Journal of Climatology and Weather Forecasting, Vol. 10, Issue 5, 001-002 Research Article

Impact of Extreme Weather Events in India on Human Life - A Study

Sivaram Boppe[1]*, AaInSarma[2]

1Department of Mathematics, Koneru Lakshmaiah Education Foundation, Aziznagar, Hyderabad, India

2Department of Meteorology and Oceanography, Andhra University, Visakhapatnam, India

Corresponding Author*

Sivaram Boppe
Department of Mathematics,
Koneru Lakshmaiah Education Foundation,
Aziznagar, Hyderabad, India
E-mail: sivaramboppe@klh.edu.in
Telephone: +8790519989

Received: 18-April-2022, Manuscript No. JCWF-22-16908; **Editor assigned:** 19-April-2022, Pre QC No. JCWF-22-16908 (PQ); **Reviewed**: 10-May-2022, QC No. JCWF-22-16908 (Q); **Revised**: 12-May-2022, Manuscript No. JCWF-22-16908 (R); **Published:** 21-May-2022, DOI: 10.35248/2332-2594.22.10 (5).347

Abstract

An increase in Greenhouse gases and aerosols in the atmosphere are the main reasons for an increasing trend in the extreme weather events throughout the world. The variations in extreme weather events will affect the human life and their needs such as food and water. Therefore, the study of pattern of extreme weather events is significant in understanding their effects on the human life and their essential needs. The extreme weather events flood, tropical cyclone, heat wave, gale, squall, lightning, dust-storm, hailstorm and thunderstorm have been considered to understand the form over India. The data of the incidence of these events has been obtained from IMD and other public sector agencies. The regression analysis of combination of different events revealed that effect of floods is more significant than the cyclones on the social and economic activities. It was observed an increasing trend in the all the extreme events, except the cyclones.

Keywords: Cyclones • Floods • Extreme events • Regression analysis • Economic activities

Introduction

The climate of India is dominated by the monsoon season (June to September). India witnessed a worst drought in the year 1918. The cyclones in 1971, droughts of 1972 and 1987, heat wave in 1995 and 1998 and cold wave in 2003 killed so many people in Bangladesh. The subcontinent has experienced a super cyclone was a major natural disaster in the year 1999. As the data pertaining to the occurrence of extreme weather events and their impact is scatter in publications and literature the analysis of the extreme events of the subcontinent and the research on their pattern is also scanty. When the ecosystem and society is unable to cope up with the effectiveness of the extreme weather event, then it becomes a disaster. The reasons for the extreme weather event may be the exponential growth of population, increasing greenhouse gases and industrial revolution which have changed the climate. Extremes of summertime heat have a greater impact on human health than any other severe weather in the United States 9, with elderly people being most at risk. Increased heat stress has increased the mortality rate in US [1]. Analysis of extreme weather events over Australian region showed an increase in extreme wet conditions, heavy rainfall, frequency of extreme warm and cool days, and a decrease in the frequency of incidence of tropical cyclones [2]. M Verdecchia et.al reported the results of a climate simulation for doubling of atmospheric carbon dioxide concentration over the European region [3].

Temperature and precipitation extremes and their potential future changes are evaluated in an ensemble of global coupled climate models participating in the Intergovernmental Panel on Climate Change (IPCC) diagnostic exercise for the Fourth Assessment Report (AR4) [4]. Under enhanced greenhouse conditions, return periods for extreme precipitation events are shorter and there is a general increase in the intensity of precipitation and number of wet spells in most areas. There is a decrease in frequency of cold temperature extremes and an increase in hot extremes in many areas. Greenhouse gases and climate variability was reported by [5]. David R. Easterling et al. reported that the observational data analysis showed an increasing trend in the precipitation, and changes in extreme temperatures [6]. Whereas the Model output has showed a increase in high temperatures and decrease in extreme low temperatures and increase in extreme precipitations.

To study the extreme events ranging from globally warm years to locally extreme rainfall intensities, data on a daily time scale is required. The assessment of climatological trends in the frequency of rare and extreme weather events using stochastic concept of binomial distributed counts, the probability of moderately rare events decreases rapidly with shorter record length, but does not significantly increase with longer length when very rare events are considered [7]. Due to the available data, the analysis was restricted the types of extreme weather events. Europe-average indices of wet extremes increase for the study period, although the spatial coherence of the trends is low [8].

It is important to assess the incidence and changes in climate extremes on a regional level that dependent on the analysis technique employed [9]. The studies Pall P et.al showed that the twentieth-century anthropogenic greenhouse gas emissions increased the risk of floods occurring in England and Wales and partially responsible for increases in heavy precipitation [10]. The data pertaining to the extreme weather events and their intensity over Indian subcontinent is scanty and scattered; very few attempts were carried out to analyze the extreme events [11, 12]. Significant rising trends in the frequency and the magnitude of extreme rain events in central India have been reported in a study using recent gridded dataset [13].

An increase in the mortality rate in India was reported during the heat waves succeeding the ElNino [14]. The paper aims at the analysis of the extreme weather events and their socio economic impact for the period 1967 to 2005. In the next sections the author presents the data and methodology used in the study, followed by results and discussion. Finally, the future scope of the study also presented.

Data and Methodology

From the reports on 'Disastrous Weather Events' published by India Meteorological Department (IMD), New Delhi the author has extracted the data on occurrence of extreme climate events and their impacts for the period 1967 to 2006. Due to qualitative nature of the data during the period 1967-1977, the data has been extracted from the reports published by Ministry of Agriculture and Ministry of Home Affairs. The features such as intensity, magnitude, location and date of occurrence and estimates of harm of the flood, tropical cyclone, heat wave, cold wave, also gale, squall, lightning, dust storm, hailstorm and thunderstorm have been pulled out from these reports (Table 1). Though the data the damage caused by these extreme events contains the human loss of life, affected human population, effected villages and agriculture and total economic loss, the mortality has been taken as damage indicator as the mortality data is consistent throughout the period of study. Regression analysis of annual data is used to obtain the annual trend of the extreme events. The statistics of extreme events over India and on state wise are presented. The paper aims at the analysis of the extreme weather events and their socio economic impact for the period 1967 to 2005.

Table 1. Top weather related hazards in India and trends in their occurrences (1978-2006).

Event	Total number	Mortality	Percent mortality	Trend	P-value
Flood	2973	43573	50.2	3.42	0
Cyclone	62	18853	21.7	-0.04	0.08
Heat wave	373	8514	9.8	0.55	0
Cold wave	376	6668	7.7	0.29	0
Thunderstorm	1123	3490	4	1.9	0
Lightning	1353	3395	3.9	2.75	0
Hailstorm	934	989	1.1	1	0
Dust storm	146	584	0.7	0.17	0
Squall	284	362	0.4	0.35	0
Gale	245	291	0.3	0.12	0.25

Results and Discussion

Table 2 depicts the leading states in the number of extreme events and their impact on the socio economics. The Spatial distribution of events has been examined by associating each event with one (or more) states. From the Table 2, it is evident that Maharashtra is the leading position in experiencing the total number of extreme events, as it witnessed.

Table 2. Leading states in the extreme events by number and mortality.

Extreme Event	No. of Event	Mortality
Cold wave	Bihar	Bihar
Cyclone	Andhra Pradesh	Orissa
Dust storm	Uttar Pradesh	Uttar Pradesh
Flood	Maharashtra	Uttar Pradesh
Gale	Kerala	Orissa
Hail storm	Maharashtra	Bihar
Heat wave	Rajasthan	Andhra Pradesh
Lightning	Maharashtra	Maharashtra
Squall	AS	WB
Thunderstorm	WB	WB
Total events	MH	OR

It also leads in number of occurrences of flood, hailstorm and lightning. Bihar is in forefront with maximum number of cold wave occurrence. Cyclone landfall is highest in Andhra Pradesh (AP). UP leads in dust storm. Gale activity is greatest in Kerala. Heat wave occurrence is highest in Rajasthan. Squall occurrence is in its peak spatially in Assam. Thunder storm activity is greatest in West Bengal (WB). It is evident that leading sates in mortality does not necessarily correspond to those leading in occurrences. For example AP leads in occurrences of cyclone while Orissa (OR) leads in its mortality. This reveals that exposure of the people to the events and their adaptive capacity play important role in weather hazards impact.

Conclusions

Foregoing analysis depicted following conclusions: Major share of occurrence of climate extremes is due to floods; and cyclone which has most devastating impact has least share.

Total number of climate extremes considered in the study is significantly increasing in India. Except cyclone and gale all the extremes depict significant increasing trend. Total number of climate extremes considered in the study is significantly increasing in India. Except cyclone and gale all the extremes depict significant increasing trend. Maharashtra is the leading state in total number of events and floods while Rajasthan, Bihar and Andhra Pradesh are leading in heat wave, cold wave and cyclone respectively. Almost all the states depict increasing trends in heat wave and flood occurrences. Assessment of occurrence of the climate extremes needs more spatio-temporal details for the study and formulation of policy for impact, vulnerability and adaptation of climate sensitive sectors and regions. The paper aims at the analysis of the extreme weather events and their socio economic impact for the period 1967 to 2005.

References

1. Gaffen, D.J., & Ross, R.J. "Increased summertime heat stress in the US." Nature 396.6711 (1998): 529-530.
2. Plummer, N., et al. "Changes in climate extremes over the Australian region and New Zealand during the twentieth century." Weather Clim Extremes Springer, Dordrecht (1999) 183-202.
3. Salinger, M.J., & Griffiths, G.M. "Trends in New Zealand daily temperature and rainfall extremes." Int J Climatol: J R Meteorol Soc 21.12 (2001): 1437-1452.
4. Cao, H.X., et al. "Simulated diurnal range and variability of surface temperature in a global climate model for present and doubled C02 climates." J Climate 5.9 (1992): 920-943.
5. McGuffie, K., et al. "Assessing simulations of daily temperature and precipitation variability with global climate models for present and enhanced greenhouse climates." Int J Climatol: J R Meteorol Soc 19.1 (1999): 1-26.
6. Easterling, D.R., et al. "Maximum and minimum temperature trends for the globe." Science 277.5324 (1997): 364-367.
7. Frei, C., & Schär, C. "Detection probability of trends in rare events: Theory and application to heavy precipitation in the Alpine region." J Climate 14.7 (2001): 1568-1584.
8. Tank, A.K., & Können, G.P. "Trends in indices of daily temperature and precipitation extremes in Europe, 1946-99." J climate 16.22 (2003): 3665-3680.
9. Zhang, X., et al. "Monte Carlo experiments on the detection of trends in extreme values." J Climate 17.10 (2004): 1945-1952.
10. Pall, P., et al. "Anthropogenic greenhouse gas contribution to flood risk in England and Wales in autumn 2000." Nature 470.7334 (2011): 382-385.
11. Min, S.K., et al. "Human contribution to more-intense precipitation extremes." Nature 470.7334 (2011): 378-381.
12. De, U.S., et al. "Extreme weather events over India in the last 100 years." J Ind Geophys Union 9.3 (2005): 173-187.
13. Goswami, B.N., et al. "Increasing trend of extreme rain events over India in a warming environment." Science 314.5804 (2006): 1442-1445.
14. Chaudhury, S.K., et al. "Impact of heat waves over India." Current Sci 79.2 (2000): 153-155.

Cite this article: Boope S and Sharma A. Impact of Extreme Weather Events in India on Human Life - A Study. J Climatol Weather Forecast. 2022, 10 (5), 001-002