV. Data And Methodology

The present research work is entirely based on secondary sources of data collected from Census of India Publications, 2011, New Delhi. In this study, a set of four types of latrine as indicators of improved sanitation and six types of latrines as indicators of unimproved sanitation have been taken into account in order to get spatial findings regarding inter-district variations of sanitation in terms ofimproved and unimproved systems of defecation respectively.

The indicators of improved sanitation fall into categories like piped sewer system, septic tank, with slab/ventilated improved pit, other system, and indicators for unimproved sanitation are toilets without slab/open pit, night soil disposed into open drain, night soil removed by human, night soil serviced by animal, public latrine and open. In the first step, the raw data for each variable which determine the aerial variations in sanitary conditions have been computed into standard scores. It is generally known as Z value or Z score. The score quantifies the departure of individual observation, expressed in a comparable form. This means that it becomes a linear transformation of the original data (Smith, 1973). It may be expressed as:

$$Z_{ij} = \frac{X_{ij} - \overline{X_i}}{\sigma_i}$$

Where,

Z_{ij}= Standardized value of the variable *i*in District *j*.

X_{ij}= Actual value of variable *i* in district *j*.

$\overline{X_i}$ = Mean value of variable *i* in all districts.

σ_i= Standard deviation of variable *i* in all districts.

In the second step, the z-scores of all variables have been added districtwise and the average has been taken out for these variables which may be called as composite score (CS) for each district and may be algebraically expressed as:

$$CS = \frac{\sum Z_{ij}}{N}$$

N refers to the number of indicators (variables), and

$\sum Z_{ij}$ indicates Z-Score of all variables $_i$ in the districts.

Under improved sanitation the districts holding positive values of the Z-score explains high level of development and negative values show low level of development whereas districts having positive values under unimproved sanitation reflects low level of development and negative values indicates high level of development of sanitation facilities. Besides, advanced cartographic techniques, GIS-Arc view programme (version 3.2a) have been applied to show the spatial pattern of availability of improved and unimproved sanitation among the districts of Uttar Pradesh through maps.

V. Results And Discussion

Table 1 shows composite mean z-score ofavailability of improved systems of latrines among the districts of Uttar Pradesh. The analysis clearly states about its wide variation in the state. It varies in score from -0.084 in Badaun to 2.146 in Moradabad. The entire range may be arranged into three categories i.e. high (above 0.406 score), medium (-0.406 to 0.406 score) and low (below -0.406 score).

There are 17 districts falling under high category (above 0.406 scores) of improved latrine facilities, out of which 13 districts namely Saharanpur, Muzaffarnagar, Meerut, Ghaziabad, Bijnor, Moradabad, Rampur, Bareilly, Shahjahanpur, Kheri, Hardoi, Lucknow and Kanpur Nagar form a dominant region extending from northern to central part of the state. Other districts under this category are Agra, Aligarh, Allahabad and Varanasi and they do not make any distinct region.

Table 1:-District wise distribution of Z-scores of improved sanitation facilities in Uttar Pradesh, 2011.

Districts	Piped Sewer System	Septic Tank	With slab/ ventilated Improved Pit	Other System	Composite Score
Saharanpur	0.414	1.270	3.872	0.739	1.574
Muzaffarnagar	0.271	2.863	3.235	1.238	1.902
Bijnor	0.199	1.973	2.752	1.106	1.507
Moradabad	0.199	1.973	2.732	3.467	2.093
Rampur	-0.211	0.897	0.964	1.788	0.859
Jyotiba Phule Nagar	-0.302	0.019	1.159	-0.147	0.182

Table 1 (Continued)

Meerut	1.075	1.989	0.683	1.973	1.430
Baghpat	-0.408	0.094	-0.030	-0.704	-0.262
Ghaziabad	3.422	4.229	0.054	0.880	2.146
Gautam Buddha Nagar	1.516	0.111	-0.813	-0.976	-0.040
Bulandshahar	-0.164	1.465	-0.652	0.261	0.227
Aligarh	0.020	1.025	0.430	1.834	0.827
Mahamaya Nagar	-0.361	-0.584	-1.014	-0.937	-0.724
Mathura	-0.067	0.150	-0.858	-0.602	-0.344
Agra	1.159	0.962	-0.092	0.717	0.686
Firozabad	-0.159	0.127	-0.648	-0.617	-0.285
Mainpuri	-0.502	-0.561	-0.588	-0.881	-0.633
Badaun	-0.283	0.072	-0.067	-0.059	-0.084
Bareilly	1.115	2.215	1.900	3.014	2.061
Pilibhit	-0.310	0.124	0.556	0.000	0.093
Shahjahanpur	-0.281	0.358	0.733	0.821	0.408
Kheri	-0.338	0.200	1.121	1.002	0.496
Sitapur	-0.360	-0.085	0.457	0.639	0.163
Hardoi	-0.255	-0.029	1.091	0.821	0.407
Unnao	-0.303	-0.029	-0.099	-0.304	-0.184
Lucknow	3.993	1.729	-0.333	0.759	1.537
Rae Bareilly	-0.184	-0.520	0.193	-0.022	-0.133
Farrukhabad	-0.342	-0.331	-0.227	-0.351	-0.313
Kannauj	-0.342	-0.599	-0.066	-0.622	-0.407
Etawah	-0.466	-0.386	-0.275	-0.608	-0.434
Auraiya	-0.447	-0.386	-0.416	-0.949	-0.550
Kanpur Dehat	-0.389	-0.520	-0.227	-0.481	-0.404
Kanpur Nagar	4.635	0.728	0.758	0.213	1.584
Jalaun	-0.347	-0.262	0.107	-0.618	-0.280
Jhansi	-0.184	0.036	0.032	-0.261	-0.094
Lalitpur	-0.516	-0.901	-0.748	-1.093	-0.815
Hamirpur	-0.486	-0.663	-0.165	-1.202	-0.629
Mahoba	-0.534	-0.848	-0.849	-1.302	-0.883
Banda	-0.479	-0.400	-0.270	-0.771	-0.480
Chitrakoot	-0.561	-0.987	-0.998	-1.371	-0.979
Fatehpur	-0.400	-0.217	-0.022	-0.056	-0.174
Pratapgarh	-0.462	-0.648	-0.413	-0.240	-0.441
Kaushambi	-0.520	-0.878	-0.762	-0.761	-0.730
Allahabad	1.226	0.396	0.127	1.376	0.782
Barabanki	-0.403	-0.368	0.127	-0.407	-0.263
Faizabad	-0.365	-0.361	-0.689	-0.651	-0.517
Ambedkar Nagar	-0.441	-0.782	-0.274	-0.322	-0.455
Sultanpur	-0.379	-0.495	0.015	0.518	-0.085
Bahraich	-0.410	-0.442	-0.521	0.214	-0.290
Shrawasti	-0.555	-1.098	-0.992	-1.033	-0.919
Balrampur	-0.525	-0.802	-0.831	-1.040	-0.799
Gonda	-0.418	-0.671	-0.870	-0.697	-0.664
Siddharthnagar	-0.496	-0.870	-0.810	-0.593	-0.692
Basti	-0.480	-0.718	-0.710	-0.486	-0.598
SantKabir Nagar	-0.499	-0.974	-0.831	-0.818	-0.781
Mahrajganj	-0.447	-0.637	-0.390	0.164	-0.328

Table 1 (Continued)

Gorakhpur	0.065	-0.637	-0.390	1.081	0.030
Kushinagar	-0.415	-0.409	-0.539	0.084	-0.320
Deoria	-0.423	-0.235	-0.539	-0.381	-0.395
Azamgarh	-0.252	-0.237	0.387	0.903	0.200
Mau	-0.431	-0.401	-0.663	-0.656	-0.538
Ballia	-0.394	-0.401	-0.683	0.131	-0.336
Jaunpur	-0.285	-0.324	0.427	1.387	0.301
Ghazipur	-0.411	-0.099	0.427	0.154	0.018
Chandauli	-0.433	-0.560	-0.774	-0.661	-0.607
Varanasi	2.035	0.011	0.406	0.270	0.680
Sant Ravidas Nagar (Bhadohi)	-0.474	-0.932	-0.875	-1.048	-0.832
Mirzapur	-0.242	-0.576	0.007	0.268	-0.136
Sonbhadra	-0.247	-0.728	-0.606	-0.589	-0.543
Etah	-0.461	-0.690	-1.086	-1.178	-0.854
Kanshiram Nagar	-0.499	-0.734	-1.046	-1.329	-0.902

Source: *Calculation is based on publication of Census of India, 2011, Data on Availability of Latrine Facility, H-H Series Tables, Data Dissemination Wing, office of the Registrar General, New Delhi.*

Table 2: Availability of improved sanitation in Uttar Pradesh

Category	Score	No. of Districts	Districts
High	Above 0.406	17	Saharanpur, Muzaffarnagar, Meerut, Ghaziabad, Bijnor, Moradabad, Rampur, Bareilly, Shahjahanpur, Kheri, Hardoi, Lucknow, Kanpur Nagar, Agra, Aligarh, Allahabad, Varanasi.
Medium	-0.405 to 0.406	28	Ghazipur, Deoria, Ballia, Kushinagar, Maharajganj, Gorakhpur, Azamgarh, Jaunpur, Sultanpur, Bahraich, Barabanki, Rae Bareilly, Fatehpur, Sitapur, Unnao, Gautam Buddha Nagar, Bulandshahar, JyotibaPhule Nagar, Badaun, Farrukhabad, Jhansi, Jalaun, Kanpur Dehat, Baghpat, Firozabad, Pilibhit, Mathura and Mirzapur,
Low	Below -0.405	26	Mahamaya Nagar, Kanshiram Nagar, Eta, Mainpuri, Etawah, Kannauj, Auraiya, Lalitpur, Mahoba, Hamirpur, Banda, Chitrakoot, Kaushambi, Pratapgarh, SantRavidas Nagar, Sonbhadra, Shrawasti, Balrampur, Siddharthnagar, Gonda, Basti, SantKabir Nagar, AmbedkarNagar, Faizabad, Mau and Chandauli.

Source: *Based on Table 1*

Table 2 also exhibits that 28 districts are experiencing medium level (-0.406 to 0.406 score) of improved sanitation. Among them 14 districts, namely, Ghazipur, Ballia, Deoria, Kushinagar, Maharajganj, Gorakhpur, Azamgarh, Jaunpur, Bahraich, Barabanki, Sultanpur, Rae Bareilly, Fatehpur, Sitapur and Unnao constitute a large contiguous region stretching from eastern to central part of the state. The districts of Gautam Buddha Nagar, Bulandshaher, JyotibaPhule Nagar, Badaun and Farrukhabad fall in a small semicircular regional pattern in western Uttar Pradesh; other districts like Jhansi, Jalaun and Kanpur Dehat making a small linear region occurs in southern part of Uttar Pradesh. However, districts of Baghpat, Mathura, Firozabad, Pilibhit and Mirzapur fail to form any region.

Low level (below -0.405 score) of improved sanitation is observed in 26 districts. Among these districts Mahamaya Nagar, Kanshiram Nagar, Eta, Mainpuri, Etawah, Kannauj and Auraiya form a long contiguous belt in south western part of Uttar Pradesh. A linear belt in south east part of the state is comprised of 7 districts and these districts are Lalitpur, Mahoba, Hamirpur, Banda, Chitrakoot, Kaushambi and Pratapgarh. A region stretching from south west to south east is framed by Shrawasti, Balrampur, Siddharthnagar, Gonda, Basti, Sant Kabir Nagar, Ambedkar Nagar and Faizabad. Other districts which are sparsely distributed and do not make any contiguous region are Sant Ravidas Nagar, Sonbhadra and Mau.

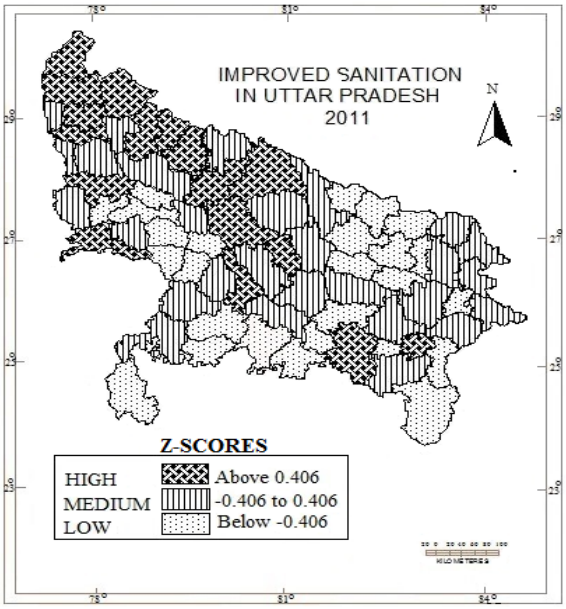

Figure 2

An examination of data in Table 3 reveals that unimproved sanitation in respect of availability of toilets among the districts of Uttar Pradesh also have a wide variation. It varies from -0.063 score in Fatehpur to 2.139 score in Moradabad. The whole range is categorized into three groups i.e. high (above 0.323 score), medium (-0.323 to 0.323 score) and low (below -0.323 score).

There are 20 districts in high category of availability of unimproved sanitation (above 0.323 score). An identifiable region of this group is stretched in western Uttar Pradesh and covers the districts like Muzaffarnagar, Bijnor, Meerut, Ghaziabad, Moradabad, Rampur, Bareilly, Badaun and Aligarh. Another observable region of this grade is formed by five districts in central Uttar Pradesh. These districts are Kheri, Sitapur, Hardoi, Lucknow, and Kanpur Nagar. High level of unimproved sanitation is also found in Gorakhpur, Azamgarh, Jaunpur, Allahabad, and Sultanpur making an extended belt in eastern Uttar Pradesh. Agra is the only district which does not form any region.

Table 3:- District wise distribution of Z-scores ofunimproved sanitation condition in Uttar Pradesh, 2011.

Districts	Without Slab/open Pit	Night soil disposed into open drain	Night Soil removed by human	Night soil serviced by animal	Public Latrine	Open	Composite Score
Saharanpur	0.544	0.114	0.722	0.040	0.008	-0.368	0.177
Muzaffarnagar	1.233	0.445	0.994	1.316	0.331	-0.482	0.639
Bijnor	2.094	-0.007	1.642	0.993	0.037	-0.353	0.734
Moradabad	3.700	1.573	5.490	1.258	0.898	-0.087	2.139
Rampur	2.669	0.170	1.815	0.250	-0.322	-1.187	0.566
Jyotiba Phule Nagar	0.222	-0.293	0.745	-0.341	-0.455	-1.084	-0.201
Meerut	0.361	7.044	0.402	1.391	0.567	-1.116	1.441
Baghpat	-0.722	-0.271	-0.355	-0.587	-0.784	-1.610	-0.722
Ghaziabad	0.401	2.105	-0.355	1.960	-0.089	-1.232	0.465
Gautam Buddha Nagar	-0.929	-0.346	-0.297	0.448	-0.089	-1.665	-0.480
Bulandshahar	-0.617	0.733	0.531	0.226	-0.083	0.216	0.168
Aligarh	-0.030	0.662	-0.083	0.955	0.333	0.389	0.371
Mahamaya Nagar	-1.103	-0.109	-0.362	-0.654	-0.449	-0.791	-0.578
Mathura	-0.896	1.107	-0.303	0.017	-0.013	-0.290	-0.063
Agra	-0.365	1.678	-0.135	0.908	1.632	0.417	0.689
Firozabad	-0.436	-0.211	-0.284	0.020	-0.290	-0.212	-0.235
Mainpuri	-0.781	-0.402	-0.369	-0.720	-0.290	-0.397	-0.493
Badaun	0.214	-0.020	3.976	0.491	0.111	0.914	0.948
Bareilly	2.698	0.269	2.289	1.571	0.740	-0.121	1.241
Pilibhit	0.922	-0.261	0.182	-0.860	-0.458	-0.121	-0.099
Shahjahanpur	0.794	-0.171	1.238	-0.108	-0.177	0.184	0.293
Kheri	1.636	-0.223	-0.218	0.153	-0.083	1.754	0.503
Sitapur	2.042	-0.152	-0.306	1.052	0.194	2.590	0.903
Hardoi	1.827	-0.266	0.666	0.922	0.480	1.743	0.895
Unnao	0.259	-0.093	-0.271	-0.443	-0.199	0.966	0.037
Lucknow	0.025	0.916	-0.348	1.710	2.272	-0.183	0.732

Table 3 (Continued)

Rae Bareilly	0.419	-0.262	-0.416	0.369	-0.140	1.521	0.249
Farrukhabad	-0.232	-0.262	0.216	-0.764	-0.637	-0.721	-0.400
Kannauj	-0.105	-0.399	-0.224	-0.577	-0.456	-0.737	-0.416
Etawah	-0.659	-0.200	-0.326	-1.013	-0.711	-0.812	-0.620
Auraiya	-0.414	-0.547	-0.383	-1.203	-0.781	-0.856	-0.697
Kanpur Dehat	-0.618	-0.492	-0.397	0.378	-0.380	-0.856	-0.394
Kanpur Nagar	0.189	0.837	-0.294	0.378	6.444	-0.856	1.116
Jalaun	-0.278	-0.407	-0.401	-0.379	-0.674	-0.881	-0.503
Jhansi	-0.746	-0.190	-0.377	0.293	0.213	-0.633	-0.240
Lalitpur	-0.849	-0.424	-0.440	-1.499	-0.918	-0.849	-0.830
Hamirpur	-0.592	-0.530	-0.433	-1.499	-0.793	-1.111	-0.826
Mahoba	-1.184	-0.514	-0.441	-1.211	-0.884	-1.247	-0.914
Banda	-0.298	-0.265	-0.434	-0.468	-0.629	-0.446	-0.423
Chitrakoot	-1.109	-0.542	-0.442	-1.541	-0.976	-1.111	-0.953
Fatehpur	-0.273	-0.252	-0.321	0.048	-0.307	0.454	-0.108
Pratapgarh	-0.206	-0.320	-0.436	-0.093	0.010	1.204	0.026
Kaushambi	-0.539	-0.439	-0.432	-0.739	-0.459	-0.466	-0.512
Allahabad	1.465	0.159	-0.408	2.928	1.601	2.323	1.345
Barabanki	0.677	-0.173	-0.322	-0.359	0.025	1.235	0.180
Faizabad	-0.466	-0.386	-0.436	-0.720	-0.320	0.211	-0.353
Ambedkar Nagar	-0.345	-0.352	-0.377	-0.383	-0.029	0.007	-0.246
Sultanpur	0.343	-0.306	-0.417	0.379	0.298	1.683	0.330
Bahraich	-0.235	-0.293	-0.402	-0.649	-0.407	1.529	-0.076
Shrawasti	-0.842	-0.527	-0.433	-1.446	-0.815	-0.940	-0.834
Balrampur	-0.726	-0.502	-0.432	-1.291	-0.853	-0.940	-0.791
Gonda	-0.748	-0.255	-0.431	-0.473	-0.468	1.291	-0.181
Siddharthnagar	-0.829	-0.438	-0.431	-0.574	-0.447	0.258	-0.410
Basti	-0.523	-0.386	-0.423	-0.968	-0.356	0.173	-0.414
Sant Kabir Nagar	-0.762	-0.436	-0.437	-0.885	-0.669	-0.537	-0.621
Mahrajganj	0.033	-0.410	-0.430	0.541	-0.325	0.354	-0.040
Gorakhpur	0.262	-0.160	-0.413	1.522	1.074	1.328	0.602
Kushinagar	-0.277	-0.406	-0.415	0.704	0.133	1.229	0.161
Deoria	-0.858	-0.350	-0.434	0.794	0.309	0.552	0.002
Azamgarh	0.014	-0.203	-0.431	1.496	0.803	1.654	0.556
Mau	-0.808	-0.357	-0.430	-0.299	-0.486	-0.444	-0.471
Ballia	-0.672	-0.259	-0.417	2.028	0.112	0.451	0.207
Jaunpur	0.683	-0.070	-0.398	1.486	1.086	1.720	0.751
Ghazipur	-0.444	-0.272	-0.310	0.180	0.017	0.830	0.000
Chandauli	-0.786	-0.396	-0.429	-0.674	-0.514	-0.537	-0.556
Varanasi	0.123	-0.134	-0.391	-0.674	0.550	-0.385	-0.152
Sant Ravidas Nagar	-0.800	-0.457	-0.439	-1.210	-0.621	-0.842	-0.728
Mirzapur	-0.001	-0.248	-0.404	-1.210	-0.080	-0.051	-0.332
Sonbhadra	0.373	-0.468	-0.436	-1.210	-0.098	-0.348	-0.364
Etah	-1.085	-0.421	-0.436	-0.649	-0.478	-0.445	-0.586
Kanshiram Nagar	-1.041	-0.267	0.137	-0.802	-0.784	-0.824	-0.597

Source: *Calculation is based on publication of Census of India, 2011, Data on Availability of Latrine Facility, H-H Series Tables Data Dissemination Wing, office of the Registrar General, New Delhi.*

Table 4: Availability of unimproved sanitation in Uttar Pradesh

Category	Score	No.of Districts	Districts
High	Above 0.323	20	Muzaffarnagar, Bijnor, Meerut, Ghaziabad, Moradabad, Rampur, Bareilly, Badaun,Aligarh, Kheri, Sitapur, Hardoi, Lucknow, Kanpur Nagar, Gorakhpur, Azamgarh, Jaunpur, Allahabad, Sultanpur and Agra.
Medium	-0.323 to 0.323	22	Bahraich, Gonda, Barabanki, Rae Bareilly, Unnao, Fatehpur, Pratapgarh, Maharajganj, Kushinagar, Deoria, Ballia, Ghazipur, Varanasi, Pilibhit, Shahjahanpur, Saharanpur, JyotibaPhule Nagar, Bulandshaher, Mathura,Firozabad, Jhansi and Ambedkarnagar.
Low	Below -0.323	29	Baghpat, Gautam Buddha Nagar, Mahamaya Nagar, Etah, Kanshiram Nagar, Farrukhabad, Etawah, Mainpuri, Kannauj, Auraiya, Kanpur Dehat, Jalaun, Hamirpur, Mahoba, Banda, Chitrakoot, Kaushambi, Lalitpur, Shrawasti, Balrampur, Siddharthnagar, Basti, SantKabir Nagar, Faizabad, Mau, Sonbhadra, Chandauli, Mirzapur, SantRavidas Nagar.

Source: *Based on Table 3*

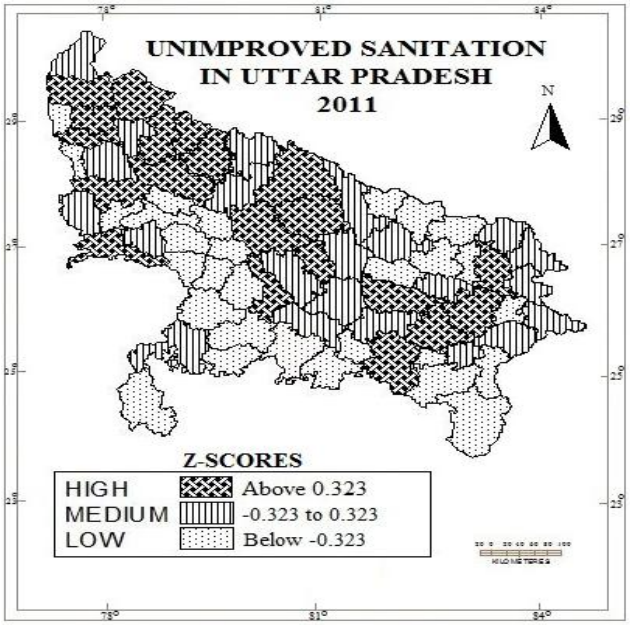

Figure 3

Medium level (-0.323 to 0.323 score) of unimproved sanitation has been noticed in 22 districts among these Bahraich, Gonda, Barabanki, Rae Bareilly, Unnao, Fatehpur and Pratapgarh forming a remarkable region in central to eastern Uttar Pradesh. Districts of Maharajganj, Kushinagar, Deoria, Ballia, Ghazipur, and Varanasi make a recognisable region in eastern part of the study area. A small region is also marked by two districts namely Pilibhit and Shahjahanpur. Seven districts namely Saharanpur, Jyotiba Phule Nagar, Bulandshahar, Mathura, Firozabad, Jhansi and Ambedkarnagar are widely scattered and do not frame any region.

There are 29 districts which score for low level unimproved sanitation (below -0.323), among which, Mahamaya Nagar, Eta, Kanshiram Nagar, Farrukhabad, Etawah, Mainpuri, Kannauj, Auraiya, Kanpur Dehat, Jalaun, Hamirpur, Mahoba, Banda, Chitrakoot, Kaushambi make a vast contiguous region in southern Uttar Pradesh. Six districts namely Shrawasti, Balrampur, Siddarthnagar, Basti, Sant Kabir Nagar and Faizabad constituting a pocket spread over the eastern part of Uttar Pradesh. Another region formed by the districts of Sonbhadra, Mirzapur, Chandauli, and Sant Ravidas Nagar exist in south-eastern part Uttar Pradesh. Districts which do not fall under any distinct region are Baghpat, Gautam Buddha Nagar,Mau and Lalitpur.

VI. Conclusion And Suggestions

The overall analysis of study reveals that accessibility of improved sanitation among the districts of Uttar Pradesh is recorded mainly of medium and low levels which are identified in eastern and southern parts of the state with a linear belt of high level covering the upper western to central part of the state. Most of the districts of southern and eastern parts of Uttar Pradesh experience medium to low level of availability of unimproved sanitation, while few pockets are reflecting high level of unimproved sanitation in western, central and eastern parts of Uttar Pradesh. Regions falling in high category in both the cases are in the western part of the state with few districts in south-west, central and eastern parts. Here, it is found that in Uttar Pradesh there are some districts which fall under high category in terms of both improved and unimproved sanitation. The outcome of such results may be due to vertical and horizontal inequalities within the state and high density of population in western, northern and central parts along with few districts in the east. So, to fill the gaps or to minimize such inequalities and disparities there needs some measures which can work out to level up inter-district variations in availability of sanitation in Uttar Pradesh. Some of the measures thatcan be adopted to minimize inter-district variations in availability of sanitation within the state are

- Effective implementation and regular monitoring of schemes and programs launched by State Government for improved sanitation facilities in the state.
- To bring about an improvement in the general quality of life in the rural areas, dwellers of slum and squatter settlements, population of such settlements who are shifted in new colonies or in urban areas, special attention has to be given in spreading awareness and consciousness for cleanliness, health and hygiene under certain drives for ecologically safe and sustainable sanitation.
- To change the casual attitude of defecating and throwing waste at free will and to change the traditional rigid mindset of community, an intensive behavior change campaign and an intensive inter-personal

communication supported by media campaign is the need of an hourboth in rural and urban areas of the state.

- Fringe areas of the cities should be incorporated in municipal boundaries so that the basic sanitation facilities may be diffused there.
- Decentralization of sanitation facilities from the urban areas to the areas where these facilities are least availed.

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