Study On Impact Of Natural Disasters And Its Relationship With Rainfall Distribution In The State Of Uttar Pradesh During 2006-2010

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Abstract:

Although disaster is the product of a hazard such as earthquake, flood or windstorm etc when coincides with a vulnerable situation which include communities, villages or cities. It occurs when hazards and vulnerability meet. Rainfall in an Indian Scenario has large spatial as well as temporal variability. In fact it is the main source of disaster where the average annual rainfall is less than 13mm over the western Rajasthan, while at Mausinram in the Meghalaya has as much as 1141mm. Thus rainfall pattern roughly reflects the different climatic regimes of the country which vary from humid in the northeast about 180 days rainfall in a year to arid in Rajasthan (20 days rainfall in a year) so significant is the monsoon to the Indian climate that all other seasons are often referred relative to it. The State of Uttar Pradesh is one of the largest and underdeveloped states in India. It is surrounded by states of Uttarakhand and Himachal Pradesh in the north Haryana in the west, Madhya Pradesh in the south and Bihar in the east. It has been observed that recurring floods and droughts in the state over the years have been causing severe damage and adversely affecting human, plant, animal life, property and environment. Hence with a objective to study the indices of natural disasters with reference to rainfall distribution in UP from 2006-2010 and further to reveal the impact of flood/drought with reference to the issues of sustainability and livelihood. The Data for the study was obtained from various state agencies, estimates were done by Latin Square Design (LSD) technique and with the help of SPSS 15 software. Vulnerabilities have been obtained for 17 divisions of the state in terms of impact of rainfall distribution year wise with reference to population, area, agriculture and lives. Our studies indicate that natural disasters cause devastating losses and the poor segments of society especially bear the greatest risk of negative impacts due to high level of exposure and limited coping capacities.

Keywords: Natural disasters, Rainfall Distribution, Uttar Pradesh, Vulnerability.

Introduction:

Disaster is the widespread destruction of life and property. Disaster is the product of a hazard such as earthquake, flood, tsunamis, or windstorm coinciding with a vulnerable situation which all include communities, cities or villages. A disaster occurs when hazards and vulnerability meet. Unmesh, et al.;2010 stated in a report about Vulnerability and Coping to Disasters: A Study of Household Behavior in Flood Prone Region of India. A dangerous condition or events that threaten or have the potential for causing injury to life or damage to property or the environment is called hazard. People all over the world are affected by disasters that occur now and then. Natural disasters can have catastrophic impacts. These may be economic, social and environmental damage. Social impacts all include loss of life, injury, ill health, homelessness and disruption of communities. (Yezer,et al.; 2009) studied the economics of natural disaster. Environmental damage ranges from the falling of trees to the reshaping of entire landscapes. Recent events such as the Indian Ocean tsunami in 2004, hurricane Katrina in 2005, and the Haitian and Chilean earthquakes in 2010 have received worldwide media coverage. Hazards can be categorized in various ways but based on origin, they worldwide are basically classified into two, Natural Hazard with meteorological or even biological origin and Un-natural Hazard with human caused or technological origin. It is also important to know that natural phenomena interact with the manmade environment or fragile areas which causes wide spread damage. India is a vast country and highly prone to multi disaster India has already experienced the super clones of Orissa, resulting in all devastation in the state killing 1many people destroying 18 lakhs houses, destroying nearly the entire agriculture crop. The cyclone affected the way of life of about 15 million. Few years back Gujarat had faced earthquake measuring 6.9 on reactor scale epicenter near Kuchh district. In Madhya Pradesh release of toxic gas in 1984 at Union Carbide Company in Bhopal and fire accident

in L.P.G. storage and distribution area at HPCL in Vishakhapatnam are some of the industrial accidents cited as the worst disasters. Tsunami cyclones have taken lives of so many people in India and Indonesia. Rapid population growth, unplanned development, the constant use of environment and its resources has inevitably resulted in certain changes in environment. The nature and intensity of natural disaster has changed considerably. About 60% of land mass is prone to earth quakes of various intensities; over 40 million hectare is prone to flood about 8% of land. Disasters almost always have negative impacts, ranging from damage to ecosystems to the production of vast quantities of waste. Post-disaster reconstruction can either be an opportunity to address these impacts and long-standing environmental problems in the disaster location or it can cause a second wave of damage. Impact of disaster includes Loss of vegetation, habitat, flooding mudslides and soil erosion ,damage to offshore coral reefs and natural coastal defense mechanisms etc. In India people living in disaster prone regions of the country are subject to variety of risks concerning their livelihoods. Fuzzy Comprehensive Assessment (FCA), Simple Fuzzy Classification (SFC), and the Fuzzy Similarity Method (FSM) have been used to assess flood disaster risk (Weiguo,et al.; 2008). The risks arise mostly because of the majority of population depend on climate sensitive factors for their livelihoods. Preliminary assessments reveal that the severity and intensity of floods in various parts of India might increase due to climate change. To characterize the vulnerability of a farmer to climate change and climate variability, and tries to identify the regions that are relatively more vulnerable to climate variability and change (Kavikumar ,et al.; 2010). India is home to an extraordinary variety of climatic regions, ranging from tropical in the south to temperate and alpine in the Himalayan north. Negative impact of climate change as stated by Johanna, 2009. Rainfall is also the main source of disaster the average annual rainfall is less than 13 cm over the western Rajasthan, while at Mausinram in the Meghalaya has as much as 1141 cm. Zope, et al.; 2012 have performed statistical analysis of rainfall for various duration and various return period. The rainfall pattern roughly reflects the different climate regimes of the country, which vary from humid in the northeast to arid in Rajasthan 20 days rainfall in a year. India is characterized by strong temperature variations in different seasons ranging from mean temperature of about 10°C in winter to about 32 °C in summer season. India Meteorological Department (IMD) has categorized the months of January and February as Winter. In summer season the temperatures start to increase all over the country in March and by April record mean daily temperatures of 30-35 °C. In Monsoon it covers June, July, August and September the most significant feature of the Indian climate. The season is spread over four months, the monsoon is influenced by global and local phenomenon like El Nino, northern hemispheric temperatures, sea surface temperatures, snow cover etc. chances of flooding and landslides during rainy seasons with subsequent impacts on agriculture and Geographic information system technology played an important role in collection of disaster data (Zhou, et al .;2009). (Zhou, et al (2005) stated GIS based approach to Flood Risk Zonation. The Disaster Management Act, 2005 has been enacted for establishing requisite institutional mechanisms for drawing up and monitoring the implementation of disaster management plans all Government of India took a defining step by enacting the Disaster Management Act, 2005, which envisaged the creation of the National Disaster Management Authority headed by the Prime Minister, State Disaster Management Authorities headed by the Chief Ministers and District Disaster Management Authorities headed by the Collector or District Magistrate or Deputy Commissioner to prevention, mitigation and also to minimize losses of life, livelihoods and property. Disaster Management include measures such as prevention threat of any disaster, mitigation or reduction of risk, research and knowledge management, Assessing the severity or magnitude of effects of any disaster, and Rehabilitation and reconstruction. India the seventh largest country in the world all is well marked all from the rest of Asia by mountains and the sea, which gives the country a distinct geographical entity and covers an area of 32,87,2631 sq.km. The total length of the coastline of the mainland, Lakshadweep group of islands and Andaman and Nicobar group of islands is 7,516.5 km The state of Uttar Pradesh is one of the largest and under developed states in India. The state is surrounded by the states Uttarakhand and Himachal Pradesh in the north, Haryana in the west, Madhya Pradesh in the south and Bihar in the east. It also shares an international border with Nepal in the north, also one of the most populous states 16.4 percent of the country's population. It covers a large part of the densely populated Gangetic plain. Uttar Pradesh can be divided into three regions by different geographical conditions: Himalayan region - North, the Gangetic plains - Middle, and the Vindhyan hills and plateau - South. It is also the fourth largest state in geographical area covering 9.0 per cent of the country's geographical area, encompassing 2, 94, 411 square kilometers and comprising of 83 districts, 901 development blocks and 112,804 inhabited villages. The density of population in the state is 473 peoples per square kilometers as against 274 for the country. The climate varies from moderately temperate in the Himalayan region to tropical monsoon in the central plains and southern upland regions. Rainfall in the state ranges from 40-80 inches (1,000-2,000 millimeters) in the east to 24-40 inches in the west. Periodic failure of monsoons results in drought conditions and crop failure. Uttar Pradesh is situated in the foot-hills of the Himalayan range. can be summed as Latitude – 23°52' North and 31°28' North,

Longitude – 77º3' and 84º39' East. The geography of Uttar Pradesh is divided in The Himalayan Region, Gangetic Plain and Vindhya Hills. The total geographical area of Uttar Pradesh is 240.93 lakh hectares. In U.P annual estimated loss due to floods is Rs. 432 crores. The recurrence period of highly deficient rainfall in East U.P. whereas in West U.P. The Terai belt districts of UP and entire districts of Saharanpur, Muzaffarnagar, Bagpat, Bijnor, Meerut, Ghaziabad, Gautambuddh Nagar, JP Nagar, Rampur, Moradabad, Bulandshahr in western UP are Earthquake prone. Among various natural disasters floods are the most common. Important rivers, which create floods in the State, are the Ganga, Yamuna, Râmgangâ, Gomati, Sharda, Ghaghara, Rapti and the Gandak. The rainfall increases from west to east and from south to north. Similar is the pattern of floods, the problem increases from west to east and south to north. Out of the 240.93 lakh hectares geographical area of the State about 73.06 lakh hectares is flood prone. Approx. 27 lakh hectares affected annually due to Floods. Drought is another major disaster affecting the State. Annual loss due to drought in the State varies depending on the severity of the drought. In the recent years, the year 2002, & 2004 were severe in terms of drought, with loss to crop, livestock and property assessed at Rs.7540 crores and Rs. 7292 crores respectively. Main objectives were to study the increasing trends of disaster with reference to rainfall distribution in Uttar Pradesh during 2006-2010 to link the parameter of flood/ drought, agricultural, productivity and issues of sustainable livelihood.

Study Area: The study was carried out in Uttar Pradesh, the most populous of all Indian States, is also the fifth largest state in India. The inability to manage the state efficiently as a collective unit, owing to its large area has already resulted into splitting of state on more than one occasion and if the central government gives a nod it will further be divided into four small states.

Data Source: The data of rainfall was collected from Indian meteorological department, State disaster management authority. The data was also taken from Irrigation department of Uttar Pradesh, National disaster management authority, Census Department, Govt of Uttar Pradesh, National Institute of Disaster Management, and Planning Commission of India.

Materials and Methods:

In order to assess the rainfall patterns area of four region of Uttar Pradesh were analyzed. The area is further divided into 17 divisions and each division encompasses its districts. This study adopts the two way analysis by LATIN SQUARE DESIGN (LSD) to analyze the complete variance of rain fall distribution of Uttar Pradesh and to assess flood/drought disaster risk. LSD is a part of statistical software SPSS-15. In this method Univariate Analysis of Variance is computed for the distribution of rainfall in different region of Uttar Pradesh. This eliminates the possible variance in rainfall distribution. LSD synthesizes and evaluates several individual components of a process as a whole .The flood /drought disaster risk regions divided into four classes: Eastern region, Central region, Western region, Bundelkhand region of Uttar Pradesh. In this method we have analyzed the comparison between division-region, year wise, and region wise using three variables to analyze the rainfall in the different part of Uttar Pradesh. Two ways analysis by LSD (LATIN SQUARE DESIGN) of the data was done by the help of SPSS-15 software. Thus Univariate Analysis of Variance is computed for the distribution of rainfall in different regions of Uttar Pradesh.

Results and Disscussion:

Uttar Pradesh is already sensitive to flood and drought disaster. Flood and drought depended on the all rainfall distribution. (Please see tables 1-16)

1. Statistical Analysis: We observed that average rainfall for central region in the district of Kanpur dehat was highest all with value of 149.79mm in year 2009. While as contradictory to this, rainfall in the same year in the region of Agra was recorded lowest in district Hathrus as 15.86mm.
2. Variables Analysis: In this method we used the three variables region, division and year. Please refer tables 17 to 22. These variables have different value of average rainfall, Eastern region have 40, Central region 10, Bundelkhand region 10 and Western region 25. 3.

i. Regional Pattern: Observations as seen in table 18 that during 2006-10 Central region was highly affected by rainfall, maximum average rainfall mean 336.020 while in Bundelkhand region minimum average rainfall mean 194.370 have droughty condition.

ii. Divisional pattern:All Eastern region was showed maximum average rainfall in Devipatan division 440.574 and minimum average rainfall 180.350 was observed in Mirzapur division.In Central region with maximum average rainfall in Kanpur division 390.634 and Lucknow division with minimum average rainfall 281.406. In Bundelkhand region having maximum average rainfall 233.662 in Chitrakoot division and in Jhansi division having minimum average rainfall 155.078. In Western region having maximum average rainfall in all Bareilly 282.098 and minimum average rainfall was observed in Agra division 197.306.

iii. Year wise Pattern : In this observation in 2008 having maximum average rainfall 321.152 in most of the regions of Uttar Pradesh with few exceptions and minimum average rainfall 218.889.

iv Regional Comparison: In this observation please refer table no. 23 Bundelkhand region having maximum mean difference than other regions while Central region having minimum mean difference. This observation also shows that Central region having maximum rainfall and Bundelkhand region minimum. One can conclude that average rainfall of the year 2008 is maximum and minimum in case of 2006. In year 2008 32 districts, population of 41.75 lakhs , area of 4.98 lakh hectares , agriculture land of 3.53 lakh hectares, household 41.75 lakhs were affected. In addition to this loss of life was also reported and it accounted to 889 in case of humans and 1898 animals. 2006 is low affected year than the other years, in this year area affected district 12 and population, area, agriculture, household and life a value as 4.53 lakhs/ ha, 1.10 lakh/ha, .60 lakh/ha, .0059 lakh, human 889 and animal 1898. Natural disasters can cause devastating losses and the poor segments of society especially bear the greatest risk of the negative impacts due to their high level of exposure and limited coping capacities. Result obtained from the detailed rainfall analysis such as for different year using this approach, vulnerability is calculated 17 divisions in Uttar Pradesh in India in terms of the impact of rainfall distribution. It is concluded that rainfall distribution is one a of the major factor to increment occurrence of disaster like drought and flood.

Gorakhpur Division						
	Year	2006	2007	2008	2009	2010
District						
Gorakhpur		87.89	125.99	143.075	80.85	108.38
Kushinagar		89.38	100.87	120.98	78.23	90.2
Devariya		71.06	95.05	32.4	69.09	69.08
Mahrajganj		88.33	92.24	50.125	41.35	62.808
	Total	336.66	414.16	346.58	369.52	330.468

Table No-1

Basti Division						
	year	2006	2007	2008	2009	2010
District						
Basti		70.46	70.46	104.61	60.975	68.57
siddharthnagar		74.625	94.35	124.575	75.98	77.35
Santkabir nagar		70.21	90.76	100.78	67.98	88.32
	Total	215.295	290.326	329.965	204.935	234.24

Table No-2

Faizabad Division						
	year	2006	2007	2008	2009	2010
District						
Faizabad		50.86	75.59	105.59	74.3	69.62
Ambedkarnagar		38.93	52.74	110.81	51.46	46.47
Barabanki		51.44	44.11	114.89	83.53	67.2
Sultanpur		55.175	69.325	97.125	58.91	60.7
	Total	196.405	241.765	428.415	268.2	244.0

Table No3

Devipatan Division						
	Year	2006	2007	2008	2009	2010
District						
Gonda		48.2	91.77	91.46	80.25	85.46
Bahrich		79.39	123.69	105.79	101.55	70.46
Shravasti		84.52	92.68	85.7	90.1	86.01
Balrampur		73.66	66.03	120.45	66.2	82.7

Khiri		66.16	85.24	126.75	98.125	100.54
	Total	351.93	459.41	530.15	436.225	425.16

Table No4

Varanasi Division						
	Year	2006	2007	2008	2009	2010
District						
Varanasi		63.98	63.76	100.81	36.13	58.1
Chandauli		56.7	60.43	45.98	44.09	54
Gazipur		67.85	100.93	67.34	53.63	62.8
Jaunpur		76.756	80.44	93.3	42.4	41.7
	Total	265.09	305.56	307.43	176.25	216.6

Table No5

Azamgarh Division						
	Year	2006	2007	2008	2009	2010
District						
Azamgarh		93.73	134.116	77.25	40.91	75.6
Ballia		50.4	64.5	100.86	24.21	42.625
Mau		43.36	15.6	69.25	26.2	119.35
	Total	187.49	214.216	247.36	91.32	237.575

Table No6

Allahabad Division						
	Year	2006	2007	2008	2009	2010
District						
Allahabad		74.75	84.091	103.091	43.23	48.23
Kaushambi		62.76	60.25	45.53	87.31	48.22
Fatehpur		34.78	39.87	93.091	35.36	51.5
Pratapgarh		58.95	28.26	54	92.62	59.81
Raibarelly		52.9	57.34	53.54	28.31	28.7
	Total	284.14	269.811	349.252	286.83	236.46

Table No7

Mirzapur Division						
	year	2006	2007	2008	2009	2010
District						
Mirzapur		67.7	62.65	93.45	30.31	54.64
Santravidasnagar		56.83	54.425	117.5	50.875	43.25
Sonbhadra		76.075	58.475	43.5	44.5	47.58
	total	200.605	175.55	254.45	125.685	145.47

Table No8

Kanpur Division						
	year	2006	2007	2008	2009	2010
District						
Kanpur Nagar		45.21	57.25	120.23	149.79	114.68
Kanpur Dehat		54.65	35.18	50	47.975	42.95
Etawah		27	21.59	62.9	33.4	47.28
Frrukhabad		58.25	42.425	62.13	63.51	84.71
Kannuj		41.76	40.12	61.98	56.21	80.21
Auraiya		28.225	40.54	58.23	40.93	48.39
Hatahrus		29.6	25.45	99.1	45.11	36.27
	total	284.695	262.555	514.57	436.925	454.49

Table No9

Lucknow Division						
	year	2006	2007	2008	2009	2010
District						
Lucknow		76.2	67.05	121.54	69.31	
Hardoi		49.833	34.9	66.21	53.775	

Sitapur		84.075	76.14	131.8	79.54	
Unnao		52.375	56.89	67.43	54.08	
	total	262.483	234.98	386.98	256.705	

Table No10

Chitrakut Division						
	year	2006	2007	2008	2009	2010
District						
Banda		57.88	49.88	88.3	55.15	55.79
Chitrkut		50.76	41.87	80.87	60.54	45.76
Hamirpur		37.83	80.86	84.091	50.21	44.99
Mahoba		38.21	76.66	80.77	45.76	40.12
	Total	184.68	251.27	334.031	211.66	186.66

Table No11

Jhanshi Division						
	year	2006	2007	2008	2009	2010
District						
Jalun		32.35	26.94	61.36	44.41	58.37
Jhanshi		31.9	29.4	97.46	45.48	50.15
Lalitpur		60.35	49.44	62.21	62.708	62.875
Mahoba	Total	124.6	105.78	221.03	152.598	171.395

Table No12

Meerut Division						
	year	2006	2007	2008	2009	2010
District						
Meerut		29.39	31.14	36.45	18.64	57.65
bulandsahar		27	58.11	61.076	34.4	62.49
Gbudhnagar		21.9	34.9	56.98	31.98	66.54
Gaziabad		36.25	30.108	17.6	17.31	57.82
Bagpat		38.94	51.04	71.25	60.66	75.77
	Total	153.48	205.298	243.356	162.99	320.27

Table No13

Moradabad Division						
	year	2006	2007	2008	2009	2010
District						
Moradabad		49.69	82.98	64.57	56.66	127.17
Bijnaur		67.39	96.291	80.74	58.23	108.1
Rampur		21.5	28.32	32.33	32.03	71.45
J Phule nagar		77.28	91.29	107.21	60.41	73.375
	Total	215.86	298.881	284.85	207.33	380.095

Table No14

Sharanpur Division						
	year	2006	2007	2008	2009	2010
District						
Sharanpur		49.54	75.41	63.36	46.2	101.21
Muzaffarnagar		37.9	40.4	21.04	23.56	46.64
	Total	87.44	115.81	84.4	69.76	147.85

Table No15

Bareilly Division						
	year	2006	2007	2008	2009	2010
District						
Bareilly		57.98	86.61	113.01	74.51	119.116
Badaun		53.85	55.48	92.491	45.05	97.45
Pilibhit		28.61	50.69	29.291	66.91	65.59
Shajahnpur		50.291	67.35	99.3	71.33	85.59
	Total	190.731	260.13	334.092	257.8	367.747

Table No16

Agra Division

	Central Region	.(a)	.	.	.
	Budelkhand region	.(a)	.	.	.
	Western region	.(a)	.	.	.
Varanasi	Eastern region	254.200	21.226	211.796	296.604
	Central Region	.(a)	.	.	.
	Budelkhand region	.(a)	.	.	.
	Western region	.(a)	.	.	.
Azamgarh	Eastern region	195.590	21.226	153.186	237.994
	Central Region	.(a)	.	.	.
	Budelkhand region	.(a)	.	.	.
	Western region	.(a)	.	.	.
Allahabad	Eastern region	285.298	21.226	242.894	327.702
	Central Region	.(a)	.	.	.
	Budelkhand region	.(a)	.	.	.
	Western region	.(a)	.	.	.
Mirzapur	Eastern region	180.350	21.226	137.946	222.754
	Central Region	.(a)	.	.	.
	Budelkhand region	.(a)	.	.	.
	Western region	.(a)	.	.	.
Kanpur	Eastern region	.(a)	.	.	.
	Central Region	390.634	21.226	348.230	433.038
	Budelkhand region	.(a)	.	.	.
	Western region	.(a)	.	.	.
Lucknow	Eastern region	.(a)	.	.	.
	Central Region	281.406	21.226	239.002	323.810
	Budelkhand region	.(a)	.	.	.
	Western region	.(a)	.	.	.
Chitrakoot	Eastern region	.(a)	.	.	.
	Central Region	.(a)	.	.	.
	Budelkhand region	233.662	21.226	191.258	276.006
	Western region	.(a)	.	.	.
Jhanshi	Eastern region	.(a)	.	.	.
	Central Region	.(a)	.	.	.
	Budelkhand region	155.078	21.226	112.674	197.482
	Western region	.(a)	.	.	.
Meerut	Eastern region	.(a)	.	.	.
	Central Region	.(a)	.	.	.
	Budelkhand region	.(a)	.	.	.
	Western region	217.076	21.226	174.672	259.480
Moradabad	Eastern region	.(a)	.	.	.
	Central Region	.(a)	.	.	.
	Budelkhand region	.(a)	.	.	.
	Western region	257.230	21.226	214.826	299.634
Saharanpur	Eastern region	.(a)	.	.	.
	Central Region	.(a)	.	.	.
	Budelkhand region	.(a)	.	.	.
	Western region	101.052	21.226	58.648	143.456
Bareilly	Eastern region	.(a)	.	.	.
	Central Region	.(a)	.	.	.
	Budelkhand region	.(a)	.	.	.
	Western region	282.098	21.226	239.694	324.502
Agra	Eastern region	.(a)	.	.	.
	Central Region	.(a)	.	.	.
	Budelkhand region	.(a)	.	.	.
	Western region	197.306	21.226	154.902	239.710

At this level combination of factors is not observed thus the corresponding population marginal mean is not estimable.

Table No. 20. Dependent variable : rainfall Dependent variable average rainfall mean of division along with region

Year	Mean	Std. Error.	95% confidence Interval	
2006	218.889(a)	11.512	195.893	241.886
2007	251.516(a)	11.512	228.519	274.513
2008	321.152(a)	11.512	298.155	344.149
2009	220.721(a)	11.512	197.724	243.718
2010	264.706(a)	11.512	241.710	287.703

a based on modified population marginal mean.

Table No. 21. Dependent Variable : rainfall Average rainfall mean in year wise

Region		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Eastern Region	Central Region Bundelkhand Region Western Region	-57.7740(*) 83.9060(*) 67.3236(*)	16.78078 16.78078 12.10079	.001 .000 .000	-91.2675 50.3825 43.1495	-24.2205 117.4295 91.4977
Central Region	Bundelkhand Region Eastern Region Western Region	57.7440(*) 141.6500(*) 125.0676(*)	16.78078 21.22619 17.75911	.001 .000 .000	24.2205 99.2458 89.5897	91.2675 184.0542 160.5455
Bundelkhand Region	Central Region Eastern Region Western Region	-83.9060(*) -141.6500(*) -16.5824	16.78078 21.22619 17.75911	.000 .000 .354	-117.4295 -184.0542 -52.0603	-50.3825 -99.2458 18.8955
Western Region	Central Region Bundelkhand Region Eastern Region	-67.3236(*) -125.06776(*) 16.5824	12.10079 17.75911 17.75911	.000 .000 .354	-91.4977 -160.5455 18.8955	-43.1495 -89.5897 52.0603

Based on observed means (*) The mean difference is significant at the .05 level.

Table No. 22: Dependent Variable : rainfall ;Average rainfall variance in region wise along with other region.

Year	Affected District	Affected population (lakhs)	Affected Area (lakhs□h)	Affected Agriculture (lakh□h)	Affected Household (lakhs)	Affected Life	
						HUMAN	ANIMAL
2006	12	4.53	1.10	.60	.0059	353	583
2007	23	26.53	4.83	5.66	0.34	272	170
2008	32	41.75	4.988	3.53	5.30	889	189
2009	25	28.76	2.23	1.55	.02	102	144
2010	28	27.87	2.43	1.98	.015	98	190

Table No. 23: Disturbance due to rainfall and consequent disaster.

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Abbreviations

IMD	-	Indian Meteorological Department
UP	-	Uttar Pradesh
FCA	-	Fuzzy Comprehensive Assessment
SFC	-	Simple Fuzzy Classification
FSM	-	Fuzzy Similarity Method
GIS	-	Geographic Information System
GOI	-	Government of India
LSD	-	Latin Square Design
SPSS	-	Software Package For Statistical Analysis