

कर्नल संजय श्रीवास्तव

अध्यक्ष सीआरओपीसी

वज्रपात पर विशेषज्ञों के राष्ट्रीय पैनल के सदस्य,

संयोजक वज्रपात सुरक्षित भारत अभियान,

आजीवन सदस्य भारतीय मौसम विज्ञान सोसायटी.

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Member National Panel of Experts on Lightning

Convener, Lightning Resilient India Campaign

Life Member Indian Meteorological Society IMS



जलवायु रेजिलिएंट अवलोकन

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Climate Resilient Observing

Systems Promotion Council (CROPC)

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New Delhi 110070

Executive Summary



ANNUAL LIGHTNING REPORT 2021-2022

Lightning Resilient India Campaign 2019-2022

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

It gives me immense pleasure in presenting the Annual Lightning Report 2021-2022, the third annual report of Lightning Resilient India Campaign. The biggest achievement of this campaign is that today Lightning is no more a mystery, the science of lightning that is fulminology has evolved in India as a science and lightning is a reckonable disaster. It is at the forefront of disaster risk reduction (DRR). In addition to Ministry of Earth Science Institutions that is India Meteorological Department (IMD) and Indian Institute of Tropical Meteorology (IITM) Pune, most of the government agencies from National Disaster Management Authority

to state disaster management agencies are serious about lightning risk management. Lightning Resilient India Campaign – the joint initiative of Climate Resilient Observing Systems Promotion Council (CROPC) and India Meteorological Department (IMD) Ministry of Earth Science (MoES) has taken the early warning services of IMD and knowledge products of MoES institutions to stakeholders and community with value added insights to far more meaningful outcomes. The available inputs were related to various scientific and socio-economic aspects to derive optimum outcome of the science. The citizen science approach was adopted. More than 1.6 million volunteers from World Vision India, Indian Red cross Society and NGOs across the country contributed shoulder to shoulder in dissemination and implementation of lightning resilience actions plans up to last mile. The reduction of deaths by more than 60% in Odisha, Andhra Pradesh and Nagaland are testimony to it. Yet the challenges of reducing deaths in Madhya Pradesh, Uttar Pradesh and Bihar remains as these three states incur more than 60% losses of national toll due to lightning. We still have one more year and our target till 2022 is to bring it down by 40% more. Now with concerted efforts, we have reviewed our goal and we aim towards zero avoidable lightning deaths in near future.

The Annual Lightning Report is a 429 pages document with 10 chapters as given below:-

Chapter 1- Brief about Lightning Resilient India Campaign

Chapter 2- Lightning a global perspective in the context of India, its detection, Early warning and forecasts

Chapter 3- National Lightning strike profile of India as observed in 2021-2022 and comparison

Chapter 4 – Lightning strikes in all 37 states and UTs for period 01 April 2021 to 31 March 2022 and its comparison with past data

Chapter 5- Lightning and socio-economic vulnerability

Chapter 6- Lightning and its relation to climate Change

Chapter 7 – District wise vulnerability analysis and prioritizing most lightning prone districts

Chapter 8- Mitigation and preparedness measures. The chapter gives out various lightning protection standards.

Chapter 9 – Capacity building

Chapter 10 – Lightning Research and Development programme

Annual Lightning Report 2021-2022, third in its series contains Lightning Atlas of India with micro zonation done up to district level. It contains mapping of entire lightning strikes over India and all 37 states and union territories along with its impacts and detailed analysis. The report is of extremely high value and it is very useful for disaster management authorities/departments at National and state level that is NDMA and SDMA, all the scientific

institutions involved in weather and lightning for understanding the hazard, generation of early warning and solutions to lightning ,fulminologists, weather scientists, disaster management professionals, rural and urban development planners, land use planners', armed forces, communication and IT set ups, Industries, Water management authorities specially Dam , tourism, Power industries, petrochemical industries , electrical industries , Bureau of Indian Standards, BMTPC, ministry of forest, environment and climate change, department of science and technology, academia, students and researchers. It's a collation of adverse impact of extreme weather phenomenon in the form of lightning and ways to reduce the extremities. The third report gives us substantial inputs on the pattern and behaviour of lightning strikes including its seasonal, monthly and diurnal pattern. Our First Lightning Atlas is a great milestone. We aim to develop climatology of lightning over a period of at least five years and de-mystify lightning complexities.

I would like to remember that what we conceived in Jharkhand in 2008, developed lightning EW in 2011, IMD started lightning forecast by 01 April 2019 and CROP-IMD jointly launched **lightning Resilient India Campaign** on 26 March 2019 with an aim to reduce lightning deaths by 80% in three years. The campaign, through multistakeholders engagement at National and state level with governments, academia, NGOs and communities, has been successful in bringing down deaths by more than 60% within two years. In addition, the scientific mapping of lightning in India as country and all 37 states and union territories and analysis of data with citizen centric approach has been key factor in scientifically endorsed addressal to lightning hazard.

Annual Lightning Report 2021-2022 contains mapping of lightning in real time and space which brings out the hotspots and comparison to the lightning strikes in 2019-2020 and 2020-2021. It also highlights critical communities and assets to be saved. The salient aspects of comparison of last two years data are as follows:-

1. There has been 19.48 % decrease in Total Lightning strikes in the country. However, the reduction Cloud to Ground lightning was only 2.5% . This implies that the conversion ratio was high and lightning has been extremely high.

Total lightning has reduced from 18544367 strikes in 2019-2020 to 14931365 strikes in 2020-2021, a decrease of 3613002 strikes

Studies have revealed that globally there was 8% less lightning due to COVID -2019 . Similar research in India too observed [significant decrease of lightning activities during COVID-19 lockdown period over Kolkata megacity in India.](#)

The reason attributed to reduction in lightning is due to covid-2019 pandemic induced reduction in aerosol level, pollution, environmental upgradation and relatively stable weather system in Indian subcontinent.

The states with more pollution, degradation in environment continue to register increase in lightning.

2. Ranking of states in lightning occurrences. Madhya Pradesh continue to be at the top with highest lightning strikes . Maharashtra and Chhattisgarh have emerged with more strikes above Odisha. West Bengal, Jharkhand, Karnataka, Uttar Pradesh , Tamilnadu and Bihar , Andhra Pradesh, Gujarat, Rajasthan remain states with more than 2 lakhs CGs.

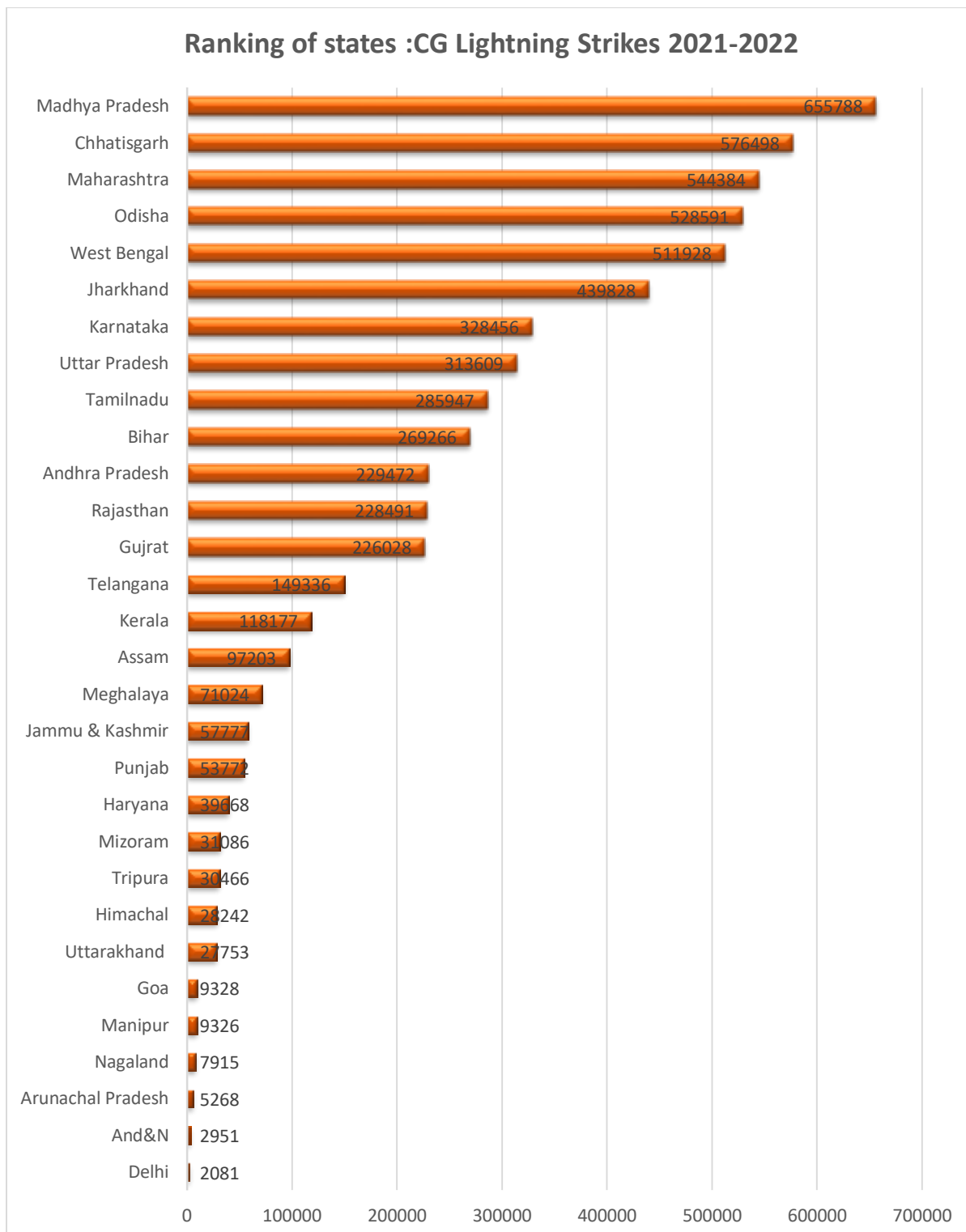


Table 1: Ranking of states in CG Lightning Strikes 2021-2022

3. **Increase in Lightning strikes.** During year 2021-2022, there are states with very high rise in lightning strikes up to 338 percent rise in Goa , Puducherry 80.77% rise (2020-2021- 117% rise), Himachal Pradesh 66.27% rise (2020-2021-105% rise) Karnataka 68.74% and Jammu & Kashmir 49.86% are leading states. These states need to take cognizance of it .

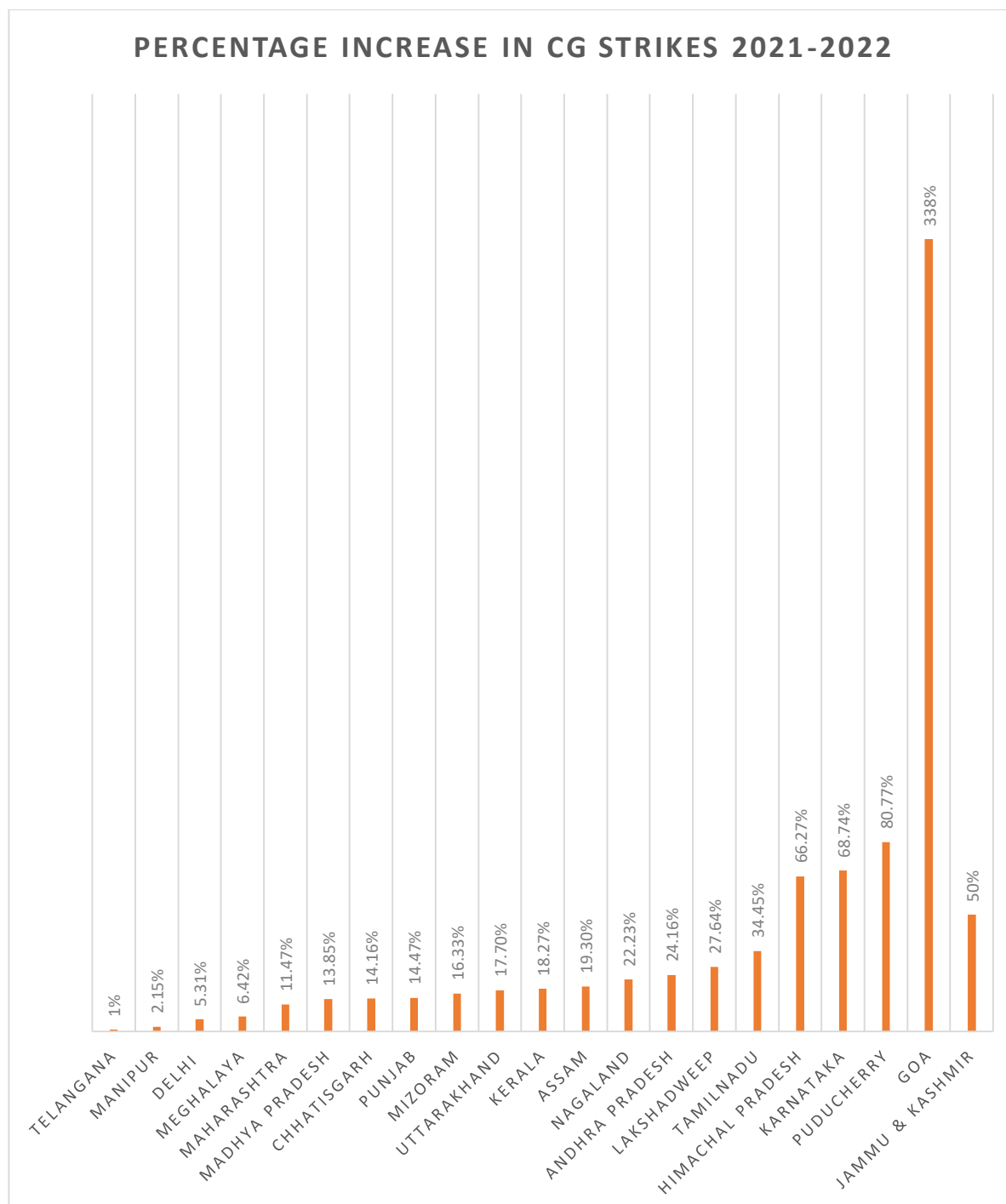


Table 2: Percentage increase in lightning strikes 2021-2022 , state wise data

The above changes in the pattern of lightning is now core of our further research and we intend developing climatology of lightning , specially climatology of cloud to ground lightning.

6. Cloud to Ground(CG)Lightning. There has been significant variability. Noted in cloud to ground lightning. Coastal state like Andhra Pradesh had less than 20% conversion of lightning from Inter Cloyd lightning to ground lightning whereas ither coastal states like Odisha and Gujarat had conversion ration more than 35-40% . The climatology of CG lightning needs to be researched more .

7. Lightning Early Warning

There has been phenomenal improvement in early warning. IMD issues forecasts Medium range for 3-5 days, short range 1-3 days , nowcast 2-3 hours and Damini app 40 minutes location specific. CROPC is dedicated to it and has developed

7.1 Public notification device

7.2 Last mile intervention signals

7.3 Sound and visual signals

7.4 Collaborated with Institute of Social Science to take the campaign to villages up to last mile

8. Large Lightning flashes – There was a 768 kilometre lightning flash detected in USA in April 2020. India is also witnessing large lightning flashes. The incident of mass casualty on 25 June 2020 in Bihar, past many incidents and even last month large number of fatalities had large flash lengths. These are highly lethal.

There is a need to have satellite based Global Lightning mapper for detection of such events and efforts to save life. NDMA should approach ISRO for same.

9. Death of Animals- There were two major casualties which drew attention during 2021-2022. These are firstly death of 19 elephants in Naogaon in Assam , 5 elephants in West Bengal and secondly large number of death of cows and buffaloes in Uttar Pradesh. These are highly disturbing events. National and states need to mainstream lightning risk management and prevention programme for both pet and wild animals.

10. Lightning strikes at places of heritage and archaeological monuments. There were few major strikes like 11 July 2021 incident near Amer Fort where 18 people succumbed to lightning injuries. Udaipur Fort was hit and so was Dwarkadheesh Temple . One of the main reason was failure /absence of lightning protection devices. These places being heritage, archaeological monument and high mass places, preventive and mitigation measures against Lightning need to be undertaken.

11. Rise in Atmospheric Electricity . There has been phenomenal rise in lightning amplitude that is atmospheric electricity. Lightning Resilient India observed highest strike of 312 kilo Ampere (kA) at Sundar Nagar in Gujarat, 291 kA at Vadodara in Gujarat. A sample mapping of Uttar Pradesh is appended below to apprise the rise :-

Annual Thunderstorm and Lightning Intensity comparison

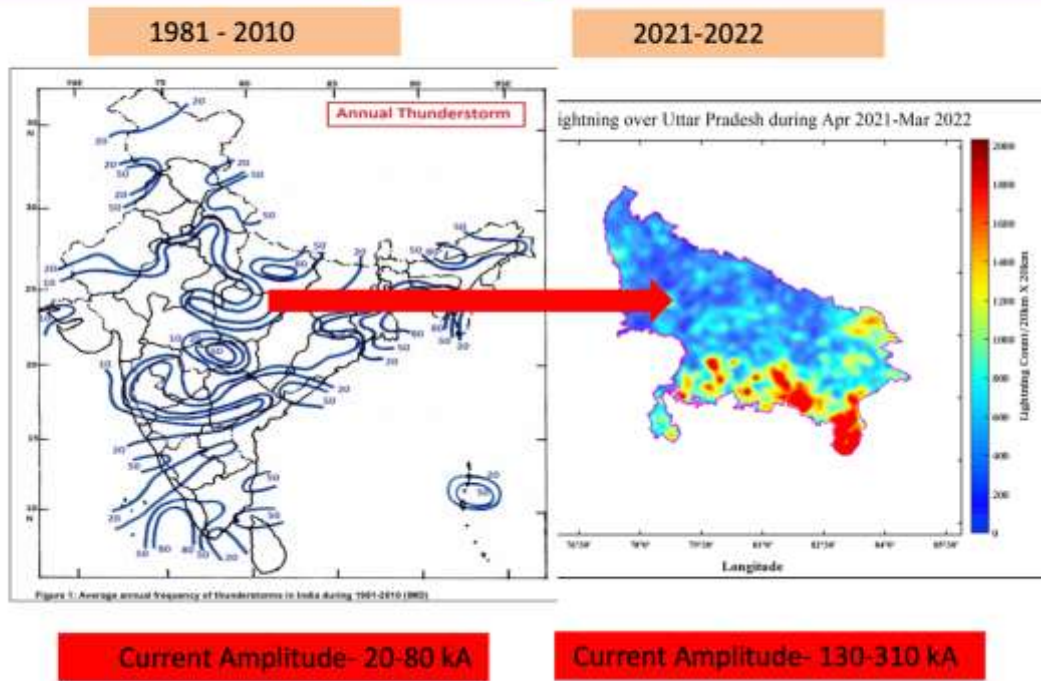


Table 5: Comparison of Lightning Intensity from 1981-2010 to 2021

12. **Lightning Protection System** – This is the biggest drawback towards mitigation to lightning. The coverage of LPS is just 2% and in rural areas its almost zero. This is the main cause of death due to lightning.

Lightning protection is carried out by either attracting the atmospheric lightning and earth it or it can be reflected back to atmosphere. There are mainly two standards – firstly IEC and secondly European . The Lightning protection devices should be regulated and it should be installed.

In India, LPS are being manufactured and tested at Central Power Research Institute (CPRI) Bangalore which is capable of testing up to 40 kA. As we have observed more than 312 kA strikes, there is a need to upgrade the testing capacity and regulate it.

13. **Casualty Pattern** More than 96% casualties are from rural India. They are mainly farmers, cattle grazers, fishermen, jungle hunters, tribal and labourers working in Open. The Lightning EW, mitigation and public awareness programme needs to be focussed on identified vulnerable and exposed community. It is suggested that on war footing, low cost lightning protection devices be installed in agriculture field, panchayats and community centres.

14. **Lightning** even today is not notified as the National Disaster. It has been declared state specific disaster by 16 states as per MHA guidelines wherein 10% of sdrf can be committed to state specific disasters. Such provisions does not serve the purpose and most of the schemes, lightning is not incorporated as a disaster, being a not notified disaster.

15. CROPC has observed that most of instrumentation in lightning detection is from foreign countries. Steps have been taken towards self reliance in this field under Atma Nirbhar Bharat.

16. Due to India's commitment to CoP Glasgow, there has been revolution in setting up renewable energy based power plant like Solar Park, Windmills and others. The Lightning protection in this field needs to be regulated through well tested devices .

17. Lightning has effected most of the industries , particularly electrical, electronics and IT industries . Sectors like agriculture, power, energy, solar, fisheries, waterways, forest, environment and climate change, building construction, architects and civil engineers, aviation, Electronic Vehicle, expressway, archaeological and heritage structures, religious institutions like temples, mosques, churches, Gurudwara,Rope ways , Golf courses need well regulated lightning protection systems.

18. CROPC advocated Lightning Safe shelters in every village.

19. Community participation, awareness, sensitisation and compliance to lightning safety pays the best dividends.

20. Climate Action plan for long term in all identified vulnerable districts and hotspots is the only long term solution to save fatalities to human beings and animals and losses to electrical infrastructures.

22. Electrical Sensitivity tests are not part of NBC 2016 for construction of infrastructures. This needs to be made mandatory for lightning disaster resilient infrastructures.

22. lightning is an special field. There is a need for scientific cadre .

23. Socio economic pattern is one of the major factor for lightning fatalities. There is need of social scientists in lightning risk management.

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Annual lightning Report 2019-2022 is a compilation of scientific products of Ministry of Earth Science institutions and ISRO's observations packed up in a citizen science format have yielded encouraging results. The outcome of Lightning resilient India Campaign is tribute to the scientific community and an exemplary practice to seed science amongst stakeholders for saving life, livestock and livelihood.

The major scientific outcomes are as follows: -

1. **Mapping of lightning flashes-** India has had first ever mapping of complete lightning strikes for that is total lightning, Intra or Inter Cloud (IC) lightning and Cloud

to Ground (CG) lightning for two consecutive years . Its good effort to develop climatology of lightning. We have also mapped for entire country and individually for all 37 states and union territories. The Lightning strikes map of CG lightning for India prepared is given below in Table 3.

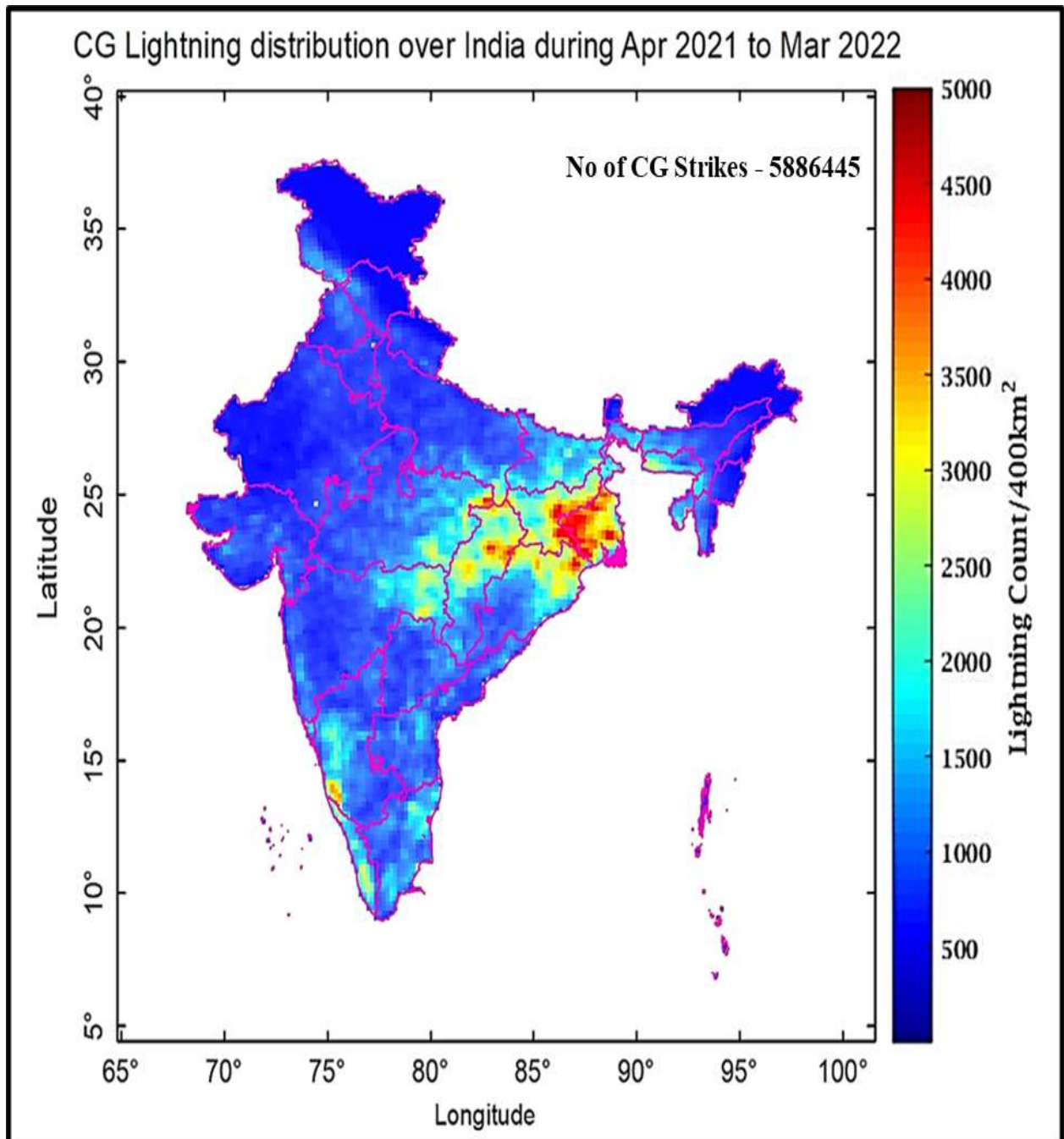


Table 6: India’s Lightning strike flashes plotted for period 01 April 2021 to 31 March 2022

This map reveals lightning prone zones , also called as lightning hotspots. This is going to be important map for strategizing lightning risk management by both national and state governments. It has critical bearing on land use pattern and development of infrastructures.

2. Climatology of CG Lightning strikes – The strikes recorded during the period have been collated with an aim to develop climatology of IC and CG clouds . The first ever such plots also reveal the intensity of CG clouds during various months . Thus seasonality of CG clouds is going to be most critical in planning the lightning safety prevention and mitigations at local level.

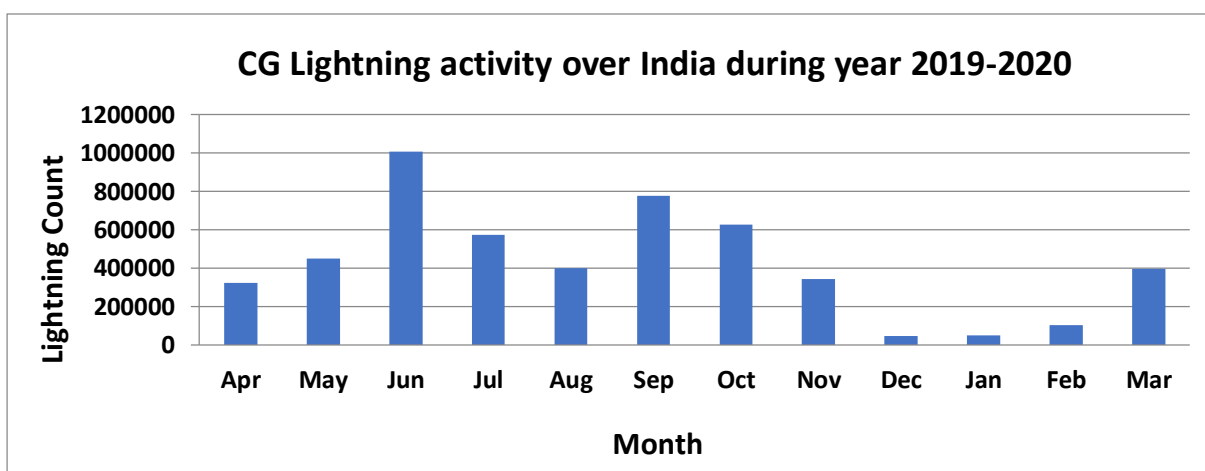
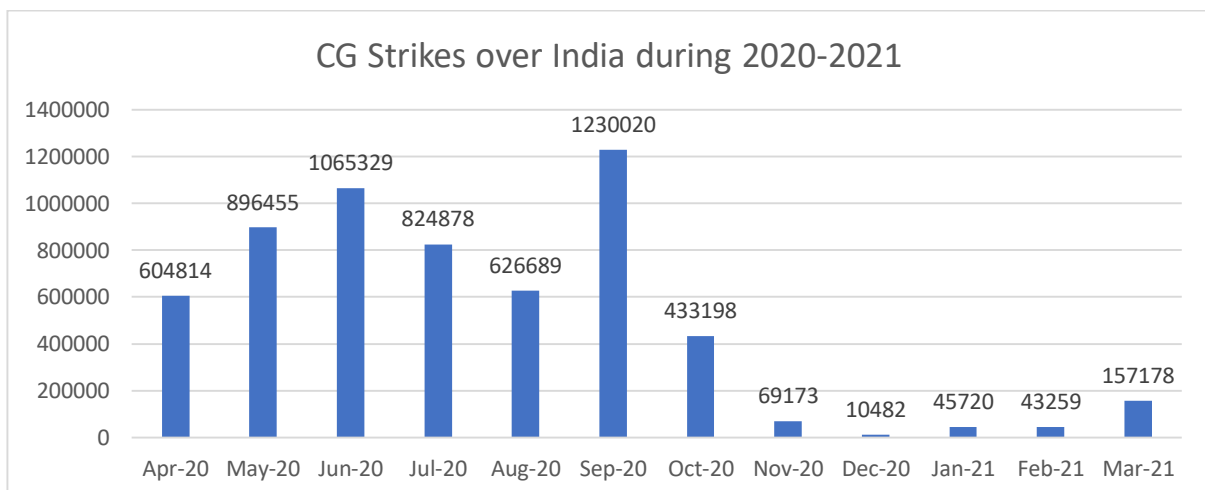
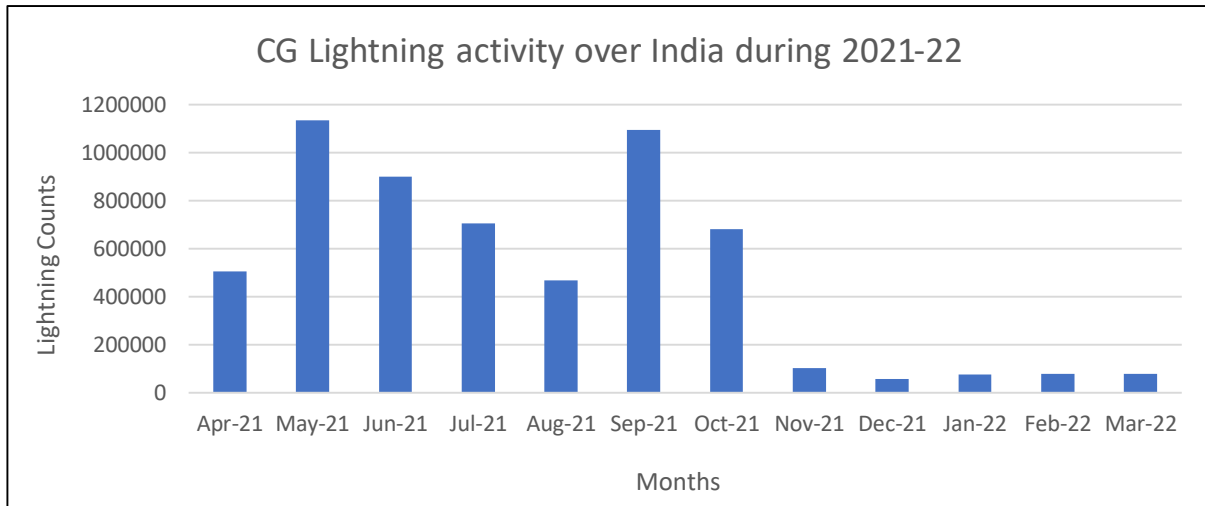


Table 7: India’s Lightning strike flashes plotted for period 01 April 2021 to 31 March 2022

3. **Variability of Lightning strikes with special reference to CG strikes** – The lightning strikes were plotted for each quarter . It was found that the lightning strikes was different for different quarter. The same has been depicted below in Table 8.

S No.		YEAR			Remarks
		2019-20	2020-21	2021-22	
1	CG	5169631	6039256	5886445	
2	IC	8692271	12505111	9044920	
3	TOTAL	13861902	18544367	14931365	
4	Point of concern Increase in CG		CG Increase by 8,69,625 flashes (+16.82%)	CG decrease by 1,52,811 flashes (-2.5%)	

Table 8: Variability in India’s Lightning strikes with reference to CG Strikes

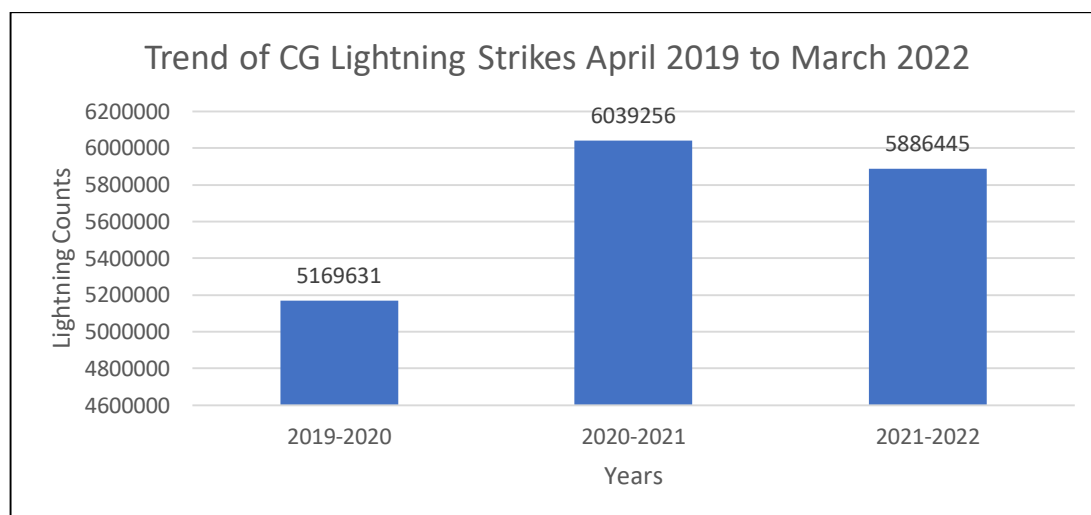


Table 8: Trend of CG Lightning April 2019- March 2021

4. **Impacts of Lightning strikes with special reference to deaths** – There was extensive mapping of deaths and data collection of fatalities through the volunteers network. This gave out the impact of lightning strikes in various states. It shows the preparedness of states and the particular areas and time interval where they need to work to prevent the losses. Madhya Pradesh with highest CG strikes of 6.55 lakhs plus has recorded 350 deaths whereas states like Uttar Pradesh and Bihar incur double the losses with half the strikes. -

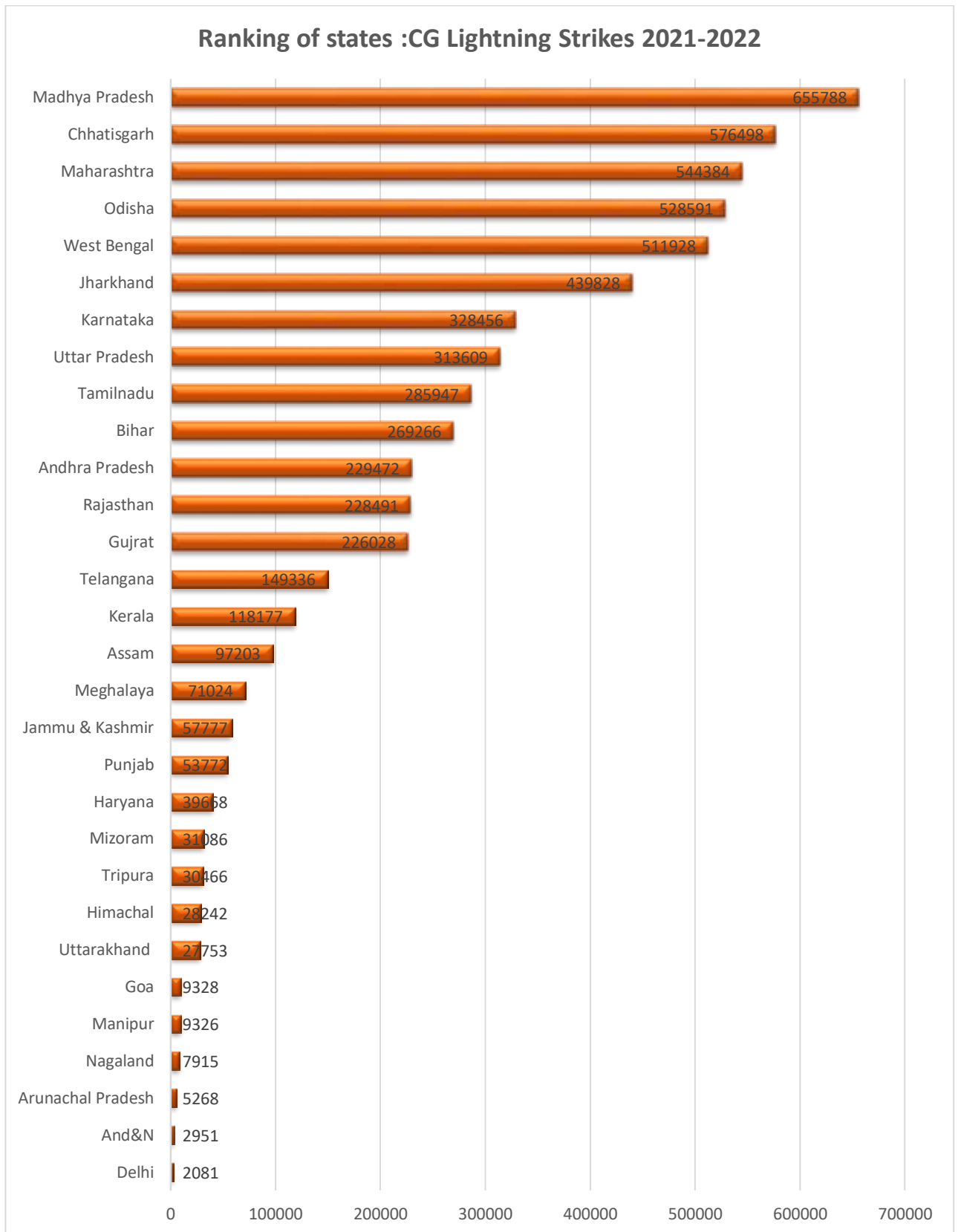


Table 9: Ranking of states in CG Lightning strikes 2021-2022

5. **States Lightning Risk Management Analysis** – A comprehensive mapping of Lightning phenomena in states along with the vulnerability of population including special groups like tribal, PVTG, children, women , industries , economic assets was assessed and shared. This assisted states proper identification of risks and precise . States like Odisha and Andhra Pradesh could bring down deaths by almost 70% within a short period.

5. **Seasonality of Lightning different among states** – There was a pre-set concept of fixed seasonality of lightning in India. The lightning recorded during the period reveals that seasonality of lightning is different for different states. Table 7 below shows month wise lightning strikes in each state . It makes amply clear that the Lightning Risk Management programme for each state has to be customised as per seasonality, intensity and frequency of lightning. It has also revealed that lightning is highly localised phenomena and it varies at different geographical areas . Thus m, within a state , the seasonality and severity may vary for different areas viz coastal, hilly, river basin, urban and industrial areas. , It is recommended that states should undertake lightning micro zonation for geographical region wise precise handling of the risk .

6. **Time wise comparison based on occurrence of lightning** – Lightning has been generally observed in most of the part during second half of the day. However, during intense cloud movement with high wind speed, especially during monsoon and cyclonic activities, lightning may occur anytime. Lightning also depends on local geographical conditions like its different in coastal region, hilly areas and river basins. Recent lightning strikes in Bihar and UP on 25-26 June 2020 as the cloud moved from north Bihar to south Bihar, the lightning started from morning till late evening as per the movement of the cloud and so was the fatal impact felt on ground.

Similarly, vulnerability of population and geographical area was deduced out the scientific mapping . This has given a scientific strategy to states and hence there was sudden fall in the number of fatalities in many sincere states.

7. **Identification of Vulnerable groups** – The mapping of lightning strike based hotspots and the analysis of its impact, revealed the circumstances of deaths and cross sections of population losing life. This was immensely helpful in focussed approach towards targeted vulnerable community.

Interestingly , it was revealed that the lightning strikes map matched with the tribal map of India. There used to be 60-70% deaths of tribal due to lightning in Jharkhand , Odisha, Madhya Pradesh, West Bengal and others. The lightning strikes based mapping for tribal area could diagnose the reasons for their fatalities in terms of tinned housing pattern and their nature of livelihood that is living off the land.

The above findings have been depicted in Table 10 below:-

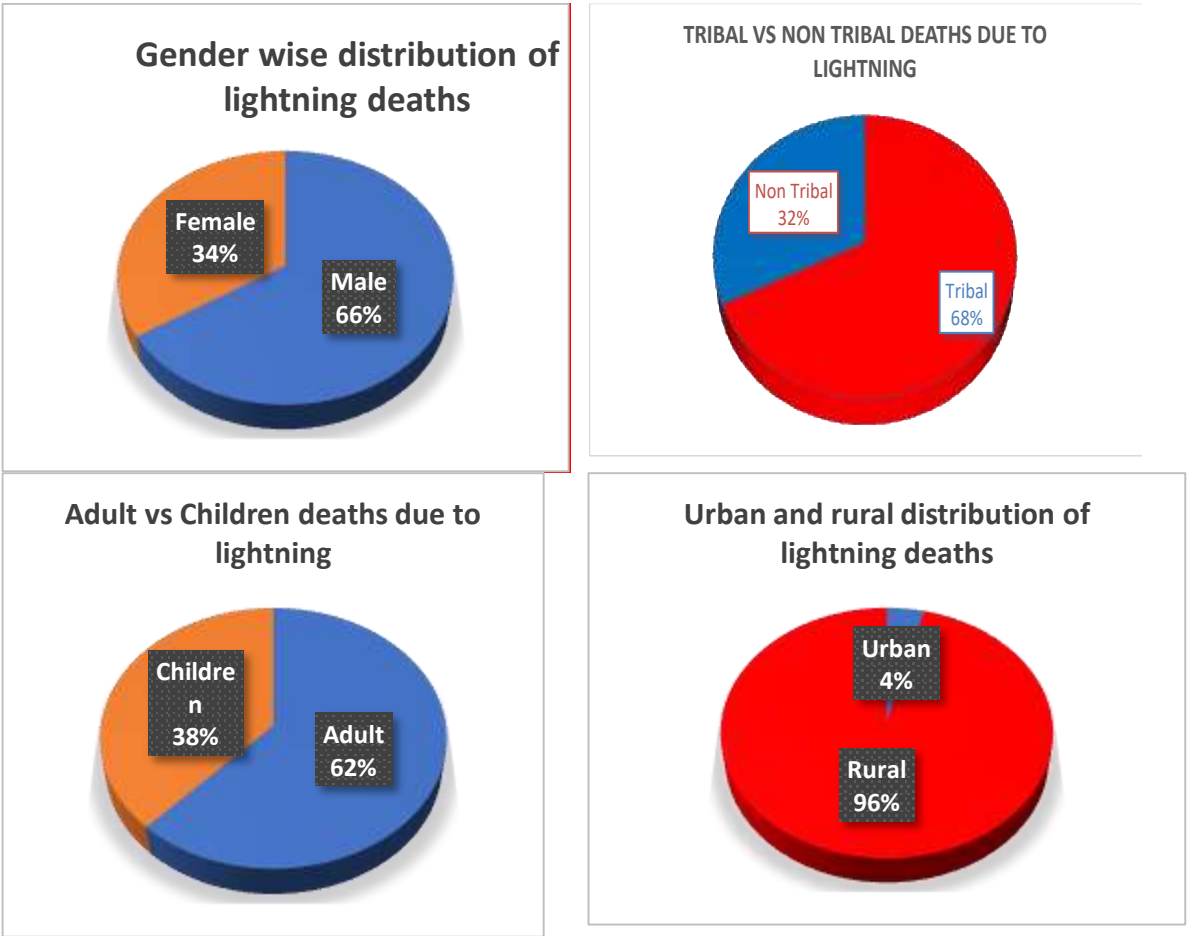


Table 10: Identification of vulnerable groups

8. **Circumstances of lightning victims during struck by lightning-** The recent fatalities and even same during previous year has , it has been observed that during pre-monsoon to initial monsoon are more due to farmers being in agriculture field or in orchards as well as strikes over their huts . Later part of the year that is September of other months, majority die due to standing under tall tree on inside their huts .Lightning deaths categorised circumstances wise given below in Table 11 reveals the capacity building needs in terms of awareness, education and training .

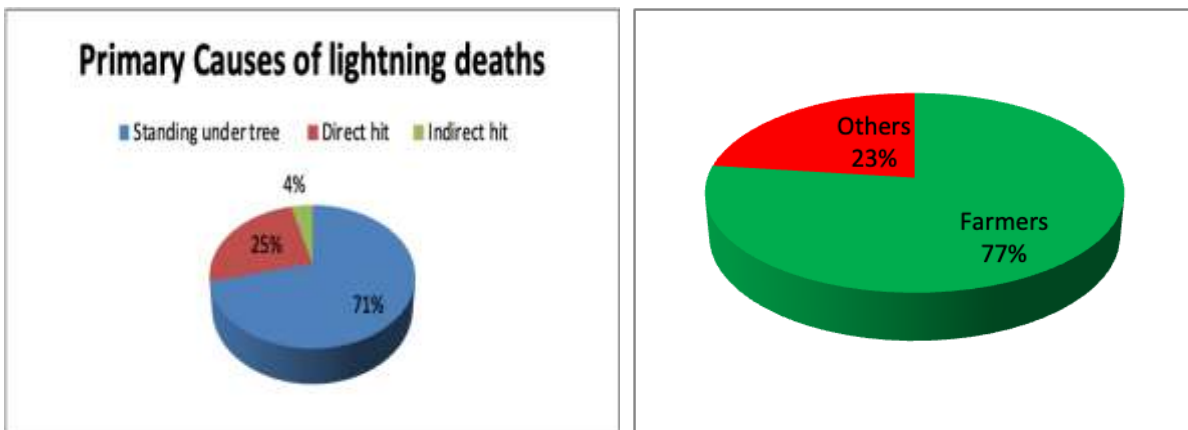


Table 11: Primary causes of deaths due to lightning

10. State's response to Lightning . The Lightning risk management by states except few are in silo and needs research based programme. Technical support and operationalisation of LEW up to last mile is a challenge due to weaknesses in SDMA and DDMA. This needs to be strengthened.

11. Lightning Risk Management cum Information System and its Data Management. Lightning being dynamic, localised and instant disaster, there is a need to do micro zonation by states and notify hotspots. For this , proper Lightning Risk Management cum Information System and its Data Management is required.

12. India needs to have a national and regional lightning research and development centres. This will help in supporting states technically and intimately.

13. Citizen science approach towards lightning resilience has effected governments at national and state levels , decision makers, academia and community. The findings establish the fact that lightning is not state specific but a national disaster. The recommendation of the campaign has brought in significant policy level interventions by most of the states. Various tools envisaged for dissemination of IMD's lightning forecast have been adopted greatly. The high level of awareness generated towards lightning resilience, policy and community level interventions have enhanced aspirations of Lightning Resilient India Campaign to ambitious goal of zero lightning deaths. The success of campaign is real tribute to Ministry of Earth Science- its scientists, institutions specially India Meteorological Department, Indian Institute of Tropical Meteorology, Pune and Indian Meteorology Society. The journey continues and its aimed to develop climatology of lightning in India and utilise science for humanity.

Recommendations

1. Lightning being omni present and most fatal, it should be notified as a national disaster.
2. Lightning detection and EW needs to be strengthened.
3. Lightning protection devices need to be populated with proper standards , safety and cost effectiveness.
4. Self-reliance in lightning instrumentation, public alert system and lightning protection should be pursued.
5. Cadre of lightning experts need to be developed.
6. Participation of private industries be encouraged.
7. The bye laws for building and lightning protection standards need review and proper regulation.
8. Damini app needs to be popularised more.

9. States must develop Lightning action plan and focus on season based efforts on lightning resilience. The disaster management departments need to be more proactive.
10. Since 96% casualty comes from rural areas, involvement of Panchayats is mandatory to take the scientific knowledge to panchayats.

The Lightning Resilient India Campaign has been a collective efforts of organisations and individuals. I would like to acknowledge support of IMD , IITM and other MoES institutions ,IMS, NDMA, SDMA's of Nagaland, Odisha, Gujarat and others states, World Vision India, IITM, IMS , NRSC, NESAC, IIT Delhi, SCDR JNU, CUJ and media – both print and electronic. Mr. M. Rajeevan Nair, former Secretary, Ministry of Earth Science, Mr Ravi Chandran, Secretary MoES , Dr. KJ Ramesh, Former DG IMD and Dr Mrutyunjay Mohapatra, DG , IMD are the great motivating institutions . NDMA Members Lt Gen NC Marwaha, Mr Kamal Kishore, Member Secretary, Mr Rajinder Singh, Mr Krishna S Vats have been guiding factor and most inspiring personalities without whose support the campaign would not have been successful. Mr Anup Kumar Srivastava, Senior Consultant has immense contribution in Lightning Resilient India Campaign .Gen Naik and Brig Ajay Gangwar from NDMA are part of great support., Maj Gen MK Bindal ED NIDM has been an inspiration in this campaign. I would also like to mention support from Dr Akhilesh Gupta, Head SPLICE, DST. I must express my gratitude of patrons of Lightning Resilient India Campaign that is Mr. P.P. Shrivastav, I.A.S., Member NDMA Advisory Board , Mr Anil Kumar Sinha, IAS , Former VC BSDMA, Prof. S.K.Dash, Past President IMS, Prof AK Gosain IIT Delhi, Mr NM Prusty, President Humanitarian Aid International, Dr Aditi Kapoor. Advisor IFRC, Mr RK Jain IAS, Secretary General Indian Red Cross Society, Prof PK Joshi, Chairman SCDR JNU, Prof Sunita Reddy SCDR JNU, Prof Janki Andharia, TISS Mumbai, Dr. PK Taneja, IAS, DG, GIDM Gujarat, Dr. PLN Raju, Advisor Government of Assam, Mr SS Kundu, NESAC, Dr .Alok Tauri NRSC Hyderabad, Dr. Parvez Hayat, IPS, Mr. Vinson Kurian , Editor Hindu business line, Mr Johnny Ashin Reiungmai, Joint CEO, Nagaland SDMA, Mr Blesson Samuel , World Vision India and many more volunteers and weather enthusiasts. IITM has huge contribution and the blessings of Director IITM and his team Dr SD Pawar, Dr Gopalakrishnan and Mr Manoj Domkawale Scientist have been incredible. I would like to extend my gratitude to Dr George Mathew Chairman, Institute of Social Science for adding a new dimension to the lightning Resilient India Campaign by paving the path towards our rural India .My sincere gratitude to team in field by World Vision India. IRCS, Sphere India, Mr Nilkantha Chatterjee of AISMIT West Bengal and his group for constant work in Bengal specially Sundarbans, Humanitarian Aid International, UNEDP, State IAGs and many more volunteers for contribution in this yeomen work. I am also thankful to media for highlighting and giving due attention to the subject It has been a collective effort and it would not have been possible without everyone's support.

A special mention is required for incredible support all the Deputy commissioners of Jharkhand, District Magistrates from Bihar and senior officers from State and National disaster management authority for extending great support.

I would like to do a special mention of Indian Institute of Tropical Meteorology (IITM) Pune , IMD , other Ministry of Earth Science institutions and National Remote Sensing Centre (NRSC) Hyderabad and other institutions of Indian Space Research Organisations for sharing comprehensive data because of which this report has been possible. Their contribution is unparalleled and we acknowledge it with deep sense of gratitude.

I am fortunate to have a great young and enthusiastic team of Interns from TISS Ms Nisha Singh and Mr Rohit Kusalkar who dedicate themselves towards this research oriented work. I am also thankful to Prof Poonam Sharma from Shahid Bhagat Singh College and student interns provided to me . They are Mr Abhishek Rajhans, Mr Nehal, Ms Anupreet Kaur, Ms Zikra Sajid, Ms Diksha, Ms Aditi Ruhela, Mr Mayank and Ms Nupur Verma. I am also thankful to Ms Ashna Gargi and Ms Sweta Sukla from SCDR JNU for their contribution.

I would like to extend my gratitude to my mother Mrs Kanaklata Srivastava who always inspired me to work for society. I thank my wife Shalini for being there always be it analysis of my write ups or field visit , for being the biggest support and constructive critic. I extend my thanks to my children son Samam Srivastava and daughter Ankita Srivastava for supporting me in the journey of lightning resilient India Campaign.

I dedicate the Annual Lightning Report 2020-2021 to late Dr Thomas Prasad, founder Director CROPC who made supreme sacrifice while assisting others during the unprecedented second wave of Covid -2019 but himself succumbed to Covid-2019 on 07 June 2021. The report is also tribute to our scientists , academia and professionals for their contribute.

State Governments , districts, organisations , individual professionals interested in knowing more can visit our website www.cropc.org or mail at cropcn@gmail.com



I am sanguine that with the collective efforts of everybody, we shall be able to make a Lightning Resilient India .

Sanjay Srivastava

Place : New Delhi
Date : 16 June 2021

(Sanjay Srivastava)
Convener
Lightning Resilient India Campai

Lightning Resilient India Campaign



When lightning roars, Never stand under tree or outdoor
जब बिजली करें गर्जना, पेड़ के नीचे कभी ना रहना

Pucca House, safest shelter
पक्का मकान, सबसे सुरक्षित स्थान

Courtesy : Climate Resilient Observing Systems Promotion Council and India Meteorological Department, Ministry of Earth Science, Government of India.

Lightning Resilient India Campaign वज्रपात सुरक्षित भारत अभियान



Design Courtesy Ms Sangavi Kennedy, Intern TISS Mumbai 2019-2021 Batch