



INTER STATE DISPARITY IN NATURAL DISASTER DAMAGES IN INDIA

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ABSTRACT

Droughts, flash floods, cyclones, avalanches, landslides brought on by torrential rains, and snowstorms pose the greatest threats. A natural disaster might be caused by earthquakes, flooding, volcanic eruption, landslides, hurricanes etc. This paper deals with interstate disparity in natural disaster impact with respect to human lives lost due to cyclonic storms/ heavy rains/ floods/ landslides. This paper outlines the loss of cattle life, houses damaged and cropped area damaged consequent upon natural disaster. This paper concludes with some interesting findings along with policy suggestions.

KEYWORDS: Natural disasters, Droughts, flash floods, cyclones, avalanches, environmental effect, landslides,

INTRODUCTION

Natural disasters in India, many of them related to the climate of India, cause massive losses of Indian life and property. Droughts, flash floods, cyclones, avalanches, landslides brought on by torrential rains, and snowstorms pose the greatest threats. A natural disaster might be caused by earthquakes, flooding, volcanic eruption, landslides, hurricanes etc. In order to be classified as a disaster it will have profound environmental effect or human loss and frequently incurs financial loss.^[1] Other dangers include frequent summer dust storms, which usually track from north to south; they cause extensive property damage in North India and deposit large amounts of dust from arid regions. Hail is also common in parts of India, causing severe damage to standing crops such as rice and wheat.

Landslides are very common indeed in the Lower Himalayas. The young age of the region's hills result in labile rock formations, which are susceptible to slippages. Rising population and development pressures, particularly from logging and tourism, cause deforestation. The result is denuded hillsides which exacerbate the severity of landslides; since tree cover impedes the downhill flow of

water. Parts of the Western Ghats also suffer from low-intensity landslides. Avalanches occurrences are common in Kashmir, Himachal Pradesh, and Sikkim.

Floods are the most common natural disaster in India. The heavy southwest monsoon rains cause the Brahmaputra and other rivers to distend their banks, often flooding surrounding areas. Though they provide rice paddy farmers with a largely dependable source of natural irrigation and fertilization, the floods can kill thousands and displace millions. Excess, erratic, or untimely monsoon rainfall may also wash away or otherwise ruin crops. Almost all of India is flood-prone, and extreme precipitation events, such as flash floods and torrential rains, have become increasingly common in central India over the past several decades, coinciding with rising temperatures. Meanwhile, the annual precipitation totals have shown a gradual decline, due to a weakening monsoon circulation as a result of the rapid warming in the Indian Ocean and a reduced land-sea temperature difference. This means that there are more extreme rainfall events intermittent with longer dry spells over central India in the recent decades.

Cyclones bring with them heavy rains, storm surges, and winds that often cut affected areas off from relief and supplies. In the North Indian Ocean Basin, the cyclone season runs from April to December, with peak activity between May and November. Each year, an average of eight storms with sustained wind speeds greater than 63 kilometers per hour (39 mph) form; of these, two strengthen into true tropical cyclones, which have sustained gusts greater than 117 kilometers per hour (73 mph). On average, a major (Category 3 or higher) cyclone develops every other year.

During summer, the Bay of Bengal is subject to intense heating, giving rise to humid and unstable air masses that produce cyclones. Many powerful cyclones, including the 1737 Calcutta cyclone, the 1970 Bhola cyclone, the 1991 Bangladesh cyclone and the 1999 Odisha cyclone have led to widespread devastation along parts of the eastern coast of India and neighboring Bangladesh. Widespread death and property destruction are reported every year in exposed coastal states such as Andhra Pradesh, Orissa, Tamil Nadu, and West Bengal. India's

western coast, bordering the more placid Arabian Sea, experiences cyclones only rarely; these mainly strike Gujarat and, less frequently, Kerala. In terms of damage and loss of life, Cyclone 05B, a super cyclone that struck Orissa on 29 October 1999, was the worst in more than a quarter-century. With peak winds of 160 miles per hour (257 km/h), it was the equivalent of a Category 5 hurricane. Almost two million people were left homeless; another 20 million people life were disrupted by the cyclone. Officially, 9,803 people died from the storm; unofficial estimates place the death toll at over 10,100.

METHODS AND MATERIALS

This section deals with impact of natural disaster on life in India during the period 2009-2010 to 2014-2015. The relevant data are collected from the reports of Climate Change - India 2015, Government of India Ministry of Statistics and Programme Implementation, Central Statistics Office Social Statistics Division New Delhi. The collected data are tabulated and data analysis is carried out with the help of percentage and average analysis.

RESULTS AND DISCUSSION

INTERSTATE DISPARITY IN NATURAL DISASTER IMPACT IN INDIA
Table 1 State Wise Details of Human Lives Lost due to cyclonic storms/ Heavy rains/ floods/ Landslides

States/ UTs	Human Lives Lost						Total
	2009-10	2010-11 (P)	2011-12 (P)	2012-13 (P)	2013-14 (P)	2014-15 (P)	
Andhra Pradesh	108	133	0	61	60	61	423 (74.46)
Arunachal Pradesh	-	44	47	70	52	61	274 (83.94)
Assam	8	57	13	168	-	90	336 (97.61)
Bihar	63	93	37	8	231	144	576 (89.06)
Chhattisgarh	5	-	0	5	-	-	10 (50)
Goa	3	1	1	1	-	-	6 (50)
Gujarat	94	232	53	26	186	27	618 (84.78)
Haryana	9	38	-	-	-	-	47 (80.85)
Himachal Pradesh	25	62	51	29	52	45	264 (90.53)
Jammu & Kashmir	-	239	19	-	30	282	570 (58.07)
Jharkhand	-	22	-	-	-	-	22 (0)
Karnataka	396	82	84	-	86	27	675 (41.33)
Kerala	142	103	152	47	182	132	758 (81.26)
Madhya Pradesh	56	38	-	-	390	-	484 (88.42)
Maharashtra	65	8	106	-	365	151	695 (90.64)
Nagaland	-	-	0	36	-	17	53 (100)
Mizoram	-	4	-	-	-	-	4 (0)
Odisha	59	10	87	4	59	50	239 (75.31)
Punjab	8	38	14	8	41	31	140 (94.28)
Tripura	-	-	-	-	-	21	21 (0)
Rajasthan	48	-	-	-	-	-	48 (0)
Sikkim	1	3	77	47	-	-	128 (99.21)
Tamil Nadu	108	-	57	15	-	-	180 (40)
Uttar Pradesh	254	530	692	17	380	132	2005 (87.33)
Uttarakhand	87	214	19	201	3379**	66	3966 (97.80)
West Bengal	137	112	79	241	183	169	921 (85.12)
A & N Islands	-	6	-	-	-	-	6 (0)
Puducherry	-	-	12	-	1	-	13 (7.69)
Total	1676	2069	1600	984	5677**	1674	13680 (87.74)

Source: Statistics Related to Climate Change - India 2015, Government of India Ministry of Statistics and Programme Implementation, Central Statistics Office Social Statistics Division New Delhi PP 254-257

http://mospi.nic.in/Mospi_New/upload/climateChangeStat2015.pdf

Data represented in table 1 indicate the state wise details of human lives lost due to cyclonic storms/ heavy rains/ floods/ landslides. It could be noted that in Andrapradesh 108 people died consequent upon natural disaster in 2009-2010 and the number rose to 423 by the end of the year 2014-2015, indicating a growth of 74.46 per cent death cases. In Arunachal Pradesh state, 44 people were killed due to natural disaster in 2010-2011 and the death cases increased to 274 by the end of the year 2014-2015, indicating a growth of 83.96 per cent death cases. The total death cases in Assam state consequent upon natural disaster was 8 in 2009-2010 and it increased to 336 at the end of the year 2014-2015, indicating a growth of 97.61 per cent death cases. Chhattisgarh state reported only 10 death cases consequent upon natural disaster during the period 2009-2010 to 2014-2015. Bihar state reported 63 human death cases consequent upon natural disaster in 2009-2010 and it moved up to 576 by the end of the year 2014-2015, indicating a growth of 81.06 per cent death cases. Goa state reported only 6 death cases consequent upon natural disaster during the period 2009-2010 to 2014-2015.

Gujarat state reported 94 human death cases consequent upon natural disaster in 2009-2010 and it moved up to 618 by the end of the year 2014-2015, indicating a growth of 84.78 per cent death cases. Haryana state reported only 47 human death cases consequent upon natural disaster during the period 2009-2010 to 2014-2015. Himachal Pradesh state reported 25 human death cases consequent upon natural disaster in 2009-2010 and it moved up to 264 by the end of the year 2014-2015, indicating an increase of 90.53 per cent death cases. In Jammu and Kashmir State, 239 people were killed due to natural disaster in 2010-2011 and the human death cases increased to 570 by the end of the year 2014-2015, indicating a growth of 58.07 per cent death cases. Jharkhand state reported only 22 death cases consequent upon natural disaster during the period 2009-2010 to 2014-2015.

Karnataka state reported 396 human death cases consequent upon natural disaster in 2009-2010 and it moved up to 675 by the end of the year 2014-2015, indicating an increase of 41.33 per cent death cases. Kerala state reported 142 death cases consequent upon natural disaster in 2009-2010 and it moved up to 758 by the end of the year 2014-2015, indicating a rise of 81.26 per cent death cases. In Madhya Pradesh state 56 people were

killed due to natural disaster in 2010-2011 and the death cases increased to 484 by the end of the year 2014-2015, indicating a rise of 88.42 per cent death cases. In Maharashtra State, 65 people were killed due to natural disaster in 2010-2011 and the death cases increased to 695 by the end of the year 2014-2015, indicating a growth of 90.64 per cent death cases. Nagaland state reported only 53 death cases by the impact of natural disaster during the period 2009-2010 to 2014-2015. Mizoram state reported only 4 death cases consequent upon natural disaster during the period 2009-2010 to 2014-2015. In Odisha state 59 people were killed due to natural disaster in 2010-2011 and the death cases increased to 239 by the end of the year 2014-2015, indicating a growth of 75.39 per cent death cases.

In Punjab state 8 people were killed due to natural disaster in 2010-2011 and the death cases increased to 140 by the end of the year 2014-2015, indicating a rise of 94.28 per cent death cases. Tripura state reported only 21 human death cases by the impact of natural disaster during the period 2009-2010 to 2014-2015. Rajasthan state reported only 48 death cases consequent upon natural disaster during the period 2009-2010 to 2014-2015. In Sikkim state 1 person was killed due to natural disaster in 2009-2010 and the death cases increased to 128 by the end of the year 2014-2015, indicating an increase of 99.21 per cent death cases. In Tamil Nadu state 108 people were killed due to natural disaster in 2010-2011 and the death cases increased to 180 by the end of the year 2014-2015, indicating a rise of 40 per cent death cases. In Uttar Pradesh state 254 people were killed due to natural disaster in 2010-2011 and the death cases increased to 2005 by the end of the year 2014-2015, indicating a growth of 87.33 per cent death cases. In Uttrakhand state 87 people were killed due to natural disaster in 2010-2011 and the death cases increased to 3966 by the end of the year 2014-2015, indicating an increase of 97.80 per cent death cases. In West Bengal state 137 people were killed due to natural disaster in 2010-2011 and the death cases rose to 961 by the end of the year 2014-2015, indicating a growth of 85.12 per cent death cases. Andaman and Nicobar region reported only 6 death cases by the impact of natural disaster during the period 2009-2010 to 2014-2015. Pudhuchery region reported only 13 death cases consequent upon natural disaster during the period 2009-2010 to 2014-2015.

Table 2 State Wise Details of Cattle Heads Lost due to cyclonic storms/ Heavy rains/ floods/ Landslides

States/ UTs	Cattle Heads Lost						Total
	2009-10	2010-11 (P)	2011-12 (P)	2012-13 (P)	2013-14 (P)	2014-15 (P)	
Andhra Pradesh	44132	17230	0	1858	2517	4777	70514 (37.41)
Arunachal Pradesh	-	10163	929	891	401	1992	14376 (29.30)
Assam	12	3623	-	9921	-	8961	22517 (99.94)
Bihar	2	142	-	-	6458	28	6630 (99.96)
Chhattisgarh	3	-	0	65	-	-	68 (95.58)
Goa	265	1	-	2	-	-	268 (1.11)
Gujarat	456	541	175	67	274	112	1625 (71.93)
Haryana	16	67	-	-	-	-	83 (80.72)
Himachal Pradesh	104	5889	2374	127	23648	698	32840 (99.68)
Jammu & Kashmir	-	1805	-	-	74	61326	63205 (97.14)
Jharkhand	-	74	-	-	-	-	74 (0)
Karnataka	9043	215	51	-	286	85	9680 (6.58)
Kerala	177	87	531	619	1366	527	3307 (94.64)
Madhya Pradesh	148	5	-	-	1166	-	1319 (88.77)
Maharashtra	31509	5	-	-	2164	53	33731 (6.58)
Nagaland	-	-	0	2560	2680	2860	8100 (100)
Odisha	-	260	1493	-	5688	672	8113 (96.79)
Punjab	-	108	4	3034	654	127	3927 (97.24)
Rajasthan	3509	-	-	-	-	-	3509 (0)
Sikkim	-	300	1333	105	-	-	1738 (82.73)
Tamil Nadu	312	-	669	90	-	-	1071 (70.86)
Uttar Pradesh	101	1049	268	-	519	107	2044 (95.05)
Uttarakhand	362	1771	10	772	9470	348	12733 (97.15)
West Bengal	38744	7	33	4234	45285	145	88448 (56.19)
Puducherry	7	-	1256	15	48	-	1326 (99.47)
Total	128902	43342	9126	24360	102998	92180	400908 (67.84)

Source Statistics Related to Climate Change - India 2015, Government of India Ministry of Statistics and Programme Implementation, Central Statistics Office Social Statistics Division New Delhi PP 254-257
http://mospi.nic.in/Mospi_New/upload/climateChangeStat2015.pdf

Data represented in table 2 indicate the state wise details of cattle lost due to cyclonic storms/ heavy rains/ floods/ landslides. It could be noted that in Andhra Pradesh 44132 cattle died consequent upon natural disaster in 2009-2010 and the number rose to 70514 by the end of the year 2014-2015, indicating an increase of 37.41 per cent cattle death cases. In Arunachal Pradesh State, 10163 cattle were killed due to natural disaster in 2010-2011 and the cattle death rise of 29.30 per cent cattle death cases. The total cattle death cases in Assam state consequent upon natural disaster were 12 in 2009-2010 and it rose to 22517 by the end of the year 2014-2015, indicating a rising trend of 99.94 per cent death cases. Chhattisgarh state reported only 68 cattle death cases consequent upon natural disaster during the period 2009-2010 to 2014-2015. Bihar state reported 2 cattle death cases consequent upon natural disaster in 2009-2010 and it moved up to 6630 by the end of the year 2014-2015, indicating a growth of 99.96 per cent cattle death cases. Goa state reported only 268 cattle death cases due to natural disaster during the period 2009-2010 to 2014-2015.

Gujarat state reported 456 cattle death cases consequent upon natural disaster in 2009-2010 and it moved up to 1625 by the end of the year 2014-2015, indicating an enhancement of 71.93 per cent cattle death cases. Haryana state reported only 83 cattle death cases consequent upon natural disaster during the period 2009-2010 to 2014-2015. Himachal Pradesh state reported 104 cattle death cases owing to the impact of natural disaster in 2009-2010 and it moved up to 32840 by the end of the year 2014-2015, indicating a rising trend of 99.68 per cent cattle death cases. In Jammu and Kashmir State, 1805 cattles were killed due to natural disaster in 2010-2011 and the death cases increased to 63205 by the end of the year 2014-2015, indicating a growth of 97.14 per cent cattle death cases. Jharkhand state reported only 74 cattle death cases by the impact of natural disaster during the period 2009-2010 to 2014-2015.

Karnataka state reported 9043 cattle death cases by the terrible impact of natural disaster in 2009-2010 and it moved up to 9680 by the end of the year 2014-2015, indicating a rising trend of 6.58 per cent cattle death cases. Kerala state reported 177 cattle death cases consequent

upon natural disaster in 2009-2010 and it moved up to 3307 by the end of the year 2014-2015, indicating a rising positive of 94.64 per cent cattle death cases. In Madhya Pradesh state, 148 cattles were killed due to natural disaster in 2009-2010 and the death cases rose to 1319 by the end of the year 2014-2015, indicating a growth of 88.77 per cent cattle death cases. In Maharashtra state, 31509 cattles were killed due to natural disaster in 2010-2011 and the death cases enhanced to 33731 by the end of the year 2014-2015, indicating a rising trend of 6.58 per cent death cases. Nagaland state reported only 8100 cattle death cases consequent upon natural disaster during the period 2009-2010 to 2014-2015. In Odisha state 260 cattle were killed due to natural disaster in 2010-2011 and the death cases went up to 8113 by the end of the year 2014-2015, indicating a rise of 96.79 per cent death cases.

In Punjab state 108 cattle were killed due to natural disaster in 2010-2011 and the death cases moved up to 3927 by the end of the year 2014-2015, indicating an enhancement of 97.24 per cent death cases. Rajasthan state reported only 3509 cattle death cases by the impact of natural disaster during the period 2009-2010 to 2014-2015. In Sikkim state 300 cattles were killed due to natural disaster in 2010-2011 and the death cases propelled to 1738 by the end of the year 2014-2015, indicating an increase of 82.73 per cent death cases. In Tamil Nadu state 312 cattle were killed due to natural disaster in 2010-2011 and the death cases went up to 1071 by the end of the year 2014-2015, indicating an enhancement of 70.86 per cent death cases. In Uttar Pradesh state 101 cattle were killed due to natural disaster in 2010-2011 and the death cases rose to 2044 by the end of the year 2014-2015, indicating an enhancement of 95.05 per cent death cases. In Uttarakhand state 362 cattle killed due to natural disaster in 2010-2011 and the death cases hiked to 12733 by the end of the year 2014-2015, indicating an increase of 97.15 per cent death cases. In West Bengal state 38744 cattle were killed by the terrible impact of natural disaster in 2010-2011 and the death cases rose to 88448 by the end of the year 2014-2015, indicating an upward trend of 56.19 per cent death cases. Pudhuchery region reported only 1326 cattle death cases consequent upon natural disaster during the period 2009-2010 to 2014-2015.

Table 3 State Wise Details of Number of Houses damaged due to cyclonic storms/ Heavy rains/ floods/ Landslides

States/ UTs	No. of Houses damaged						
	2009-10	2010-11	2011 -12	2012 -13	2013 -14	2014 -15	Total
Andhra Pradesh	213748	38152	0	30973	59639	40379	382891 (44.17)
Arunachal Pradesh	-	19409	2443	1819	2316	2742	28729 (32.44)
Assam	240	383408	277	531186	-	138000	1053111 (99.97)
Bihar	6050	138092	1603	1713	156986	5621	310065 (98.04)
Chhattisgarh	1321	-	0	-	-	-	1321 (0)
Goa	1053	101	134	34	139	875	2336 (54.92)
Gujarat	12641	4735	4734	2676	407	41	25234 (49.90)
Haryana	2216	5362	-	-	-	-	7578 (70.75)
Himachal Pradesh	2670	6656	10838	2449	5633	1963	30209 (91.16)
Jammu & Kashmir	-	2901	-	-	72574	253184	328659 (99.11)
Jharkhand	-	4726	-	-	-	-	4726 (0)
Karnataka	665877	14400	419	-	11061	19125	710882 (6.33)
Kerala	22744	15328	14222	2455	10672	8292	73713 (69.14)
Madhya Pradesh	11356	143	-	-	22816	-	34315 (66.90)
Maharashtra	75441	9	-	-	147369	44	222863 (66.14)
Meghalaya	-	6	-	-	-	-	6 (0)
Mizoram	-	10127	-	-	-	-	10127 (0)
Nagaland	-	-	0	5253	982	14537	20772 (100)
Odisha	13547	5339	290780	522	474250	83140	867578 (98.43)
Punjab	72	2040	26	149	9774	24795	36856 (99.80)
Rajasthan	221	-	-	-	-	-	221 (0)
Tripura	-	-	-	-	-	1139	1139 (0)
Sikkim	-	511	23903	2780	-	-	27194 (98.12)
Tamil Nadu	8437	-	99904	4831	-	-	113172 (92.54)
Uttar Pradesh	2893	157523	22858	1344	54994	75564	315176 (99.08)
Uttarakhand	412	23851	107	5569	10625	1824	42388 (99.02)
West Bengal	318786	180374	317481	77981	169296	33621	1097539 (70.95)
Puducherry	1	346	86439	27	694	-	87507 (99.99)
Total	1359726	1013539	876168	671761	1210227	725390	5856811 (76.78)

Source Statistics Related to Climate Change - India 2015, Government of India Ministry of Statistics and Programme Implementation, Central Statistics Office Social Statistics Division New Delhi PP 254-257

http://mospi.nic.in/Mospi_New/upload/climateChangeStat2015.pdf

Table 3 presents data on the State Wise Details of Number of Houses damaged due to cyclonic storms/ Heavy rains/ floods/ Landslides. It could be noted that in Andhra Pradesh state 213748 houses were damaged in 2009-2010 consequent upon natural disaster and it rose to 382891 by the end of the year 2014-2015, showing 44.17 per cent increase to houses damage during the period. The damaged houses in Arunachal Pradesh state were 19409 in 2010-2011 and it went up to 28729 by the end of the year 2014-2015, recording an increase of 32.44 per cent in the period of analysis. Assam state reported 240 houses damaged by the terrible impact of natural disaster in 2009-2010 and it ran over to 1053111 by the end of the year 2014-2015, registering an increase of 99.97 per cent in the period of analysis. Chhattisgarh state reported 1321 houses were damaged due to natural disaster during the period 2009-2010 to 2014-2015.

In Goa state 1053 houses were damaged by the impact of natural disaster in 2009-2010 and it moved up to 2336 by the end of the year 2014-2015, reflecting an increase of 54.92 per cent in the period of analysis. Gujarat state reported that 12641 houses damaged consequent upon natural disaster in 2009-2010 and it ran over to 25234 by the end of the year 2014-2015, registering an enhancement of 49.90 per cent in the period of analysis. Haryana state reported that 7578 houses were damaged due to natural disaster during the period 2009-2010 to 2014-2015.

In Himachal Pradesh state 2670 houses were damaged by the impact of natural disaster in 2009-2010 and it went up to 30209 by the end of the year 2014-2015, reflecting an increase of 91.16 per cent in the period of analysis. The damaged houses in Jammu And Kashmir State were 2901 in 2010-2011 due to natural disaster and it went up to 328659 by the end of the year 2014-2015, recording an increase of 99.11 per cent in the period of analysis. Jharkhand state reported that 4726 houses were damaged due to natural disaster during the period 2009-2010 to 2014-2015. In Karnataka state 665877 houses were damaged by the impact of natural disaster in 2009-2010 and it increased to 710882 by the end of the year 2014-2015, reflecting a rise of 6.33 per cent in the period of analysis. In Kerala state, 22744 houses were damaged by the impact of natural disaster in 2009-2010 and it rose to 73713 by the end of the year 2014-2015, reflecting an enhancement of 69.14 per cent in the period of analysis. In Madhya Pradesh state 11356 houses were damaged by the impact of natural disaster in 2009-2010 and it rose to

34315 by the end of the year 2014-2015, reflecting an increase of 6690 per cent in the period of analysis. In Maharashtra state 75441 houses were damaged by the impact of natural disaster in 2009-2010 and it rose to 222863 by the end of the year 2014-2015, reflecting a rise of 66.14 per cent in the period of analysis. Meghalaya state reported that 6 houses were damaged due to natural disaster during the period 2009-2010 to 2014-2015. Mizoram state reported that 10127 houses were damaged due to natural disaster during the period 2009-2010 to 2014-2015. Nagaland state reported that 20772 houses were damaged due to natural disaster during the period 2009-2010 to 2014-2015. The damaged houses in Odisha state were 13547 in 2010-2011 by the impact of natural disaster and it went up to 867578 by the end of the year 2014-2015, recording an increase of 98.43 per cent in the period of analysis.

The damaged houses in Punjab state were 72 in 2010-2011 and it went up to 36856 by the end of the year 2014-2015, recording an increase of 99.80 per cent in the period of analysis. Rajasthan state reported that 221 houses were damaged due to natural disaster during the period 2009-2010 to 2014-2015. Tripura state reported that 1139 houses were damaged due to natural disaster during the period 2009-2010 to 2014-2015. The damaged houses in Sikkim state were 511 in 2010-2011 and it went up to 27194 by the end of the year 2014-2015 by the terrible impact of natural disaster, recording an increase of 98.12 per cent in the period of analysis. The damaged houses in Tamil Nadu state were 8437 in 2009-2010 by the impact of natural disaster and it went up to 113172 by the end of the year 2014-2015, recording an increase of 98.54 per cent in the period of analysis.

In Uttar Pradesh state 2893 houses were damaged by the impact of natural disaster in 2009-2010 and it moved up to 315176 by the end of the year 2014-2015, reflecting an increase of 99.08 per cent in the period of analysis. The damaged houses in Uttarakhand state were 412 in 2009-2010 owing the impact of natural disaster and it went up to 42358 by the end of the year 2014-2015, recording an increase of 99.02 per cent in the period of analysis. The damaged houses in West Bengal state were 318786 in 2009-2010 and it went up to 1097539 by the end of the year 2014-2015, recording an enhancement of 70.95 per cent in the period of analysis. The damaged houses in Puducherry region were 1 in 2009-2010 and it went up to 87507 by the end of the year 2014-2015, recording an increase of 99.99 per cent in the period of analysis.

Table 4 State Wise Details of Cropped Area Affected due to cyclonic storms/ Heavy rains/ floods/ Landslides (lakh hectares)

States/ UTs	Cropped Area Affected (lakh hectares)						Total
	2009-10	2010-11 (P)	2011 -12 (P)	2012 -13 (P)	2013 -14 (P)	2014 -15 (P)	
Andhra Pradesh	2.82	12.07	0	8.37	13.12	3.30	39.68 (92.89)
Arunachal Pradesh	-	1.64	0	0.13	2.20	0.80	4.77 (65.61)
Assam	0.298	1.87	4.17	3.28	0.013	3.67	13.301 (97.75)
Bihar	n	0.32	-	0.08	4.00	1.16	5.56 (94.24)
Chhattisgarh	-	-	0	-	-	-	0
Goa	0.034	-	n	-	0.04	-	0.074 (54.05)
Gujarat	0.029	0.67	-	-	-	-	0.699 (95.85)
Haryana	0.083	1.31	-	-	-	-	1.393 (94.04)
Himachal Pradesh	-	0.26	1.56	1.57	0.53	0.136	4.056 (93.58)
Jammu & Kashmir	-	0.14	-	-	-	6.48	6.62 (97.88)
Jharkhand	-	0.0014	-	-	-	-	0.0014 (0)
Karnataka	24.22	0.14	-	-	2.27	0.91	27.54 (12.05)
Kerala	0.39	0.03	1.18	0.172	0.11	0.20	2.082 (81.26)
Madhya Pradesh	-	-	-	-	9.25	-	9.25 (0)
Maharashtra	8.79	-	-	-	7.49	-	16.28 (46.00)
Nagaland	-	-	0	0.97	0.08	0.31	1.36 (100)
Mizoram	-	0.02	-	-	-	-	0.02 (0)
Odisha	1.33	0.3	4.19	0.02	11.00	3.65	20.49 (93.50)
Punjab	0.06	0.84	-	0.0271	4.00	1.06	5.9871 (98.99)
Tripura	-	-	-	-	-	0.015	0.015 (0)
Sikkim	-	-	0.14	0.1	-	-	0.24 (41.66)
Tamil Nadu	-	-	2.12	0.173	-	-	2.293 (7.54)
Uttar Pradesh	4.61	8.15	5.25	0.04326	7.97	5.00	31.0232 6 (85.14)
Uttarakhand	-	5.02	-	0.3854	0.36	0.013	5.7784 (13.12)
West Bengal	4.47	0.3	0.09	0.02148	1.31	0.508	6.69948 (33.27)
Puducherry	n	0.01	0.17	-	0.003	-	0.183 (94.53)
Total	47.134	33.0914	18.87	15.34	63.746	26.85	205.031 4 (77.01)

Source Statistics Related to Climate Change - India 2015, Government of India Ministry of Statistics and Programme Implementation, Central Statistics Office Social Statistics Division New Delhi PP 254-257

http://mospi.nic.in/Mospi_New/upload/climateChangeStat2015.pdf

Table 4 presents data on the state wise details of cropped area affected due to cyclonic storms/ Heavy rains/ floods/ Landslides. It could be noted that in Andhra Pradesh state 2.82 lakh hectares of cropped area were damaged in 2009-2010 consequent upon natural disaster and it rose to 39.68 by the end of the year 2014-2015, showing a 92.81 per cent cropped area damage during the period. The damaged cropped area in Arunachal Pradesh state was 1.64 lakh hectares in 2010-2011 and it went up to 4.77 lakh hectares by the end of the year 2014-2015, recording an increase of 65.61 per cent in the period of analysis.

Assam State reported that 0.298 lakh hectares of cropped area were damaged consequent upon natural disaster in 2009-2010 and it ran over to 13.301 lakh hectares by the end of the year 2014-2015, registering a growth of 97.75 per cent in the period of analysis. Bihar state reported that 5.56 lakh hectares of cropped area were damaged due to natural disaster during the period 2009-2010 to 2014-2015.

In Goa state 0.034 lakh hectares of cropped area were damaged by the impact of natural disaster in 2009-2010 and it increased to 0.074 lakh hectares by the end of the year 2014-2015, reflecting an increase of 54.05 per cent in the period of analysis. Gujarat state reported that 0.029 lakh hectares of cropped area were damaged consequent upon natural disaster in 2009-2010 and it ran over to 0.699 lakh hectares by the end of the year 2014-2015, registering a growth of 95.85 per cent in the period of analysis. Haryana state reported that 1.393 lakh hectares of cropped area were damaged due to natural disaster during the period 2009-2010 to 2014-2015.

In Himachal Pradesh state 0.26 lakh hectares of cropped area were damaged by the impact of natural disaster in 2010-2011 and it increased to 4.056 lakh hectares by the end of the year 2014-2015, reflecting an enhancement of 9358 lakh hectares in the period of analysis. The damaged cropped area in Jammu And Kashmir State was 0.14 lakh hectares in 2010-2011 and it went up to 6.52 lakh hectares by the end of the year 2014-2015, recording a rising trend of 99.58 per cent in the period of analysis. Jharkhand state reported 0.0014 lakh hectares of cropped area damaged due to natural disaster during the period 2009-2010 to 2014-2015. In Karnataka state 24.22 lakh hectares of cropped area were damaged by the impact of natural disaster in 2009-2010 and it increased to 27.54 lakh hectares by the end of the year 2014-2015, reflecting an enhancement of 12.05 per cent in the period of analysis.

In Kerala state 0.39 lakh hectares of cropped area were damaged by the impact of natural disaster in 2009-2010 and it went up to 2.082 by the end of the year 2014-2015, reflecting a rising trend of 81.26 per cent in the period of analysis. In Madhya Pradesh state 9.25 lakh hectares of cropped area were damaged by the impact of natural disaster during the period 2009-2010 to 2014-2015,

In Maharashtra state 8.79 lakh hectares of cropped area were damaged by the impact of natural disaster in 2009-2010 and it rose to 16.28 by the end of the year 2014-2015, reflecting an upward trend of 46 per cent in the period of analysis. Mizoram state reported 0.02 lakh hectares of cropped area damaged due to natural disaster during the period 2009-2010 to 2014-2015. Nagaland state reported 1.36 lakh hectares of cropped area damaged due to natural disaster during the period 2009-2010 to 2014-2015. The damaged cropped area in Odisha state was 1.33 lakh hectares in 2010-2011 and it went up to 20.49 lakh hectares by the end of the year 2014-2015, recording an increase of 93.50 per cent in the period of analysis.

The damaged cropped area in Punjab state was 0.06 lakh hectares in 2010-2011 and it went up to 5.9871 lakh hectares by the end of the year 2014-2015, recording an enhancement of 92.99 per cent in the period of analysis. Tripura state reported 0.015 lakh hectares of cropped area damaged due to natural disaster during the period 2009-2010 to 2014-2015. The damaged cropped area in Sikkim state was 0.14 lakh hectares in 2010-2011 and it went up to 0.24 lakh hectares by the end of the year 2014-2015, recording an increase of 41.66 per cent in the period of analysis. The damaged cropped area in Tamil Nadu state was 2.12 lakh hectares in 2011-2012 and it went up to 2.293 lakh hectares by the end of the year 2014-2015, recording an enhancement of 7.54 lakh hectares in the period of analysis.

In Uttar Pradesh state 4.61 lakh hectares of cropped area were damaged by the impact of natural disaster in 2009-2010 and it rose to 31.02 lakh hectares by the end of the year 2014-2015, reflecting a rising trend of 85.14 lakh hectares in the period of analysis. The damaged cropped area in Uttrakandh state was 5.02 lakh hectares in 2010-2011 and it went up to 5.77 lakh hectares by the end of the year 2014-2015, recording an upward trend of 13.12 lakh hectares in the period of analysis. The damaged cropped area in West Bengal state was 4.47 lakh hectares in 2009-2010 and it went up to 6.69 lakh hectares by the end of the year 2014-2015, recording an increase of 33.27

lakh hectares in the period of analysis. The damaged cropped area in Puducherry region was 0.01 lakh hectares in 2010-2011 and it went up to 0.183 lakh hectares by the end of the year 2014-2015, recording an enhancement of 94.53 lakh hectares in the period of analysis.

CONCLUSION

It could be seen clearly from the above discussion that in India 1676 people were killed consequent upon natural disaster such as cyclonic storms/ Heavy rains/ floods/ Landslides in 2009-2010 and it rose to 13680 by the end of the year 2014-2015, indicating an increase of 87.74 human death cases in India during the period. However regional disparity has been observed with respect to loss of human life consequent upon natural disaster. Uttrakand state ranks the first order with respect to largest number of human death cases due to natural disaster and Uttarpradesh state takes the second position. The human death cases in the range of 500-1000 have been observed in West Bengal, Maharashtra, Kerala, Karnataka, Jammu and Kashmir, Gujarat and Bihar consequent upon natural disaster during the period 2009-2010 to 2014-2015. The human death cases in the range of 250-500 have been observed in Madhya Pradesh, Assam, Arunachal Pradesh and Andhra Pradesh consequent upon natural disaster during the period 2009-2010 to 2014-2015. Below 10 death cases has been observed in A and N islands, Mizoram and Goa consequent upon natural disaster during the period 2009-2010 to 2014-2015. The death cases in the range of 100-200 have been observed in Tamil Nadu, Sikkim and Punjab. Thus, it is clear India has interstate disparity with respect to loss of human life due to natural disaster. The natural disaster is more vulnerable in Uttarkhand and Uttar Pradesh State since these states are frequently affected by heavy rainfall and river flood. It could be noted that loss of human life cannot be prevented at the 100 per cent level, but the loss of human life can be prevented by the way of developing earth warming system, mitigation measures and coping mechanism.

The result of loss of cattle analysis reveals that 128902 cattle death cases were reported in 2009-2010 and it rose to 400908 cattle death cases in 2014-2015 in India consequent upon cyclonic storms/ Heavy rains/ floods/ Landslides. However, there is a significant regional disparity with respect to cattle death cases in India. It could be noted that the cattle death cases are highest in West Bengal. Above 10000 death cattle cases are reported in Andhra Pradesh state, Arunachal Pradesh state, Assam state, Himachal Pradesh state, Jammu and Kashmir state, Maharashtra state and Uttrakandh state during the period 2009-2010 to 2014-2015. The cattle death cases in the

range of 5000-10000 are reported in Bihar, Karnataka, Nagaland and Odisha during the period 2009-2010 to 2014-2015. The cattle death cases in the range of 1000-2000 are reported in Pudhuchery region, Uttar Pradesh state, Tamil Nadu state, Sikkim state and Gujarat state during the period 2009-2010 to 2014-2015. The cattle death cases are found to be below 100 in Chhattisgarhi state, Haryana state, and Jharkhand state. It is clear that largest number of cattle death cases is observed in West Bengal and it shows inadequate mitigation measures adopted in respect of protecting the life of cattle on the one hand and severity in occurrence of natural disaster on other hand.

The result of houses damaged wise analysis reveals that at the national level 1359726 houses were damaged consequent upon natural disaster in 2009-2010 and the number increased to 5856811 by the end of the year 2014-2015, recording a growth of 76.78 per cent of houses damaged in India. In the mean time one can find an interstate disparity in houses damaged owing to impact of natural disaster. It could be noted that a more than ten lakh houses were damaged in West Bengal state and Assam state during the period 2009-2010 to 2014-2015. A more than three lakh houses were damaged in Andhra Pradesh state, Bihar state, Jammu and Kashmir state, Karnataka state, Odisha state and Uttar Pradesh state during the period 2009-2010 to 2014-2015. A more than one lakh houses were damaged in Arunachal Pradesh state and Maharashtra state during the period 2009-2010 to 2014-2015. A more than 20000 houses were damaged in Kerala, Madhya Pradesh, Nagaland, Punjab and Sikkim during the period 2009-2010 to 2014-2015. The houses damaged due to natural disaster is found to be very low in Meghalaya, Rajasthan, Chhattisgarhi, Haryana, Jharkhand, Mizoram and Tripura during the period 2009-2010 to 2014-2015. The high incidence of houses damaged in West Bengal and Assam is due to lack of mitigation measures and coping mechanism among the households during the time of natural disaster.

The result of cropped area damaged wise analysis reveals that at the national level 47134 lakh hectares of cropped area were damaged by the impact of natural disaster in 2009-2010 and it rose to 205.03 lakh hectares by the end of the year 2014-2015 showing a growth of 77.01 per cent. The crop damage is not uniform in all the states in India and showing regional disparity. The crop damage level is found to be highest in Uttar Pradesh state. The crop damage level of above 20 lakh hectares has been observed in Andhra Pradesh state, Karnataka state and Odisha state during the period 2009-2010 to 2014-2015. The crop damage level of above 5 lakh

hectares has been observed in Assam, Bihar, Jammu and Kashmir, Madhya Pradesh, Maharashtra, Punjab, Uttrakandh and West Bengal during the period 2009-2010 to 2014-2015. The crop damage level of below 1 lakh hectares has been observed in Goa, Haryana, Jharkhand, Mizoram, Tripura and Sikkim during the period 2009-2010 to 2014-2015.

The finding of the present study leads to the following concluding remarks.

1. There is a need to reduce the human loss due to flood in Uttar Pradesh state and Uttarkhand state through developing proper early warning system and mitigation measures.
2. The death of cattle population can be prevented in West Bengal state, Andhra Pradesh state and Jammu and Kashmir state consequent upon natural disaster through developing mitigation measures.
3. The government should encourage the poor households to construct safety houses in Assam state, Andhra Pradesh state, West Bengal state, Uttar Pradesh state and Odisha state as these states reported high damages of houses due to natural disaster.
4. A Proper compensation to be given to the farmers who have lost the yield of their cropped area owing to natural disaster.

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