

GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
RAJYA SABHA
UNSTARRED QUESTION NO. - 185
ANSWERED ON – 03/02/2022

PREPAREDNESS FOR EXTREME WEATHER CONDITION

185. DR. KANIMOZHI NVN SOMU:

Will the Minister of EARTH SCIENCES be pleased to state:

- (a) whether Government has maintained a comprehensive report of the extreme weather conditions observed within the country over the past three years, including extreme temperatures and if so, the details thereof;
- (b) whether there has been an increase in these extreme weather conditions over the past three years and if so, the details thereof;
- (c) whether Government has used this information to enhance preparedness for the same in future; and
- (d) if so, to what extent will it be helpful?

ANSWER

THE MINISTER OF STATE (INDEPENDENT CHARGE) FOR
MINISTRY OF SCIENCE AND TECHNOLOGY
AND EARTH SCIENCES
(DR. JITENDRA SINGH)

- (a) Yes Sir. Every year, India Meteorological Department (IMD) prepares "Annual Climate Summary" for Indian region" which contains information regarding various extreme weather events observed within the country. The reports are available in Climate Research & Services (CRS) Division, IMD, Pune website (https://www.imdpune.gov.in/Clim_Pred_LRF_New/Reports.html). In addition, IMD also brings out publication on the "Disastrous weather events" every year.

Information on the major extreme weather events occurred during the last three years (2019 to 2021) and the associated loss of life are given in Figures 1-3. The loss of life due to various disastrous weather events for the period 2019 to 2021 is given in Table 1. The details of the state wise information of loss of lives due to various disastrous weather events which happened in the last three years are given in Table 2.

- (b) Yes. Associated with the global warming, increase in intense disaster meteorological events like heat waves, intense cyclonic storms, extreme rainfall, floods etc. have been observed in the country in the last three years in line with increase in the extreme events observed over various other parts of the globe. For the available details, the trends of various extreme weather events over Indian region are computed and are given in Figures 4 to 6. It contains the ratio of severe cyclonic storm over total cyclonic storms over the North Indian Ocean for the period 1891 to 2020 (Fig.4), the trend of heavy rainfall events occurred during monsoon season (JJAS) for the period 1989 to 2018 (Fig.5) and Trends of Heatwave and Cold wave over the Indian region are given in Fig.6 (a) and Fig6 (b).

- (c) IMD issues various outlook/forecast/warning at various time and spatial scales for Public as well as Disaster Management Authorities for the preparedness of extreme weather events. India is now having one of the best dynamical prediction systems for supporting early warning. IMD has developed capability for generating real time forecasts and warnings in all spatial scales from a location to Block, district, meteorological subdivisions and homogeneous regions and temporal scales of a few hours (nowcast), 3 days (short range forecast), 4-7 days (medium range forecast) 1-4 weeks (extended range forecast) and one month to a season (long range forecast). Now, more focus is given to develop on sectoral applications and further improvement in the prediction of extreme weather events.

Recently IMD brought out web based online “Climate Hazard & Vulnerability Atlas of India” prepared for the thirteen most hazardous meteorological events, which cause extensive damages, economic, human, and animal losses. The same can be accessed at https://impune.gov.in/hazardatlas/about_hazard.html. This atlas helps IMD as a reference to issue impact-based forecast for various extreme weather events.

- (d) The climate Hazard and vulnerability atlas will help state government authorities and Disaster Management Agencies for planning and taking appropriate action to tackle various extreme weather events. These information are used as reference for weather and climate services extended by the Department.

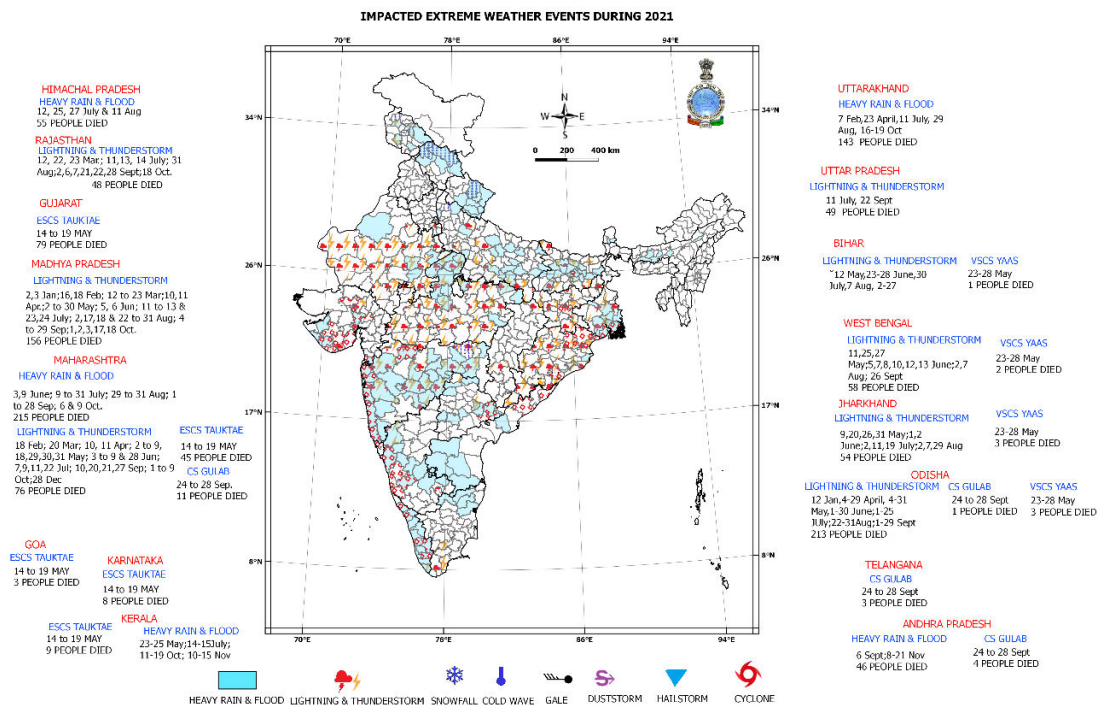


Fig.1 Major extreme weather events occurred during 2021 and the associated loss of life.

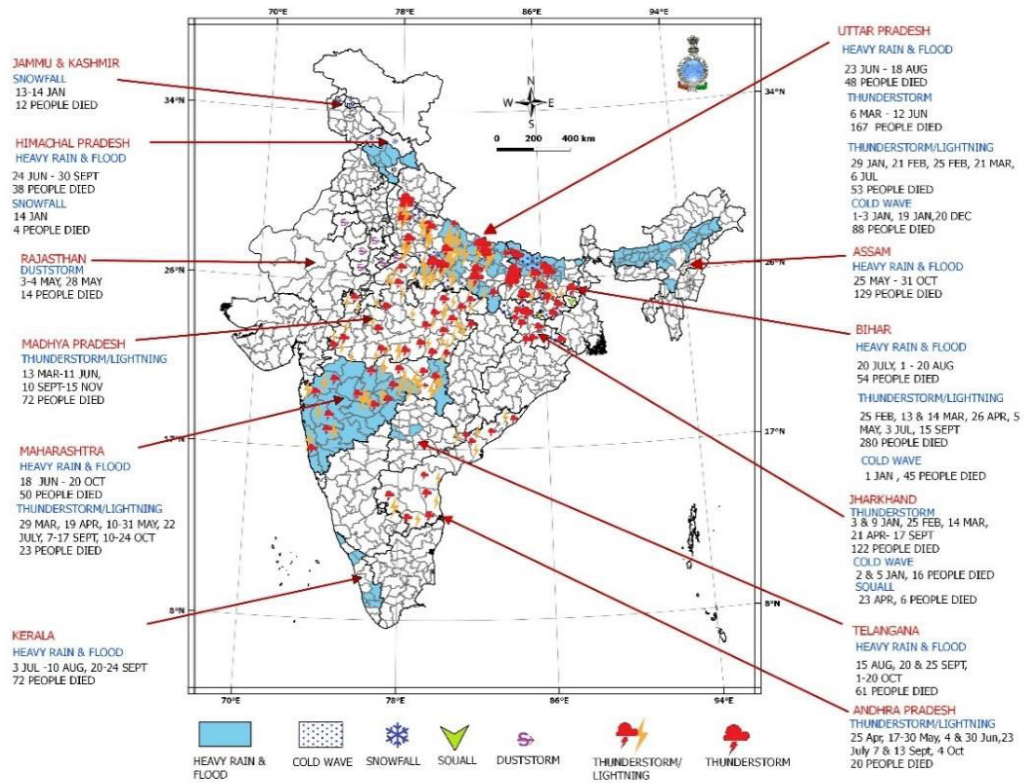


Fig.2 Major extreme weather events occurred during 2020 and the associated loss of life.

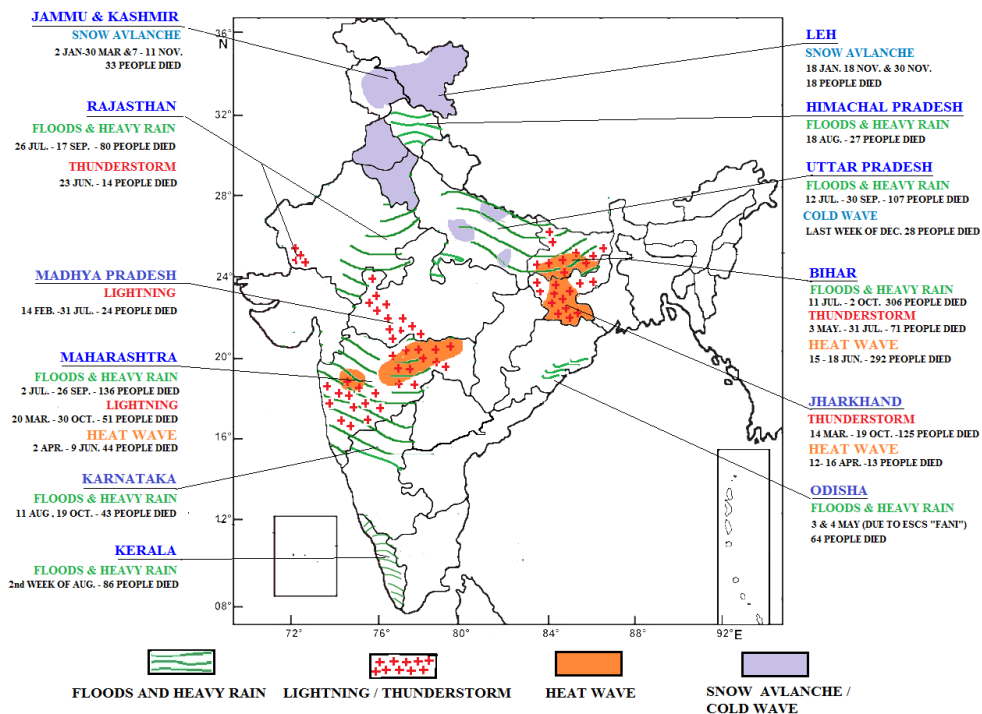


Fig.3 Major extreme weather events occurred during 2019 and the associated loss of life.

Table -1: Annual loss of human life associated with various disastrous weather events during the last three years (2019-2021).

YEAR	SNO W FAL L	COLD WAVE	HEAT WAVE	SQUAL L	GA LE	DUST STORM	LIGHT NING	THUNDE RSTORM	HAILS TORM	FLOODS AND HEAVY RAINS	CYCLONIC STORM	TOTAL (WHOLE YEAR)
2021	12	11	0	0	4	5	730	61	1	759	174	1757
2020	22	162	11	6	12	14	270	594		758	115	1964
2019	65	291	505	3	6	25	415	348	2	1297	60	3017

Table -2: State wise annual loss of human life associated with the disastrous weather events for the last three years (2019-2021) .

DISASTROUS WEATHER EVENTS OF 2021													
STATE / UT	COLD WAVE	CYCLONIC STORM	DUST STORM	FLOODS & HEAVY RAINS	GA LE	HAIL STORM	HEAT WAVE	LIGHTNING	SNO W FAL L	SQUALL	THUNDERSTORM	Grand Total	
Andhra Pradesh		6		46								52	
Assam				14								14	
Bihar		1		12				73			16	102	
Chhattisgarh								1			2	3	
Goa		3										3	
Gujarat		79		7				6				92	
Haryana								1				1	
Himachal Pradesh				55					4			59	
Jammu & Kashmir	2			21		1		4	4			32	
Jharkhand		3						22			32	57	
Karnataka		8		33				3			1	45	
Kerala		9		53				5				67	
Madhya Pradesh	1			34	1			158			2	196	
Maharashtra	3	56		215				74			2	350	
Odisha		4		3	3			213				223	
Rajasthan				14				48				62	
Sikkim				2								2	
Tamil Nadu				20				14				34	
Telangana		3		15				7				25	
New Delhi	3			4								7	
Uttar Pradesh	2		5	42				43			6	98	
Uttarkhand				143					4			147	
West Bengal		2		26				58				86	
Grand Total	11	174	5	759	4	1	0	730	12	0	61	1757	

Disastrous Weather Events Of 2020												
STATE / UT	COLD WAVE	CYCLONIC STORM	DUST STORM	FLOODS & HEAVY RAINS	GALE	HAIL STORM	HEAT WAVE	LIGHTNING	SNOWFALL	SQUALL	THUNDERSTORM	Grand Total
Andhra Pradesh		9		21				20				50
Arunachal Pradesh				11								11
Assam				129								129
Bihar	54			54			2				280	390
Chhattisgarh								14			11	25
Gujarat				29				8				37
Haryana				1								1
Himachal Pradesh				38					4			42
Jammu & Kashmir				13	3			5	17			38
Jharkhand	16			4				5		6	126	157
Karnataka				148	1			12				161
Kerala				79	8		1	2			1	91
Madhya Pradesh				10				72			7	89
Maharashtra		4		59			8	41			1	113
Meghalaya				6								6
Odisha		4		16				16				36
Rajasthan	3		14	18				4				39
Sikkim				5					1		1	7
Tamil Nadu		12						9				21
Telangana				61				6				67
New Delhi				1								1
Uttar Pradesh	88			48				53			167	356
Uttarakhand	1			4								5
West Bengal		86		3				3				92
Grand Total	162	115	14	758	12		11	270	22	6	594	1964
Disastrous Weather Events Of 2019												
STATE / UT	COLD WAVE	CYCLONIC STORM	DUST STORM	FLOODS & HEAVY RAINS	GALE	HAIL STORM	HEAT WAVE	LIGHTNING	SNOWFALL	SQUALL	THUNDERSTORM	Grand Total
Andhra Pradesh							45					45
Assam				94				15			11	120
Bihar	19			306			293				72	690
Chhattisgarh				4				2			16	22
Goa				1								1
Gujarat				150							10	160
Himachal Pradesh				26					8			34
Jammu & Kashmir									7		3	10
Jharkhand	13			5			13			2	126	159

Karnataka				30				21			8	59
Kerala				75	2		14	4				95
Madhya Pradesh	12			21		2		26				61
Maharashtra	7			145			53	65			2	272
Manipur											3	3
Mizoram				5								5
Odisha		53		10	1		9	239		1		313
Punjab				14								14
Rajasthan			25	82			3	5			15	130
Sikkim				1								1
Tamil Nadu				20	1							21
Telangana				10	2		66	7				85
Tripura				2							1	3
Jammu & Kashmir				21					32			53
Ladakh				1					18			19
Uttar Pradesh	240			18			9	26			64	357
Uttarkhand				33								33
West Bengal		7		223				5			17	252
Grand Total	291	60	25	1297	6	2	505	415	65	3	348	3017

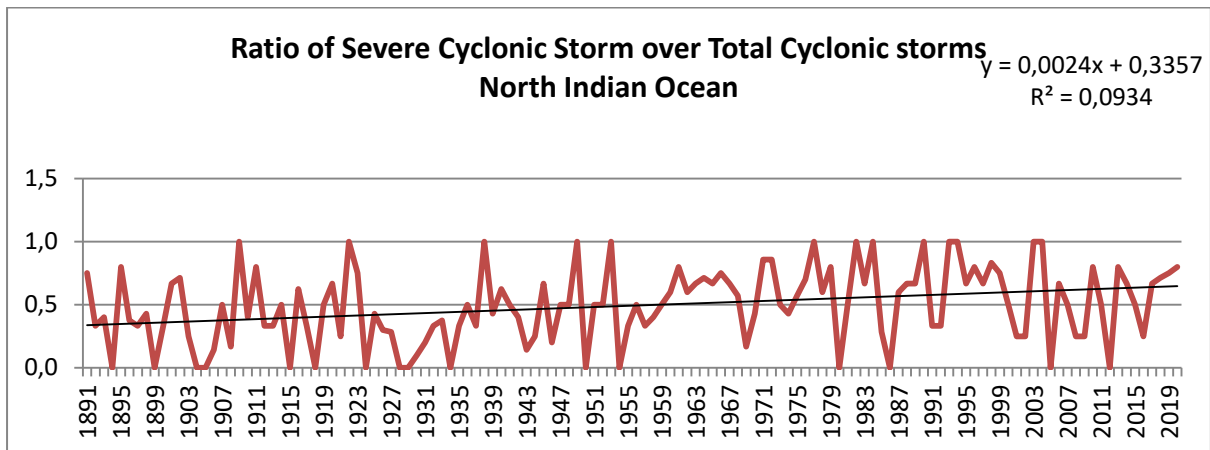


Fig.4. The time series of ratio of severe Cyclonic storms to total cyclonic storm over North Indian Ocean for the period (1891 to 2020).

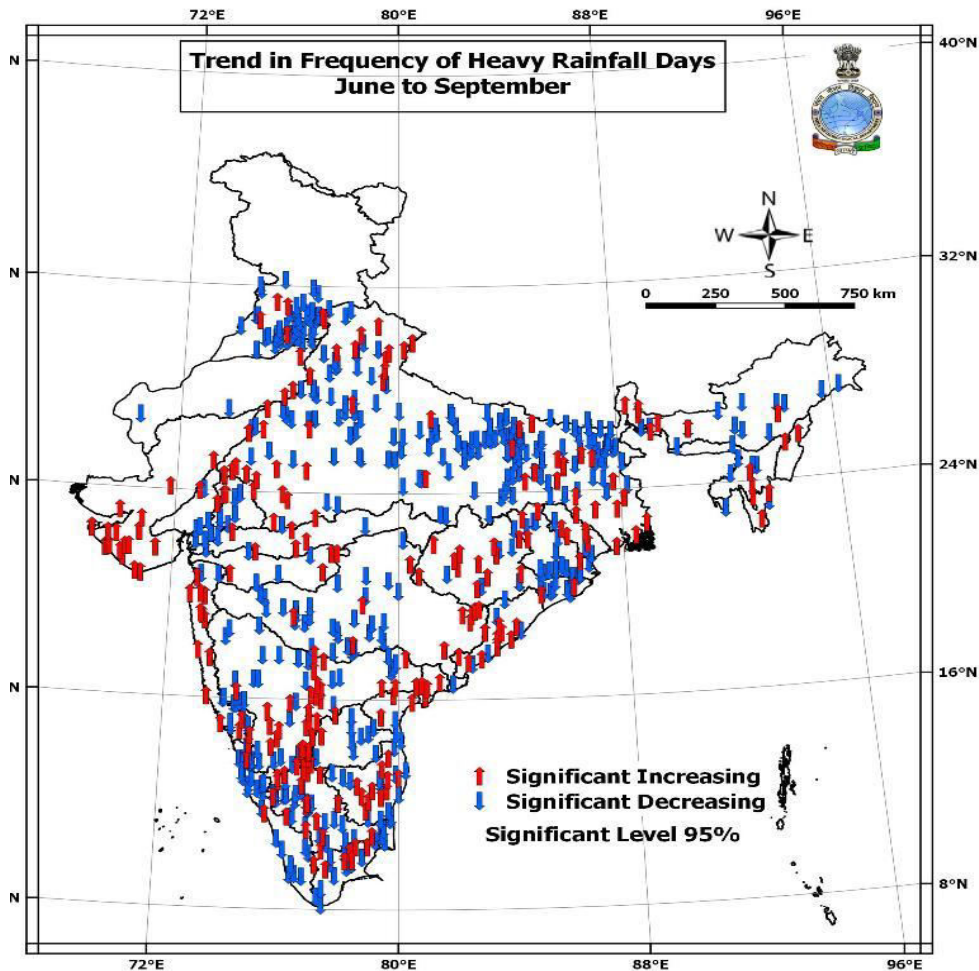


Fig. 5: Trend in Frequency of Heavy Rainfall Days during monsoon (JJAS) season for the period (1989-2018).

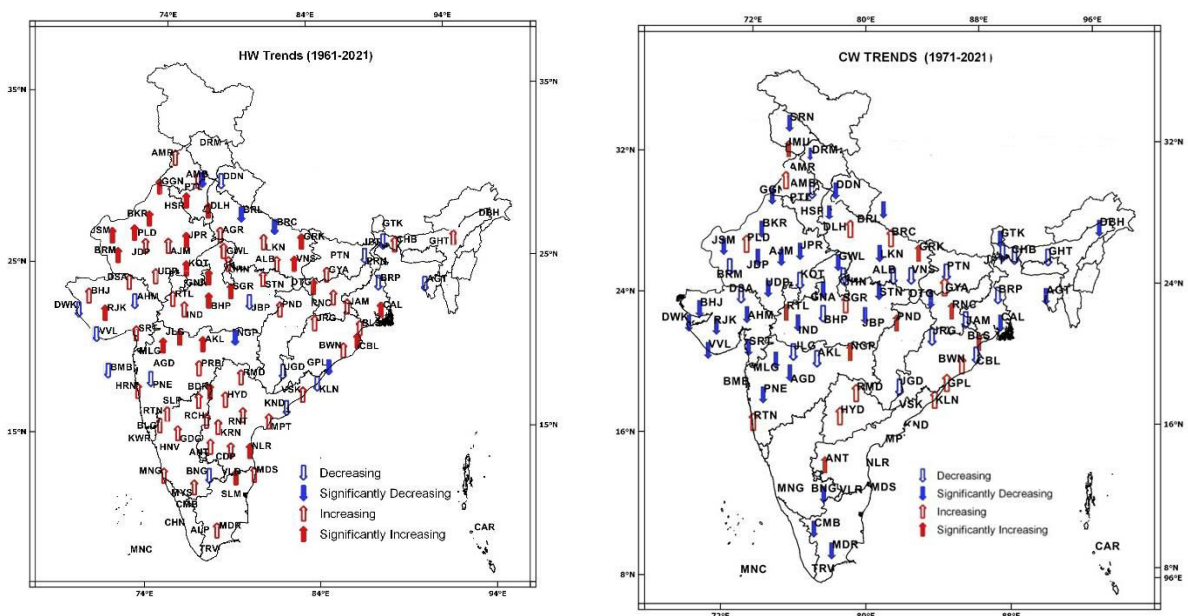


Figure 6: (a) Trends in the Heat Wave (HW) days of 103 stations during April, May and June for the period 1961–2021. (b) Trends in the Cold Wave (CW) days of 86 stations during the December, January and February for the period 1961–2021. Red rising (blue falling) arrows represent the increasing (decreasing) trends. Filled arrows represent the trends significant at 5% level. Nonparametric Mann–Kendall test was used to test the significance of the trends.
