Mid- Monsoon 2019

LIGHTNING REPORT

Lightning Resilient India Campaign

A joint initiative by Climate Resilient Observing Systems Promotion Council (CROPC), Indian Meteorological Department, Ministry of Earth Science , Government of India and World Vision India.

About the report	Lightning Resilient India Campaign 2019-2021
The Mid-Monsoon 2019 Lightning Report has been prepared by Climate Resilient Observing Systems Promotion Council (CROPC) using the Indian Meteorological Department's Lightning forecasts including now-cast, Indian Institute of Tropical Management (IITM), Pune Lightning Network data, NRSC, ISRO inputs ,other satellite's data and ground based impacts reports received from the active network of Lightning Resilient India Campaign. The network includes state governments, INGOs, Local NGOs, media etc.This is first ever scientific mapping of lightning strikes that is Lightning risk Map. State Disaster Management Authorities can collaborate with CROPC for developing State Lightning Risk Maps.	The Lightning Resilient India Campaign 2019-2021 is a joint initiative and has support from many Central and State Government Departments , academia,INGOs, Local NGOs , media and communities with an aim to reduce lightning deaths by 80% in next 3 years. The multipronged action includes carriage of IMD's EW to community in an impact-based forecast on time; create awareness towards EW, lightning safety and protection along with simultaneous research, advocacy for policy and technology intervention through meaningful partnership with academia and others. This is a unique campaign of its kind and has presence over entire India. The campaign has been appreciated by WMO, UNISDR, GNDR and others.

Dedication

Mid-Monsoon 2019 : Lightning Report

is dedicated to

my father in law

Dr. Arun Kumar Sinha

(07 April 1937-23 August 2019)

(Former Chairman cum Head , Agriculture Engineering
Birsa Agriculture University Ranchi)

for his concerted efforts and innovations

for farmers and rural communities

डॉ. मृत्युंजय महापात्र
मौसम विज्ञान विभाग के महानिदेशक,
विश्व मौसम विज्ञान संगठन में भारत के स्थाई प्रतिनिधि
एवं कार्यकारी परिषद के सदस्य
Dr. Mrutyunjay Mohapatra
Director General of Meteorology,
Permanent Representative of India with WMO,
Member of Executive Council, WMO

भारत सरकार
पृथ्वी विज्ञान मंत्रालय
भारत मौसम विज्ञान विभाग
मौसम भवन, लोदी रोड़
नई दिल्ली–110003
Government of India
Ministry of Earth Sciences
India Meteorological Department
Mausam Bhawan, Lodi Road
New Delhi - 110003

MESSAGE

I am glad to note that Climate Resilient Observing Systems Promotion Council (CROPC) is releasing Mid-Monsoon 2019 Lightning Report. This Report is a compilation of the lightning and nowcast forecast of India Meteorological Department (IMD), Indian Institute of Tropical Meteorology (IITM), Pune, National Remore Sensing Centre (NRSC), Indian Space Research Organization (ISRO), Lightning Network data alongwith inputs from various satellites' reports.

Lightning activity has affected a number of States and Union Territories of India resulting in extensive loss of life and property. This Report focuses on the States which are more prone to this activity and stresses upon scientific approach to mitigate losses to human lives and livestock.

This is a unique study, which aims towards mapping of vulnerable lightning areas and creation of lightning safe infrastructure based on the early warning system. I feel that this initiative will go a long way in mitigating loss to life and property due to lightning effect.

I convey my best wishes to the Climate Resilient Observing Systems Promotion Council (CROPC) for this Report and all their future endeavours.

(Mrutyunjay Mohapatra)

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Col Sanjay Kumar Srivastava
Chairman
Convener, Lightning Resilient India Campaign

CROPC

Climate Resilient Observing-Systems
tion Council (CROPC)
-IIT Delhi, 87A, Adchini
Aurobindo Marg, New Delhi-110017

Executive summary

With sharp increase in lightning activities and so the fatalities, it has become important for stakeholders to address lightning risk management through a scientific approach. Lightning strikes's scientific mapping vis a vis impact analysis has been undertaken for the first time in India with the help of Lightning detection sensors held with Indian Institute of Tropical Management , Pune and the lightning flashes data available through Indian Meteorological Department and other satellites . This is part of our effort to prepare a Lightning risk map of India and identify Lightning hotspots. State Governments are welcome to collaborate with us to develop Lightning risk map up to taluka level.

IMD's unique product of 24 hours advance Lightning and thunderstorm forecast has been hallmark followed by nowcast providing 2-4 hours of advance warning which is actionable. This has given much more lead time to community,state governments and other stakeholders to respond and save life. The impact of same is visible due to reduction in fatalities in states like Odisha and others .

Lightning Resilient India Campaign carrying the Lightning EW from IMD to states and to community at last mile has observed very encouraging participation from states like Karnataka, Odisha, West Bengal, Jharkhand and north eastern states. In these states, despite increase in lightning strikes, the casualties are less as compared to previous years. Odisha has been the most resilient with highest lightning counts of more than 9 lakh but only 129 casualties.States like Uttar Pradesh and Bihar need to under take immediate steps as they have incurred highest losses despite much less strikes.

The focus on Lightning protection and awareness is the need of hour. 100% Safety can be assured with installation of Lightning protection devices only.

I would like to express my sincere gratitude to the patrons specially Dr. K.J. Ramesh, former DG, IMD , Mr. P.P. Shrivastav,I.A.S. (Retired) and Prof S.K. Dash , President, Indian Meteorologist Society and Dr. Mrutyunjay Mohapatra , DG, IMD for constant guidance. I am thankful to Dr. V.Gopalkrishnan and his team of IITM Pune, Mr Alok Taori and his team of NRSC, ISRO , World Vision India , large network of volunteers from Indian Red Cross Society and other NGOs , interns from Tata Institute of Social Sciences and members of CROPC family.

The change in the pattern of rain that is very heavy precipitation followed by long gap has made lightning strikes a new normal and so the fatalities. With second half of the monsoon still left, we need to up scale the campaign to ensure substantial reduction in lightning fatalities.

This report is first of its kind and lightning fatality data has been collated based on media and state governments inputs which may vary. **We finally intend developing a Lightning Resilient Index states to judge their preparedness themselves** . he state governments are requested to respond in case of any change. Comments and suggestions are welcome at my email id sanjaysonisa@gmail.com. **For permission to use data or graphics from this report, permission is mandatory for which please contact us at cropcn@gmail.com .**

The Final Monsoon 2019 Lightning Report will be published in November 2019 after the south west monsoon and comprehensive compilation of data and more analysis.

Im sanguine that the this document will be useful to scientific community, central and state government agencies , academia, INGOs, communities and others in overall effort of evidence based scientific approach towards Lightning risk management . This would show case India's collective effort as such towards adaptation to extremities of climate change like lightning and build resilience.

(Sanjay Kumar Srivastava)
31 August 2019

Mid- Monsoon 2019 Lightning Report

Table of Contents

Lightning Resilient India Campaign

A joint initiative by Climate Resilient Observing Systems Promotion Council (CROPC), Indian Meteorological Department, Ministry of Earth Science , Government of India and World Vision India

Aim

1. To reduce Lightning deaths of human being beings, livestock and wild animals by 80% in next 03 years

Vision

2. The vision of Lightning Safe Indian Campaign is to create a Lightning Resilient Society through a comprehensive, multipronged innovative approach and collective action thereby taking Multi Hazard Early Warning to the community up to last mile , capacity building and creating lightning safe infrastructures with focus on local disaster hotspots in accordance with the Sendai Framework for Disaster Risk Reduction(SF DRR) and zero tolerance towards avoidable disasters.

Mission

3. Lightning safe India Campaign's mission is to bring down the deaths due to lightning by 80% in a period of three years from 2019 to 2021 through increased standardized instrumentation ,prompt dissemination of early warning to last mile through committed volunteers in user friendly manner, create a culture of safety through active capacity building through education, awareness & training and guidance on installation of lightning safety devices in critical infrastructures like school, hospital. Community centers etc.

Grateful for support to

National Disaster Management Authority

Ministry of Home Affairs

Indian Meteorological Society (IMS)

Association of Agro-meteorologists

IIT Delhi

SCDR, JNU

All India Radio

International Federation of Red Crescent (IFRC)

Indian Red Cross Society

UNISDR

GNDR

State Governments

NRSC ISRO

IITM PUNE

UNICEF INDIA

LOCAL NGOs

Volunteers

Community

Total Lightning Strikes01 April-31 July 2019

64,55,540

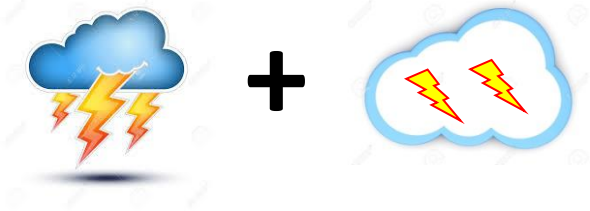
Total Lightning strikes

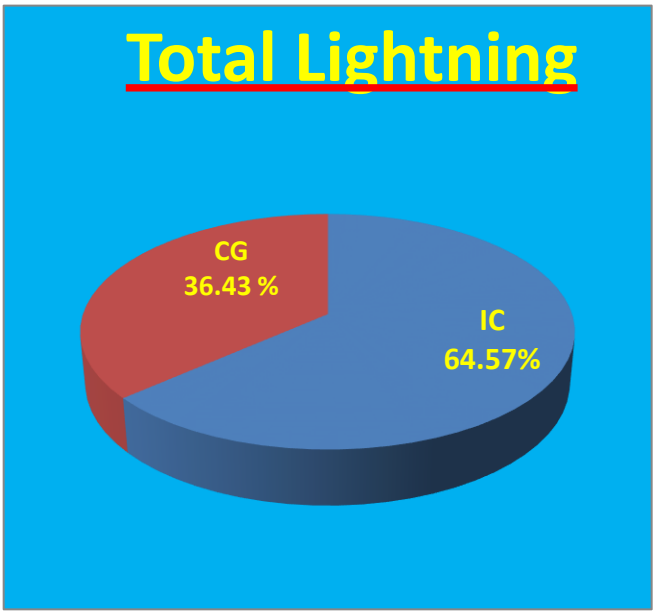
23,52,614

Cloud to ground Lightning

Total Lightning

is the combination of cloud to ground (CG) and in-Cloud (IC) lightning strikes





Cloud to Ground Lightning	In-Cloud Lightning
Lightning that happens between opposite charges in a cloud and on the ground	Lightning that occurs between opposite charges within a thunderstorm

23,52,614

In Cloud Lightning

Lightning strikes Map of India

Period 01 April 2019 to 31 July 2019

The map below represents lightning strikes across India during later half of pre-monsoon and first half of Monsoon period including Kaalbaisakhi when frequency of lightning strikes is the highest.

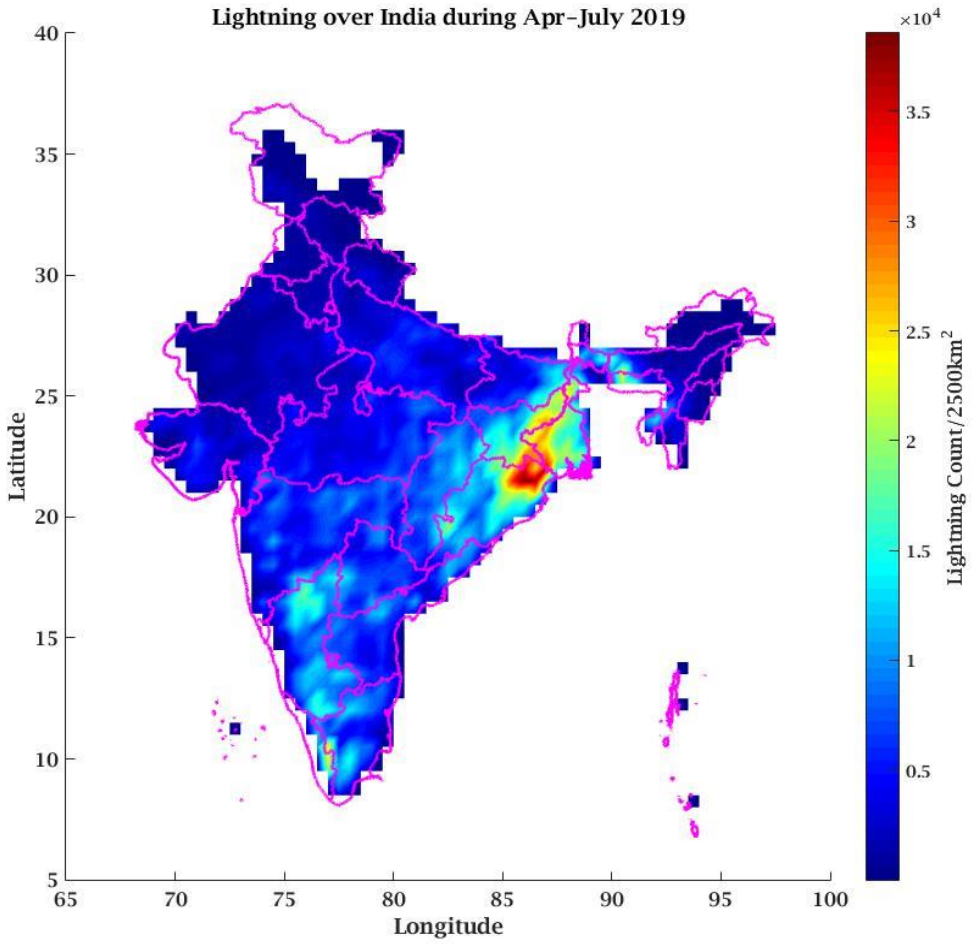


Figure 1: Plotted lightning strikes over India for period 01 April 2019 to 31 July 2019.

The Lightning strikes have been dominantly observed all over India, maximum intensity observed is in eastern India in Chotanagpur plateau that is confluence of Jharkhand, Odisha and West Bengal. Odisha owns maximum part of most lightning intensity and frequency zone. (Source – IITM, Pune). Ideally microzonation of lightning strikes would identify precise Lightning hotspots for which states may seek expertise of CROPC for their specific requirements separately .

Lightning Count Rankings

Period 01 April 2019 to 31 July 2019

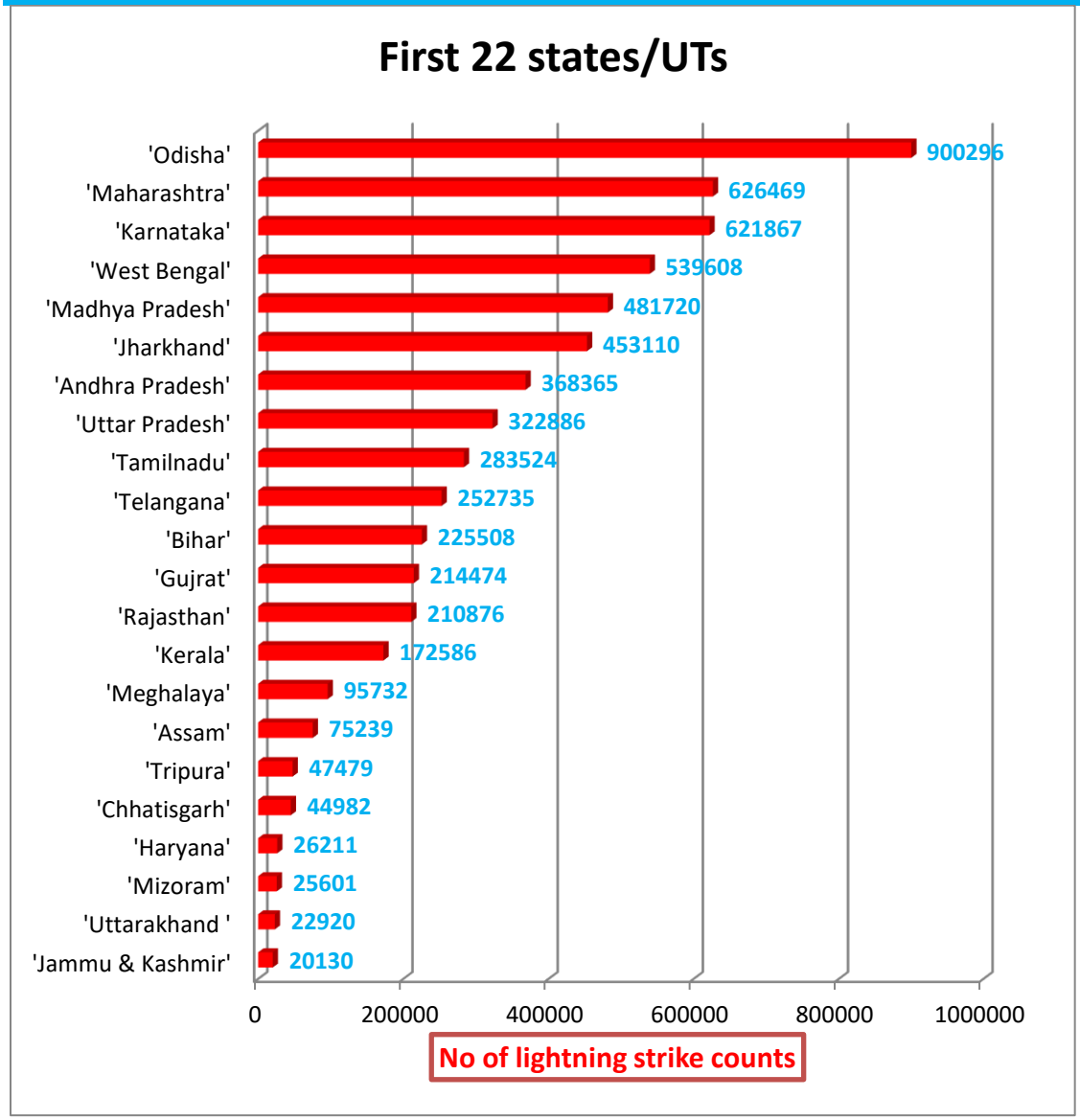


Figure 2 : lightning strikes counts ranking – first 22 states

Odisha tops with 9 lakhlightning strikes which is15% of total strikes.. Maharashtra, Karnataka, West Bengal, Madhya Pradesh, Jharkhand, Uttar Pradesh and Andhra Pradesh together account for more than 50%lightning strikes of India . Details about other states are at appendix . States can opt for micro-zonation of above strikes upto taluka /panchayat level from CROPC at cropcn@gmail.com .

Lightning Flash Counts :IC vs CG

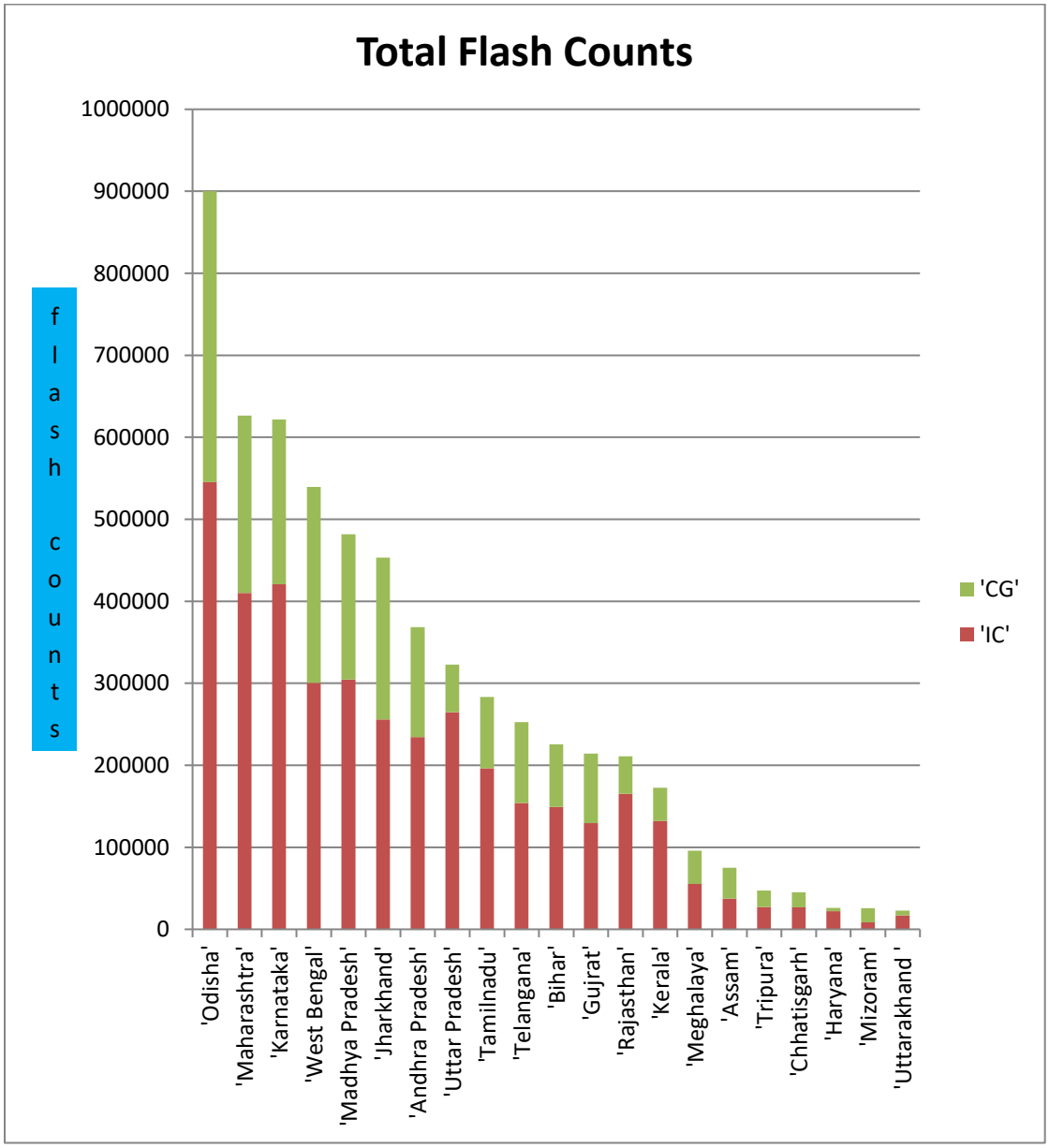


Figure3 : lightning total flash counts of CG and IC, top 21 states

Total Lightning flash comprises of Inter-cloud (IC) and Cloud to ground (CG) lightning flashes. *Its important to note that it is CG lightning flashes which strike us*. However, it is In-Cloud (IC) lightning which is instrumental in forecast of lightning .

Lightning Day 01 April 2019 to 31 July 2019

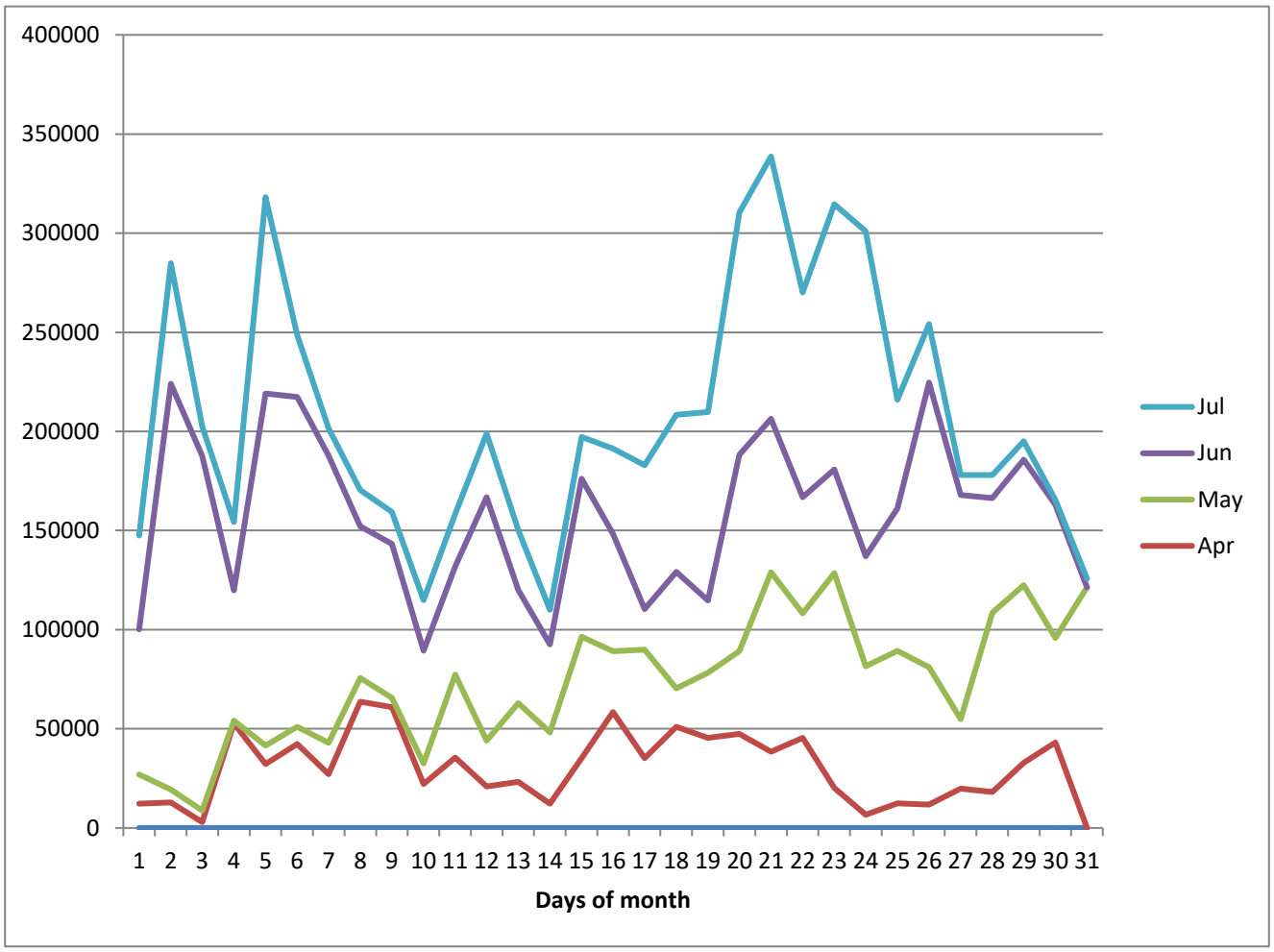
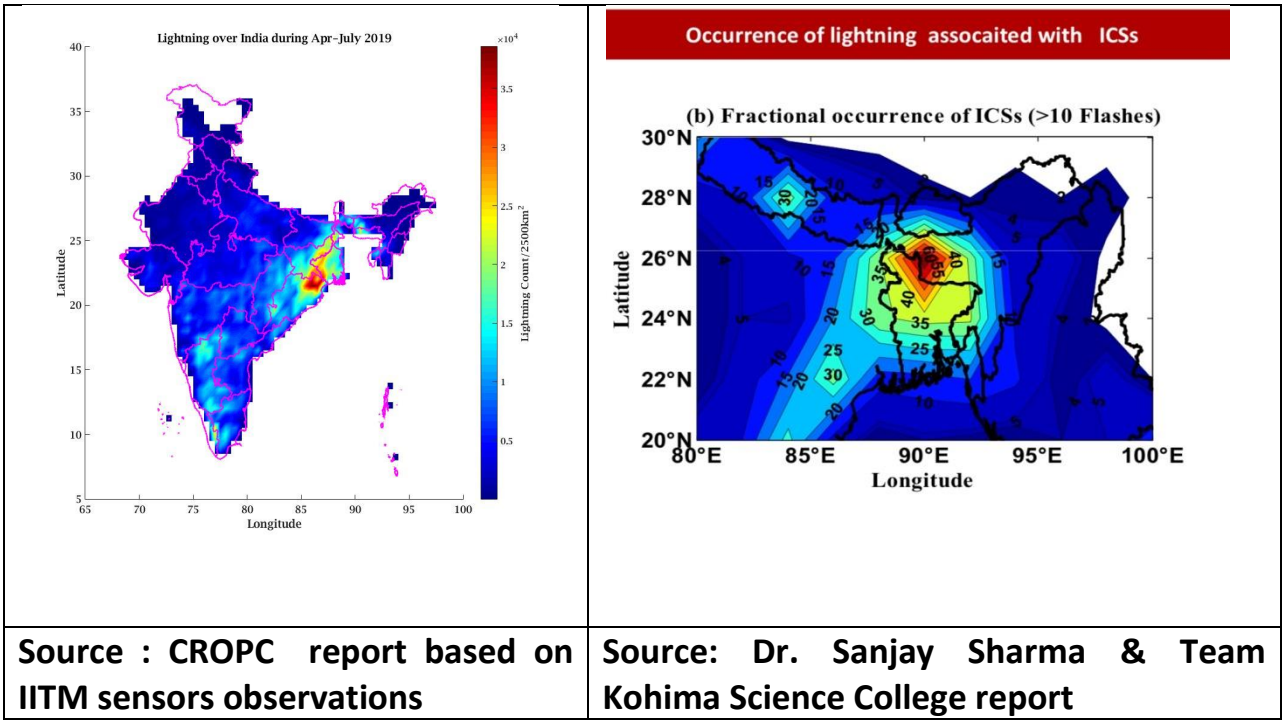


Figure 4 :lightning days during April. May. June and July (Source : IMD & IITM)

The number of lightning days across India has shown significant increase, every month progressively. July witnessed highest lightning days, especially in the later half due to turbulent onset of monsoon.There has been constant lightning almost every day in one or the other parts of country. Odisha and Andhra Pradesh have so far been most lightning active states. Ideally , location specific mapping of lightning days would figure out the trend for which states can approach CROPC separately with their specific requirements .

East to North East – the lightning road

Eight states of North East comprising of Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland, Tripura and Sikkim –the 2.4% of geographical area of India with 3.86% of national population falls in the most hot lightning rod zone. Our research reveals that it orginates from Chotanagpur Plateau – the confluence of Odisha, West Bengal and Jharkhand ; extend through Bangladesh to Patkai plateau of Meghalaya affecting other North eastern states. This corroborates the study done by Prof. Sanjay Sharma and his team of Kohima Science College, Kohima presented at NESAC , Shillong on 22 June 2019 during Lightning Resilient India Campaign in North East.



Source : CROPC report based on IITM sensors observations	**Source: Dr. Sanjay Sharma & Team Kohima Science College report**

Figure 5 : lightning hotspots : comparative analysis

Lightning Deaths

01 April 2019 to 31 July 2019

This report on lightning deaths has been compiled based on reports as received from state Governments or media or reported by Volunteers. With few states, the data is still being reconciled .

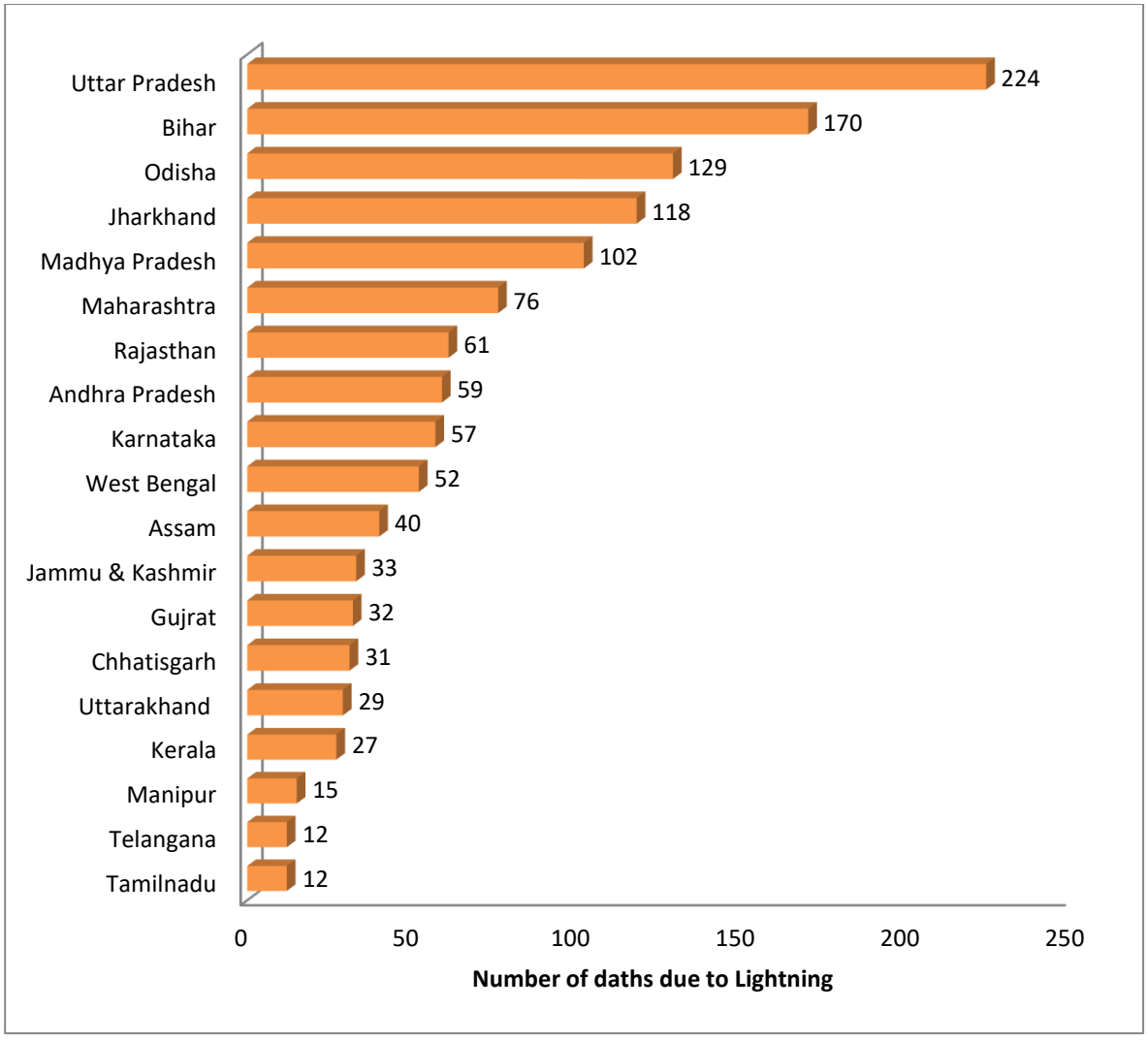


Figure 6 : lightning deaths during 01 April 2019 t0 31 July 2019

Uttar Pradesh tops the list followed by Bihar. Jharkhand, Madhya Pradesh . Odisha , Maharashtra are other high fatalities states . Each state of the country has incurred losses due to lightning. There are more than double the number of injured too.

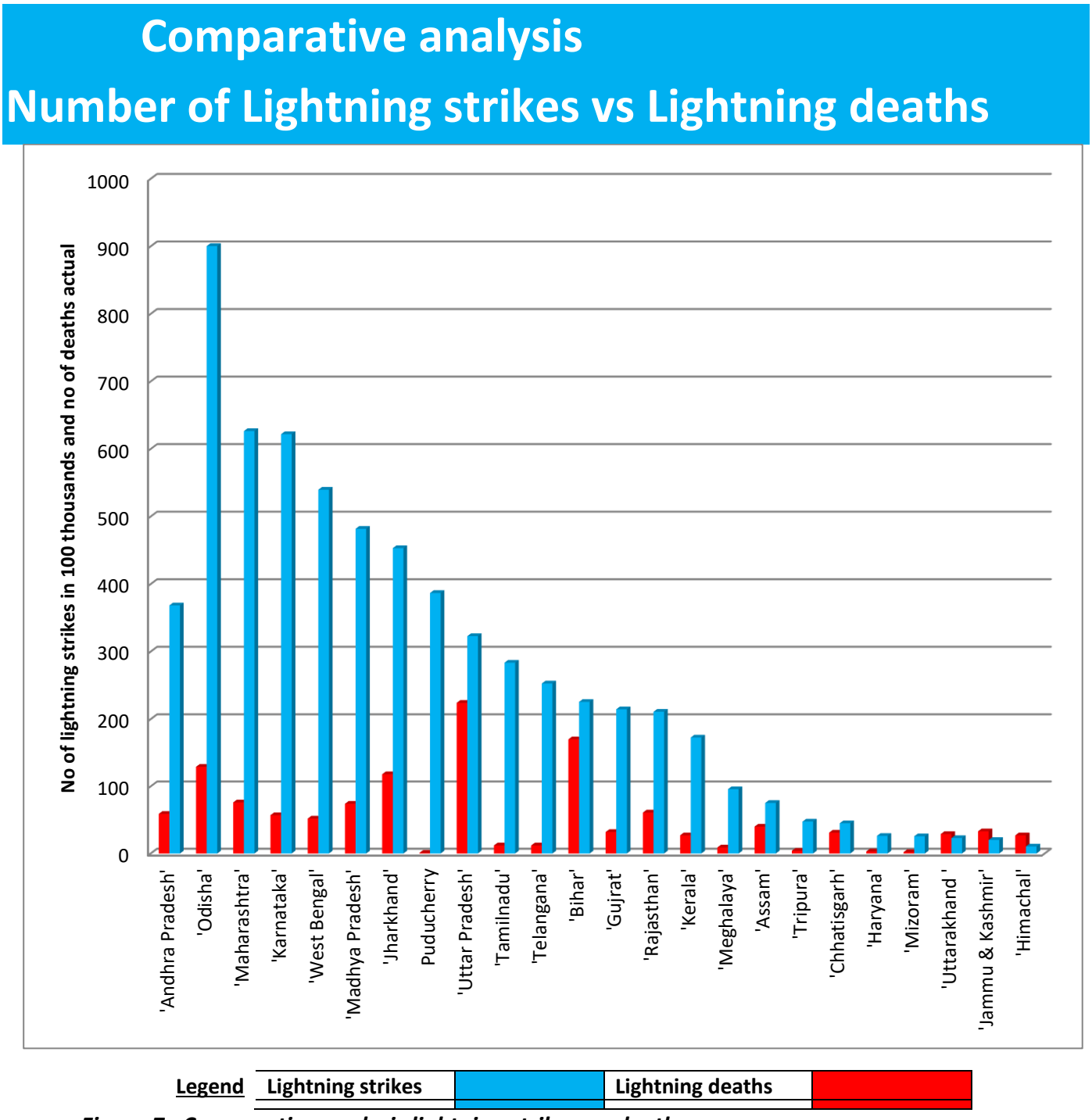
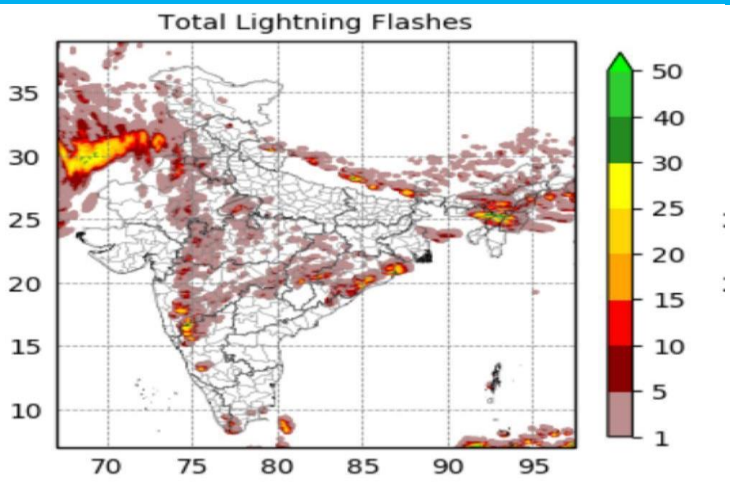
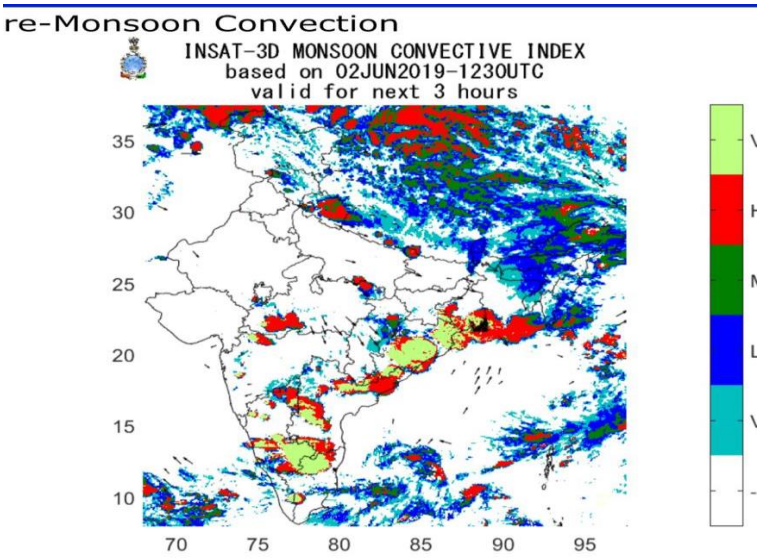


Figure 7 : Comparative analysis lightning strikes vs deaths

Odisha with 9 lakh plus strikes the highest strikes and minimal casualty of 129 is worth emulating by other states . The chart is self explanatory and speaks volumes about others. Its imperative for states to aggressively participate in Lightning Resilient India Campaign and undertake lightning risk management more comprehensively.

Indian Meteorological Department (IMD)'s Total Lightning forecasts and Nowcasts





With undauting effort of Dr. K.J. Ramesh and his team , IMD started Lightning forecast from 01 April 2019 by integrating inputs from IAF sensors , IITM Pune's sensors network and INSAT-3D satellites , This is a landmark advancement in IMD's forecast .

24 hours advance warning is the haulmark of IMD's lightning forecast . This is precise and actionable .

There are adequate number of sensors by IMD /IITM and regional IMDs and NESAC are giving adequate EW including nowcast

IMD's now-cast gives you 3 hours to 30 minutes early warning against Lightning Web Link to IMD's Lightning forecast

http://srf.tropmet.res.in/srf/ts_prediction_system/index.php

State Governments and other stakeholders should take this IMD's forecast on lightning to community on time and thereby can reduce the losses to life , livestock, livelihood and assets substantially.

Dangerous Thunderstorms and Lightning

The Lightning Resilient India Campaign has been using various products from IMD, IITM, NRSC ISRO, WMO and foreign satellites and mobile app based technologies to monitor and disseminate Dangerous Thunderstorms and Lightning alerts **to enhance its outreach and sanitise Govt & community .**

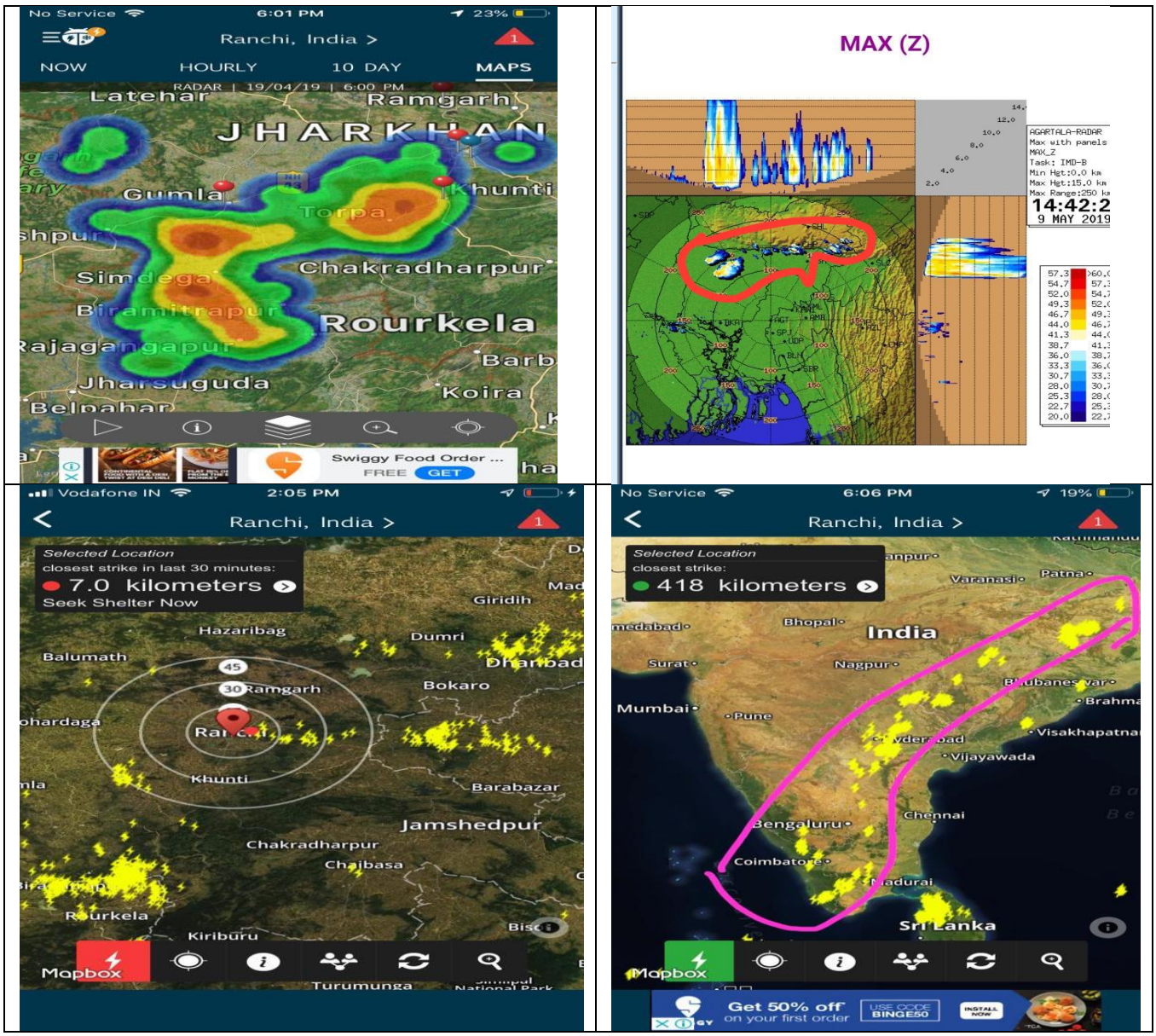


Figure 8 : lightning mobile app Weatherbug and IMD's Doppler radar visualization screenshots

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Recap Lightning Case Studies 2019

What happened in Gujrat, Rajasthan, Madhya Pradesh, Maharashtra in Western and Central India on 16 April 2019, a new normal
https://www.downtoearth.org.in/news/climate-change/what-caused-41-000-lightning-strikes-across-india-on-april-16--64068

03-04 may 2019 Cyclone Fani hit Odish with lakh of strikes had zero lightning casualty whereas UP lost 10 people
https://www.thehindubusinessline.com/news/national/how-lightning-arresters-helped-achieve-zero-casualty-in-odisha/article27050506.ece

Uttar Pradesh

A moderate strike of 4000 flashes batter large number of masses on 06 June 2019

Central and East India

Pre monsoon wide spread lightning strikes create mayhem on 26 June 2019

Most fatal week

Delayed monsoon had a turbulent start with wide spread lightning from 25-31 July 2019 causing more than 200 deaths

Western & Central India :16 April 2019

On 16 April 2019 ,Western Disturbances (WD) induced lightning & thunderstorms caused havoc in central and western India .Indian Meteorological Department had issued specific warning 48 hours in advance . There were 41000 strikes recorded by IITM as shown below:-

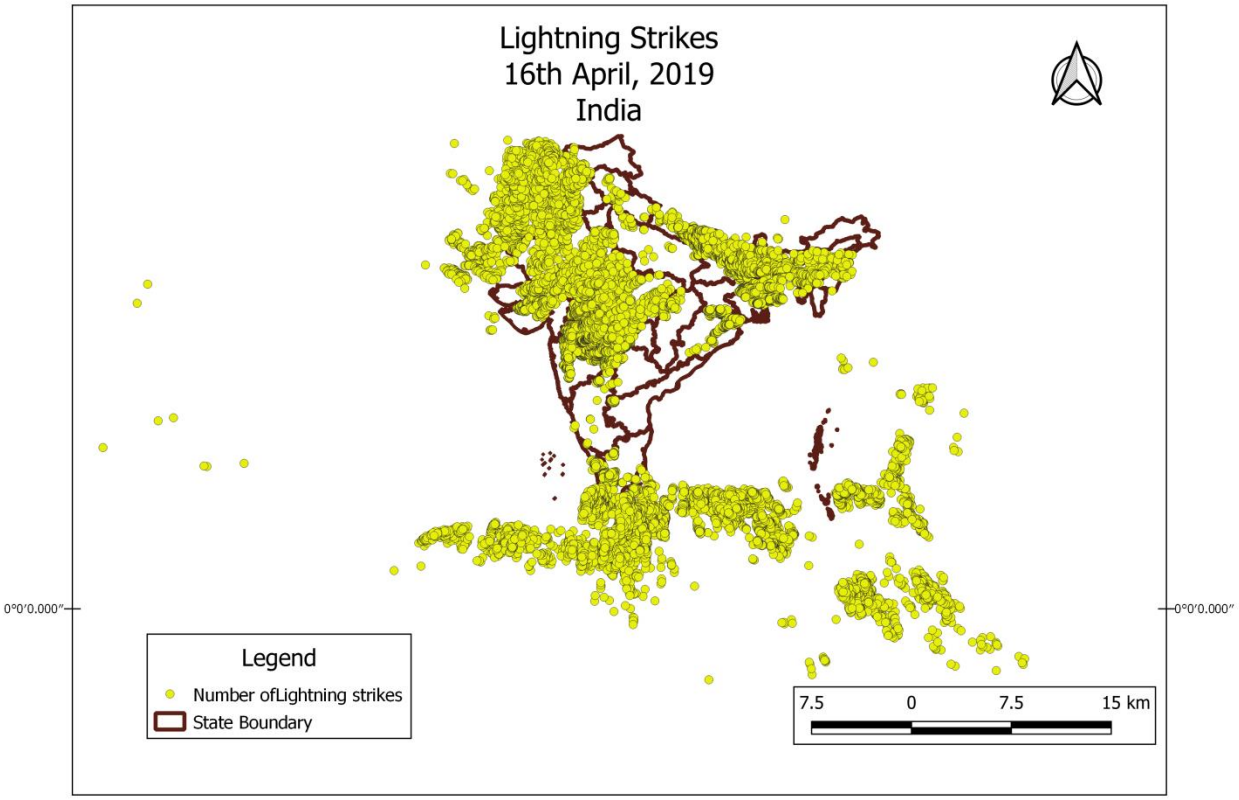
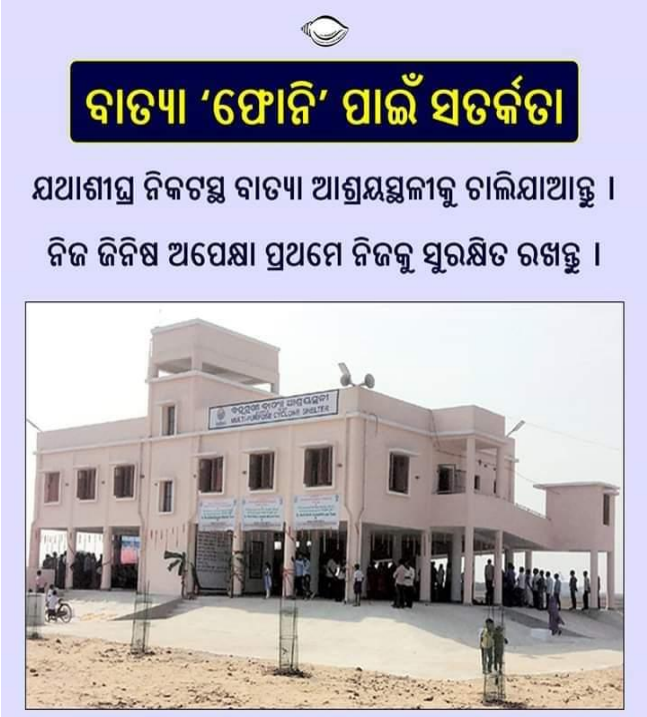


Figure9 : Cloud to ground lightning flashes plotted by CROPC

Dr M. Rajeevan , Secretary MoES termed this WD as the strongest WD since January 2019. As per media report, total 41000 strikes caused 89 deaths in 11 states with Rajasthan 26, Madhya Pradesh 16, Gujarat 12, Maharashtra 17.https://www.downtoearth.org.in/news/climate-change/what-caused-41-000-lightning-strikes-across-india-on-april-16--64068

Cyclone Fani : 03-04 May 2019

During Cyclone Fani, Odisha has more than one lakh intense lightning strikes on 03-04 May 2019. More than 1.2 million people were evacuated to cyclone shelters. The Lightning risk prepared Odisha had zero casualty mainly due to all 891 cyclone shelters were fitted with Lightning Arresters.https://www.thehindubusinessline.com/news/national/how-lightning-arresters-helped-achieve-zero-casualty-in-odisha/article27050506.ece

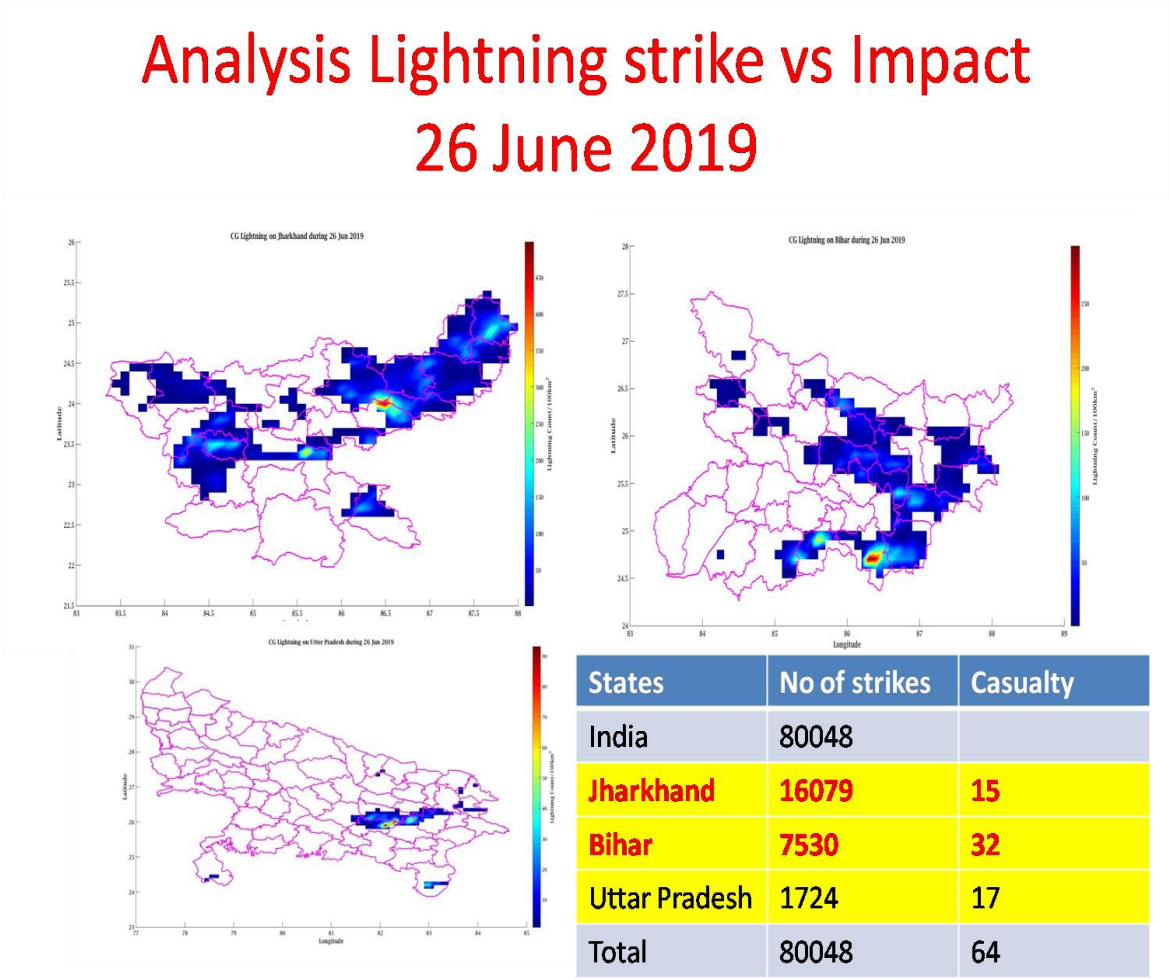


Cyclone Fani weakened on 04 May 2019 and advanced north west to Jharkhand , Bihar and Uttar Pradesh . The dissipating cloud of weak Fani had few weak lightning strikes caused 10 deaths in Chandauli , Uttar Pradesh . The reason for the same could be attributed to lack of early warning and Lightning safe infrastructure .

Essence of saving life from Lightning lies in installation of lightning protection devices that is Lightning arresters /conductors of proper quality over vulnerable buildings /community centers. The Lightning arresters /conductors are of paramount importance without which no life can be saved . Due to this very reason, in intense lightning zone of cyclone Fani in Odisha, there was zero casualty . Uttar Pradesh lacked same and hence incurred 10 deaths from weak dissipating bolt strikes .

26 June2019 : Uttar Pradesh, Bihar and Jharkhand

Pre monsoon lightning strikes were wide spread over Eastern and *Central India* .IMD had issued advance warning to states and the server at IITM Pune recorded total 80048 strikes which are plotted state wise as given below along with deaths too :-



States	No of strikes	Casualty
India	80048	
Jharkhand	16079	15
Bihar	7530	32
Uttar Pradesh	1724	17
Total	80048	64

Figure 10: Cloud to ground lightning flashes plotted by CROPC

Bihar had maximum deaths 32 though it received almost 50 % less lightning strikes than Jharkhand. Similarly, Uttar Pradesh had just 02% strikes but casualties were equal to Jharkhand. Another significant fact was that large nuber of farmers in Bihar were hit .This shows relatively lack of preparedness in Bihar and Uttar Pradesh.

25-31 July 2019: Most fatal week

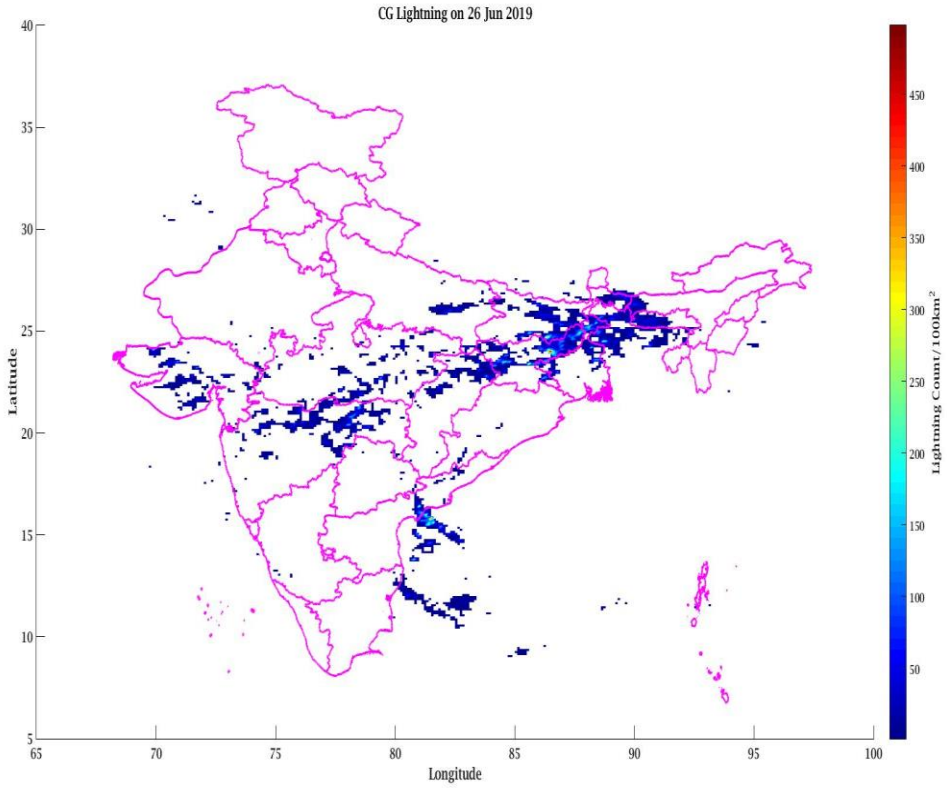
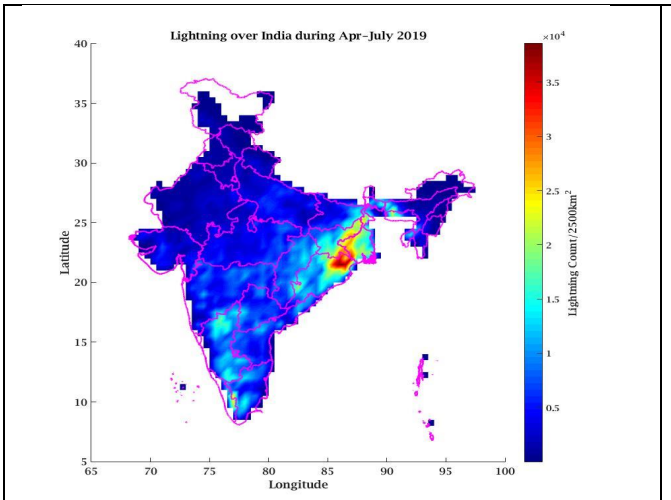
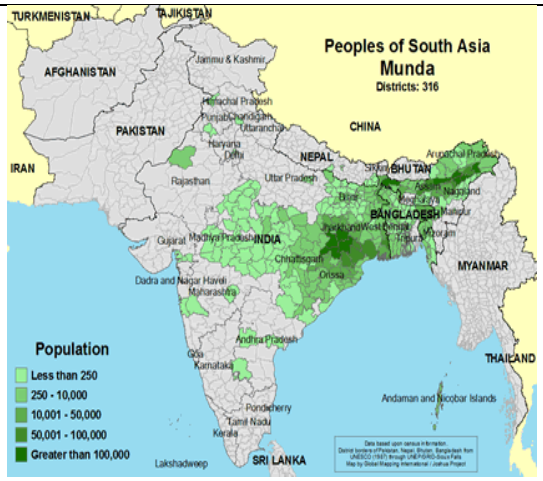


Figure 11: Cloud to ground lightning flashes plotted by CROPC

Monsoon 2019 had a turbulent onset after a heat wave and hence had lightning very intense and frequent from 22 July 2019 onwards only claiming large number of life and livestock. Lightning strike on 24-31st July has been phenomenal with more than 400000 lightning strikes over the country. As per media reports , states had to pay heavy price to it with more than 230 deaths from Uttar Pradesh 94, Bihar 74, Jharkhand 51, Rajasthan 5, Gujarat 3 and others . Some of the data are still under verification from states.

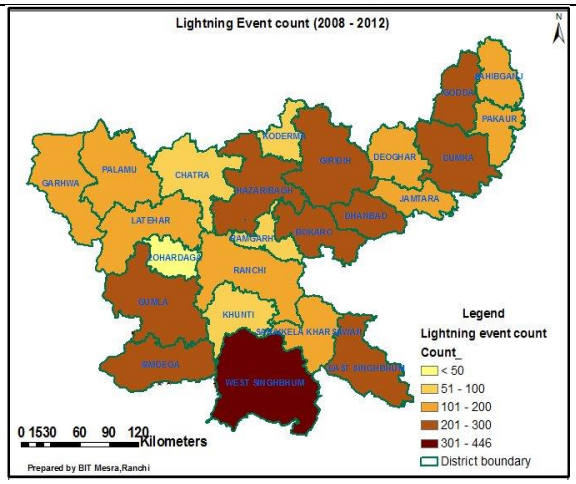
Tribal communities in Jharkhand, Odisha and West Bengal are most prone to Lightning

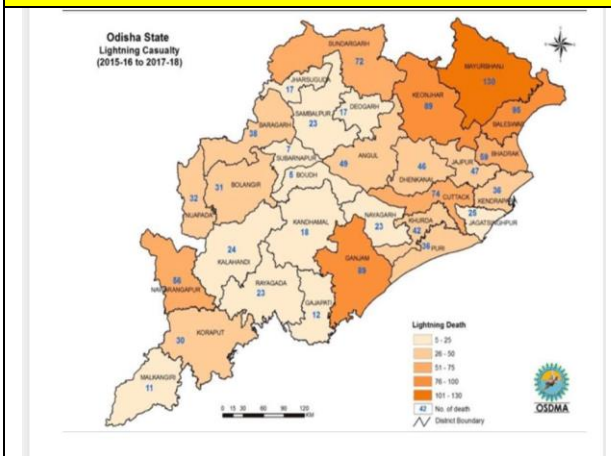




The recent observations of lightning strikes over India confirms again that the Chotanagpur plateau that is the confluence of Jharkhand, Odisha and West Bengal inhabited by tribal is the most Lightning prone area .

There are severe and fast extinction of few tribal communities like Birhor, Pahadiya , Ho, Hmar who needs to be given lightning protection to prevent their extinction.





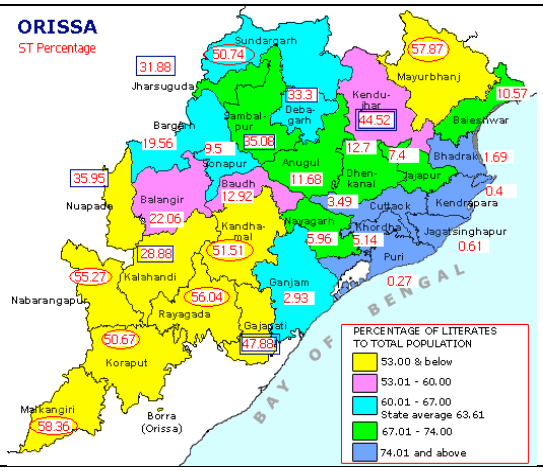


Figure 12: Lightning vs tribal vulnerability as plotted by CROPC (source OSDMA & Disaster Management Department, Jharkhand and National Tribal Map

Lightning Deaths of Animals

There have been phenomenal losses of animals like large number of cows in Uttar Pradesh, 250 sheep in Kashmir, 200 goats in Uttarakhand, One elephant died due to Lightning strike and so many losses not even reported post 'Fani' Odisha , Bihar, Jharkhand and hills

NEWS CLICK INTERACTIVE ELECTION MAP

Politics India

Uttar Pradesh: Cows Continue Dying At State Run Shelters Due to Rain And Lightning

Following the escalating number of cow deaths, CM Adityanath suspends eight officials.

Newsclick Report 15 Jul 2019

Representational Image. Image Courtesy: IANS

More than 200 sheep, goats killed after lightning strike in Ganderbal

By KR Web Desk on July 14, 2019 · Comments Off

0 Shares

Srinagar: More than 220 sheep and goats were killed after lightning struck a pasture in upper reaches of Kangan area in Ganderbal district of central Kashmir, reports said.

आकाशीय बिजली गिरने से 250 से अधिक भेड़ बकरियों की मौत

पुरोला। प्रखंड पुरोला के दूरस्थ गांव शिकारु में गुरुवार देर रात आकाशीय बिजली गिरने से शिकारु व ढकाड़ा गांव में 250 से भी अधिक भेड़ बकरियों की मौत हो गयी। गांव वालों ने घटना की सूचना तहसील प्रशासन को दे दी है। तहसील प्रशासन ने घटना में हुए नुकसान का जायजा लेने के लिए राजस्व टीम घटनास्थल के लिए भेज दी है।

गुरुवार देर रात शिकारु गांव से कुछ ही दूरी पर मोर यात्रा नामे तोक में अत्यधिक वर्षा के साथ आकाशीय बीजली गिरने से शिकारु गांव व ढकाड़ा गांव के पूरण चन्द, दीवान सिंह, उपेन्द्र सिंह, देवेन्द्र सिंह, चौन सिंह, जयेंद्र सिंह, ढकाडा के विनोद शर्मा, चंदेली के विजयपाल सजवाण आदि की 250 से अधिक भेड़-बकरियों की मौत हो गयी। गांव के दीवान सिंह ने बताया की अत्यधिक वर्षा होने पर उन्होंने सभी भेड़-बकरियों को पेड़ों के नीचे इकट्ठा कर लिया था। रात को करीब दो बजे तेज गर्जना के साथ बिजली गिरी और उनकी सैकड़ों बकरियां काल के गाल में समा गईं। ग्रामीण प्रताप सिंह रावत व मनमोहन रावत ने प्रशासन से भेड़ पालकों को मुआवजा देने की मांग की है। तहसीलदार जेएस नेगी ने बताया की नुकसान का जायजा लेने के लिए राजस्व उपनिरीक्षक को घटनास्थल के लिए भेज दिया गया है। रिपोर्ट आते ही कार्रवाई की जायेगी।

पैदल मार्ग क्षतिग्रस्त

गोपेश्वर। गुरुवार रात बारिश के कारण देवखाल से त्रिशूला तक के पैदल मार्ग बुरी तरह क्षतिग्रस्त हो गए हैं। अतिवृष्टि के कारण भद्रुड़ा गांव से गोगनापानी के पैदल रास्ते, सिंचाई नहर, देवखाल से त्रिशूला तक के विभिन्न गांवों को जोड़ने वाले जिला पंचायत के पैदल सड़क मार्ग बुरी तरह ध्वस्त हो गए हैं। इसके साथ ही गांवों की पेयजल स्रोत तथा पेयजल लाइनें भी क्षतिग्रस्त होने से लोगों के सामने दिक्कतें आ खड़ी हो गई हैं।

Government of India (Ministry of Animal Husbandry) has an Animal Disaster Management Plan. But for its compliance at state level both MoAH and Ministry of Home Affairs and NDMA need to take cognizance and issue necessary guidelines to states.

Lightning deaths are avoidable

Lightning is no more a mystery. It's a sudden and short term phenomenon . It is direct and extreme backlash of global warming and climate Change .It needs close monitoring and proactive collective action to reduce its adverse impacts .

There is adequate early warning and actionable forecast of Lightning by Indian Meteorological Department, Ministry of Earth Science. There are adequate knowledge base with Dos and Don'ts on Lightning and technology to create 100% safe Lightning Protection zones.

Lightning Resilient India Campaign has actively created network across India through joint collaboration with state governments , Indian Red Cross Society , World Vision India and NRSC, ISRO, NESAC Shillong, IITM Pune NEHU Shillong and other academic institutions .The deaths have reduced grossly in many areas due to the campaign.

Few interesting facts of the campaign are illustrated below:-

1. The majority of victims are rural (96%) which include farmers, women and children. They have been found to be vulnerable because of working in open.

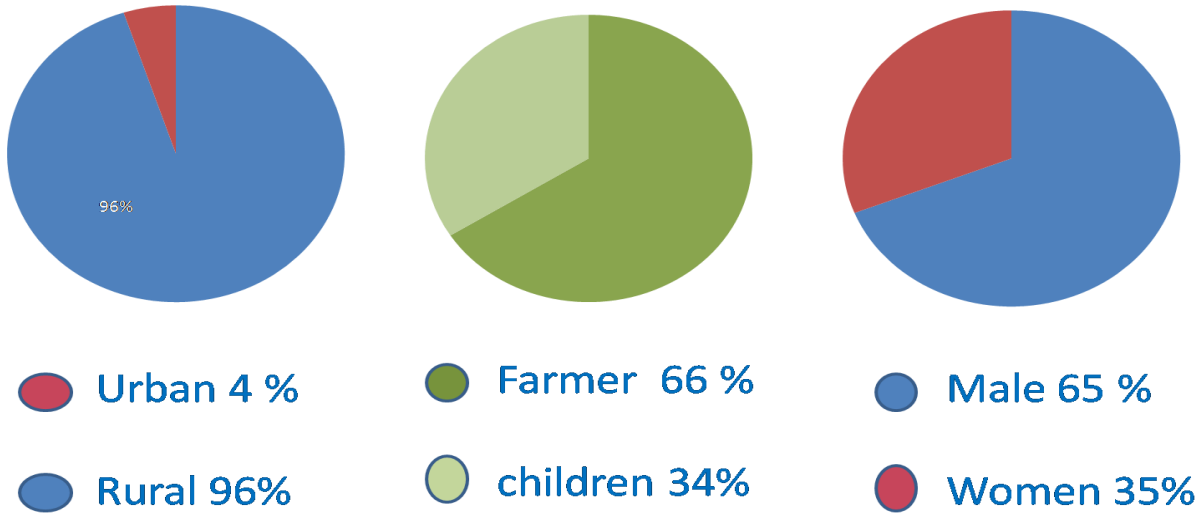


Figure 13: Lightning Deaths category wise

There are 71% people who are struck by lightning due to standing under tree during rains, thunderstorm or lightning

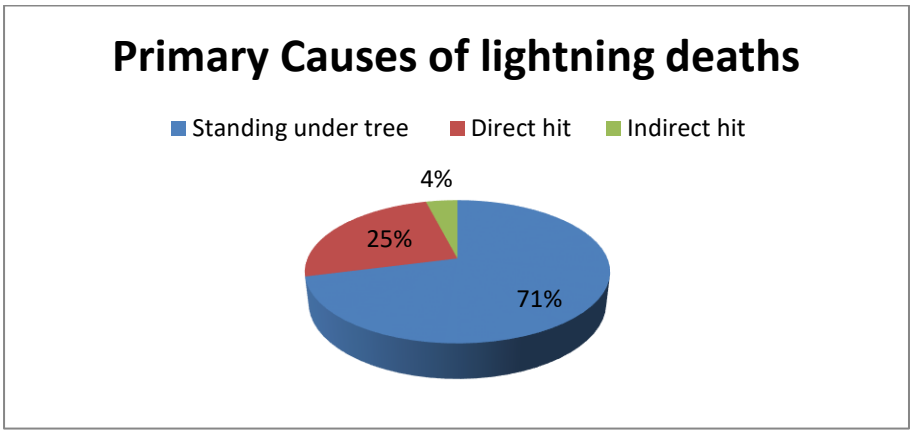


Figure 14: Primary causes of Lightning Deaths

Awareness drive needs to be up-scaled. The message of not to stand under tree during rains, thunderstorms and lightning can save more than 2000 deaths.

Figure 15: Lightning Resilient India Campaign Safety Poster

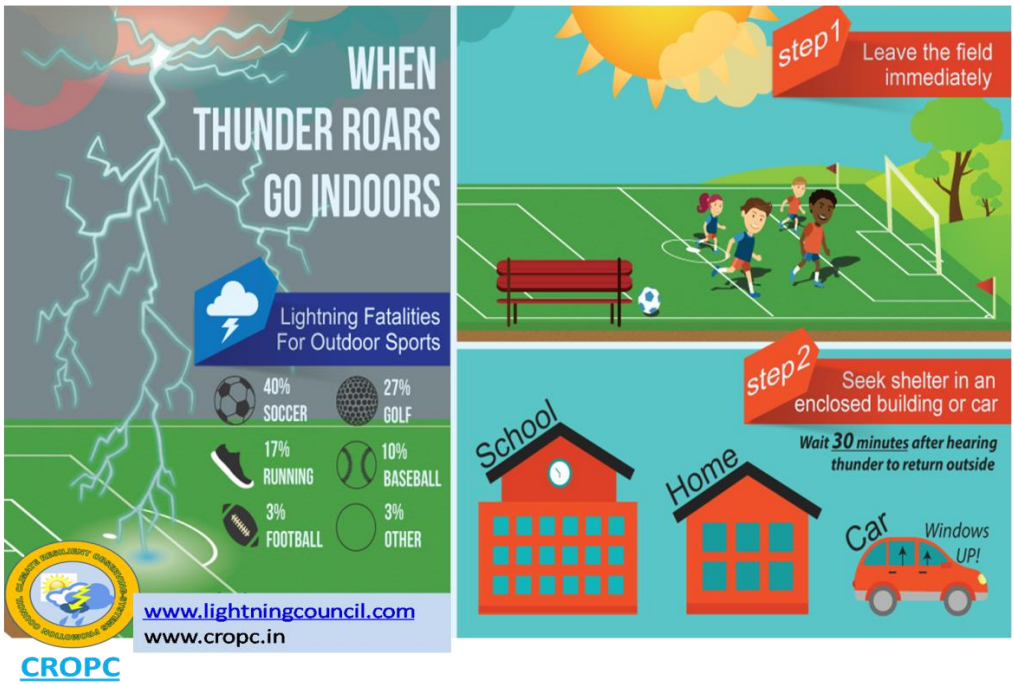


Figure 16: Lightning Resilient India Campaign safety Posters

Lightning Protection Devices

Figure 17 Lightning Safe Grid at Babadham Jharkhand and Safe Cyclone Shelter at Odisha

Essence of 100% safety from Lightning is possible only on installation of standard Lightning protection device like Lightning Safe Grid at Babadham Deoghar and Lightning safe Cyclone Shelters of Odisha . Results have been very evident as Odisha had zero lightning casualty during Cyclone Fani and Jharkhand had lightning accident free shrawani Mela ,consecutively06 years since 2014 .

Salient Highlights of Lightning Report

1. This is first of its kind evidence based mapping of lightning strikes over entire India .

2. The Highest Number of strikes

2.1 State –Odisha with 9 lakh 226 strikes

2.2 District – East Singhbhum , Jharkhand

2.3 In one day – 204665 strikes on 02 June 2019

2.4 Month wise summary of Lightning strikes- June 2019 had highest strikes but number of casualties were more in July 2019 as is evident from data below:-

Month	Total Lightning	IC Lightning	CG Lightning	Deaths
April	942269	619326	322943	
May	1342165	891796	450369	299
Jun	2614841	1608746	1006095	458
Jul	1556265	984058	572207	554
	6455540	4103926	2351614	1311

3. Emerging major facts out of the study so far are as under:-

3.1 Generally, rural population especially in open areas, who seek shelter under trees are more at-risk from lightning strikes. Warnings and education for lightning related preventive measures should be tailored accordingly.

3.2 If one compares the average highest frequency of lightning occurrence spatially, with the highest number of casualties, they do not match. Hence, it is to be analysed why lightning is more devastating in some less frequency regions such as Maharashtra but less devastating in regions where frequency is higher.

3.3 One requires event based casualty figures. Often, as in the case of Uttar Pradesh, Punjab or Rajasthan this year, all casualties may be in association with a one or two events. These events can then be studied in detail, in terms of the cause of death and meteorological conditions, to prevent their re-occurrence.

4. **Lightning Resilient Index** . CROPC plans to develop Lightning Resilience Index for states which would include Lightning risk assessment , Lightning EW and dissemination system, capacity building programme, Lightning protection system –its quality and density, Lightning research etc. Suggestions are welcome in this regard so that we develop effective Lightning Resilience Index adoptable by all.

Source of Informations

1. Source of Lightning Data : Indian Meteorological Department, Indian Institute of Tropical Management, Pune and NRSC, ISRO .

2. Lightning Casualty Data : State Governments , media , Indian Red Cross Society and other volunteers network .

3. A study of electrical and lightning characteristics of thunderstorms during pre-monsoon season over two different climatic regimes by Dr. Sanjay Sharma ,Rupraj Biswasharma, Partha Roy, Debajyoti Samantaand Gour Prasad Pramanikfrom Kohima Science College, Kohima presented during Lightning Resilient India Campaign NESAC meet at Shillong on 22 June 2019.

4. Odisha State Disaster Management Authority (OSDMA). www.osdma.org

5. Disaster Management Departments reports of Uttar Pradesh, Haryana, Odisha, Nagaland, Karnataka, Jharkhand and Bihar

6. Media reports from Shillong times , Telegraphs, Hindustan, Prabhat Khabar, TV and others .

7. Researchers from IIT Delhi, Central Universities of Jharkhand , Birla Institute of Technology, Mesra, Kohima Science College , Kohima , North Eastern Hill University NEHU Shillong , UAS, Dharwad, and other institutions.

8. National Crime Records Bureau Report .

9. Situation Reports from website of DM Division,Ministry of Home Affairs, Government of India https://www.ndmindia.nic.in/

10. National Disaster Management Authority guidelines for preparation of action plan – Prevention and Management of Thunderstorm & Lightning/squall/Dust/hailstorm and winds https://ndma.gov.in/images/guidelines/Guidelines-on-TSL-HSW.pdf

Appendix

This table ranks states based on lightning strike counts for the period 01 April 2019 to 31 July 2019

State	Total Lightning	IC	CG
'Andhra Pradesh'	368365	234321	134044
'Arunachal Pradesh'	2573	1086	1487
'Assam'	75239	37414	37825
'Bihar'	225508	149272	76236
'Chhatisgarh'	44982	26811	18171
'Goa'	3012	2304	708
'Gujrat'	214474	129570	84904
'Haryana'	26211	21949	4262
'Himachal'	10422	5909	4513
'Jammu & Kashmir'	20130	4913	15217
'Jharkhand'	453110	255998	197112
'Karnataka'	621867	420760	201107
'Kerala'	172586	131894	40692
'Madhya Pradesh'	481720	304567	177153
'Maharashtra'	626469	410311	216158
'Manipur'	7683	3027	4656
'Meghalaya'	95732	55195	40537
'Mizoram'	25601	8725	16876
'Nagaland'	3902	1591	2311
'Odisha'	900296	545266	355030
'Punjab'	1480	976	504
'Rajasthan'	210876	165225	45651
'Sikkim'	338	182	156
'Tamilnadu'	283524	196331	87193
'Andhra Pradesh'	368365	234321	134044
'Arunachal Pradesh'	2573	1086	1487
'Assam'	75239	37414	37825
'Bihar'	225508	149272	76236
'Chhatisgarh'	44982	26811	18171

Appendix

This table ranks states based on lightning strike counts for the period 01 April 2019 to 31 July 2019

State	Total Lightning	IC	CG
'Telangana'	252735	153935	98800
'Tripura'	47479	27357	20122
'Uttar Pradesh'	322886	264858	58028
'Uttarakhand '	22920	17073	5847
'West Bengal'	539608	300571	239037
'Andaman & N '	420	0	420
'Chandigarh'	66	45	21
'Dadar & N Haveli'	462	306	156
'Daman & Diu'	173	89	84
'Delhi'	1608	1418	190
'Lakshadweep'	452	228	224
'Nagaland'	3902	1591	2311
'Telangana'	252735	153935	98800
'Tripura'	47479	27357	20122
'Uttar Pradesh'	322886	264858	58028
'Uttarakhand '	22920	17073	5847
'West Bengal'	539608	300571	239037
'Andaman & N '	420	0	420
Total			

Appendix

This table gives out lightning deaths in states for the period 01 April 2019 to 31 July 2019 as reported by state Government agencies or media or through our volunteers networks . SDMAs are requested to reconcile and report in case of anomaly.

State	Total Lightning deaths
Andhra Pradesh	59
Arunachal Pradesh	11
'Assam'	40
'Bihar'	170
'Chhatisgarh'	31
'Goa'	3
'Gujrat'	32
'Haryana'	3
'Himachal'	27
'Jammu & Kashmir'	33
'Jharkhand'	118
'Karnataka'	57
'Kerala'	27
'Madhya Pradesh'	74
'Maharashtra'	76
'Manipur'	15
'Meghalaya'	9
'Mizoram'	2
'Nagaland'	9
'Odisha'	129
'Punjab'	118
'Rajasthan'	57
'Sikkim'	27
Tamilnadu	12
Telangana	12
Tripura	4
Uttar Pradesh	224
Uttarakhand	29
West Bengal	52
Andaman & N	1
Chandigarh	-
Dadar & N Haveli	-
Daman & Diu	-
Delhi	1
Lakshadweep	-
Puducherry	1
Andaman & N	1
Total	1333

2019 Monsoon had a delayed and turbulent start post severe heat wave /severe summer. The heat has directly contributed to rise in lightning. Communities aware of these are better prepared and are saving life and livelihood. With half the monsoon over, we need to gear up our preparedness against lightning

Lightning needs to be addressed more seriously through a scientific approach. Precise mapping of vulnerable lightning hotspots is of paramount importance followed by early warning to affected community, awareness towards lightning safety and creation of lightning safe infrastructures by installation of lightning conductors /arrester in schools, hospitals, government and private buildings , Panchayats. Such approach would yield better result .

Please visit our lightning knowledge bank at website www.lightningcouncil.com

Wish you a Lightning safe Monsoon 2019!

Col Sanjay Kumar Srivastava
Convener , Lightning Resilient India Campaign
Principal Researcher, National Lightning Research Programme