Report

Training Programme on

Early Warning Systems

Organized on 14 – 16 May 2025

NIDM Delhi Campus

Resilient India - Disaster Free India

NATIONAL INSTITUTE OF DISASTER MANAGEMENT
(Ministry of Home Affairs, Government of India)
Plot no. 15, Pocket-3, Block-B, Sector-29, Rohini, Delhi -110042

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TRAINING PROGRAMME ON EARLY WARNING SYSTEMS

Organized on 14 – 16 May 2025
NIDM Delhi Campus

PATRON
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Executive Director, NIDM

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HoD, Geo-Meteorological Risk Management Division

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The report of this training programme was written & prepared

by

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CONTENT

TRAINING FOCUS

India is home to over 1.4 billion people spread across diverse terrains and to ensure their safety from the impact of disasters is a herculean task. Like, India is a very diverse country with its vast geographical expanse, diverse climatic conditions and seismic activities. These conditions expose different regions to unique disaster risks. From earthquakes, landslides, flashfloods, avalanches, glacial lake outburst flood (GLOF), landslide lake outburst flood (LLOF) in the Himalayas to cyclones along the eastern and western coasts, droughts in arid regions to floods in riverine states, including the varying level of disaster vulnerabilities across the country. Addressing these distinct challenges requires a decentralized approach to disaster preparedness, response, and mitigation.

Disasters, whether natural or human-induced, have the potential to cause significant damage to human lives, infrastructure, and critical facilities. The ability to minimize the losses from these disasters can be significantly enhanced if early warning systems are implemented effectively, coupled with preparedness and widespread awareness among the masses. Early warning systems provide different levels of warning times depending on the type of hazard before the hazardous event strikes and enable the going to be affected communities to take precautionary measures, thereby mitigating the severity of the impacts on human settlements, infrastructure, and critical facilities.

Early warning systems (EWS) are designed to detect hazardous events and issue alerts in a timely manner, enabling people to evacuate or take appropriate actions before the hazard manifests into disaster. The effectiveness of these systems, however, hinges on accurate data, rapid communication, and preparedness at various levels of government, community, and individual.

Status of EWS in India

India's vulnerability, particularly with regard to disasters, is very vast and require tailored approaches for effective risk management and disaster preparedness. Now, India has reached a mile in establishing a system to issue forecast for meteorological events like rainfall, hailstorm, snowfall, humidity, dust/sand storms, thunderstorms, fog, frost, temperature, heat wave, cold wave, wind speeds, sea state, cyclone, lightning & gusty winds, along with the general instructions and agromet advisories. India Meteorological Department (IMD) is the nodal agency to conduct research and install required instruments in the different parts of the country to measure such meteorological events as mentioned above and based on the recorded data and scientific approaches, issues the forecast and warnings to the concerned authorities and general public through their mobile app, Mausam and these services are also now integrated on the SACHET platform and mobile app.

Beside it, Central Water Commission (CWC) is the nodal agency to maintain a network of flood forecasting stations, including inflow and level forecasting stations in India. CWC provides information about the level of water flowing in the rivers and if there arises any flood like situation, it provides a real-time flood forecast in the going to be affected regions. CWC has developed a user-friendly app called "FloodWatch India" that provides real-time flood forecasts and warnings, accessible through both Android and iOS devices.

Defence Geoinformatics Research Establishment (DGRE) is the nodal agency for Snow and Avalanche Hazard Assessment, Forecasting, Mitigation & Engineering solutions. They do the development of technologies for data gathering, forecasting, monitoring, control and mitigation of snow & avalanches in India.

Forest Survey of India (FSI) is the nodal agency for assessing and monitoring forest resources in India, including forest fires. FSI uses satellite data (MODIS sensor on-board Aqua and Terra Satellite of NASA and SNPP-VIIRS sensor) to detect forest fires and alerts state forest departments about these incidents. FSI has a program to monitor continuous, large forest fires using near-real-time data, supporting tactical firefighting and escalation of support from state and national agencies. The Ministry of Environment, Forest and Climate Change (MoEFCC) has prepared a National Action Plan on Forest Fire (NAPFF) to minimize forest fires, with FSI playing a key role in its implementation.

Geological Survey of India (GSI) is the nodal agency specifically for landslide studies in India providing quality geo-scientific information in order to minimize loss of life and damage to property from landslide hazards. As per GSI's Vision - 2030 action plan, GSI endeavours to Monitor active landslides and landslide-prone areas through establishing Landslide Early Warning Systems (LEWS) and develop predictive risk analysis models incorporating inputs from landscape, weather dynamics and community factors using state-of-the-art spatial, remote sensing, AI and telecommunications technologies.

Rationale of organizing training programme

Organizing training programme for early warning systems (EWS) is essential for enhancing disaster preparedness and reducing the impact of natural hazards. Early warning systems are only effective if individuals and communities are equipped to understand and respond to the alerts they receive. Training programme ensure that key stakeholders, including local authorities, emergency responders, and community members, are knowledgeable about how to interpret early warnings, activate response plans, and implement mitigation measures in a timely manner. By providing training, stakeholders can build resilience by learning how to make informed decisions in the face of impending disasters and also enhance coordination between various organizations and sectors, ensuring a unified response when disaster strikes. Furthermore, effective early warning systems can help to save lives, protect infrastructure, and safeguard critical facilities, provided there is awareness and preparedness at all levels.

This training will also help to address the challenges of misinformation and confusion during a crisis, ensuring that the right messages reach to the right people in the right way. Last but not the least, this programme will empower stakeholders to act swiftly and effectively, reducing disaster-related losses and promoting a culture of preparedness so that they can save both lives and resources in the long run.

Objectives

The objectives of organizing this training programme on EWS include:

- To enhance technological understanding of existing hazard specific decentralized EWS

- To discuss about effective communication
- To familiarize with preparedness measures
- To develop emergency action plans
- To improve response coordination among the agencies
- To create awareness and foster a culture of resilience

Target audience

Although this training programme can accommodate a broad audience, it is proposed to specifically focus on the following groups in line with the institute's mandate.

- SDMAs, SEOCs, DDMAs, DEOCs
- Municipal Corporations, ULBs, Metropolitan/Urban Development Authorities/ Industries
- NDRF, SDRF, NGOs, CBOs

Expected outcomes

The expected outcomes of organizing a training programme on EWS includes:

- Improved knowledge and awareness
- Enhanced technical understanding
- Strengthened response coordination
- Effective communication and information dissemination
- Better preparedness, and Cultural shift towards resilience

TRAINING SCHEDULE

Day 1: 14.05.2025

S. NO.	TIME	PROGRAMME	
1	09:30 - 10:00	**Welcome and Registration**: Dr. Pankaj Kumar and Team	
2	10.00 - 10:10	**Inaugural Session**	**Programme Overview and Context Setting**: Prof. Surya Parkash, NIDM
3	10:10 - 10:20		**Special Address**: Shri Safi Ahsan Rizvi, IPS, ED, NIDM
4	10:20 - 10:50		**Keynote Address**: Dr. Mrutyunjay Mohapatra, DG, IMD
5	10:50 - 11:10		**Inaugural Address**: Shri Rajendra Singh, Member & HoD, NDMA
6	11:10 – 11:15		**Vote of Thanks**: Shri Randeep Kumar Rana, Sr. Advisor, NIDM
7	11:15 – 11:45	Group Photograph and High Tea	
8	11:45 - 13:00	**Session-2**	EWS for Rainfall, Hail Storms and Agromet Advisory Services **RP**: Dr. Sheshakumar Goroshi, Sc.-E, IMD **Mode**: Lecture cum Discussion **Coordinator**: Dr. Pankaj Kumar, NIDM
9	13:00 - 14:00	Lunch Break	
10	14:00 - 15:15	**Session-3**	EWS for Dust/Sand Storms and Heat & Cold Waves **RP:** Dr. Naresh Kumar, Sc.-F, IMD **Mode**: Lecture cum Discussion **Coordinator**: Dr. Pankaj Kumar, NIDM
11	15.15 – 15.30	Tea Break	
12	15:30 – 16:30	**Session-4**	Air Quality Early Warning System **RP**: Dr. Gaurav Goverdhan, Sc.-D, IITM **Mode**: Lecture cum Discussion **Coordinator** : Dr. Pankaj Kumar, NIDM
13	16:30 – 17:30	**Session-5**	EWS for Lightning and Mitigation Measures **RP**: Dr. Anupam Hazra, Sc.-G, IITM **Mode**: Lecture cum Discussion **Coordinator**: Dr. Pankaj Kumar, NIDM

Day 2: 15.05.2025

14	09:00 - 09:30	**Session-6**	Recapitulation of Day-1 **RP**: Dr. Pankaj Kumar, NIDM
15	09:30 - 10:45	**Session-7**	Early Warning Systems on Flood Forecasting/Flash Floods/Urban Floods – Case Studies **RP**: Shri. Suraj Kumar Shaw, Asst. Director, CWC **Mode**: Lecture cum Discussion **Coordinator**: Dr. Pankaj Kumar, NIDM
16	10:45 - 12:00	**Session-8**	EWS for Forest Fire and related Mitigation Programmes **RP**: Dr. Sunil Chandra, Deputy Director, FSI **Mode**: Lecture cum Discussion **Coordinator**: Dr. Pankaj Kumar, NIDM

17	12:00 - 12:15	Tea Break	
18	12:15 - 13:30	**Session-9**	SACHET Platform **RP**: Col. Dheeraj Chandola (retd.), Sr. Consultant NDMA **Mode**: Lecture cum Discussion **Coordinator**: Dr. Pankaj Kumar, NIDM
19	13:30 - 14:30	Lunch Break	
20	14:30 - 15:45	**Session-10**	Common Alert Protocol and CBS **RP**: Mr. Sumit Jha, Sc.-D, C-DOT **Mode**: Lecture cum Discussion **Coordinator**: Dr. Pankaj Kumar, NIDM
21	15:45 - 16:00	Tea Break	
22	16:00 – 17:30	**Session-11**	Early Warning System for Avalanches **RP**: Dr. Amreek Singh, Sc.-G, DGRE **Mode**: Lecture cum Discussion **Coordinator**: Dr. Pankaj Kumar, NIDM

Day 3: 16.05.2025

23	09:00 - 09:30	**Session-12**	Recapitulation of the Day-2 **RP**: Dr. Pankaj Kumar, NIDM
24	09:30 – 10:30	**Session-13**	EWS on Landslides - Case Studies **RP**: Shri Bhupender Singh, Director (G), GSI **Mode**: Lecture cum Discussion **Coordinator**: Dr. Pankaj Kumar, NIDM
25	10:30 - 11:15	**Session-14**	EWS on Earthquakes **RP**: Dr. Pankaj Kumar, NIDM **Mode**: Lecture cum Discussion
26	11:15 - 11:30	Tea Break	
27	11:30 - 13:00	**Session-15**	Group activity: Disaster Scenarios, Do's and Don'ts **Coordinator**: Dr. Pankaj Kumar, NIDM Dr. Sushma Gulera, NIDM Dr. Shekher Chaturvedi, NIDM Dr. Gagandeep Singh, NIDM Dr. Prerna Joshi, NIDM
28	13:00 - 14:00	Lunch Break	
29	14:00 - 14:30	**Closing**	**Feedback**: NIDM Team
	14:30 – 15:00		**Valedictory Address**: Shri Safi Ahsan Rizvi, ED, NIDM
	15:00 - 15:25		**Certificate Distribution**: Shri Safi Ahsan Rizvi, ED, NIDM
	15:25 – 15:30		**Vote of Thanks**: Dr. Pankaj Kumar, Asst. Professor, NIDM
30	15:30 - 16:00	High Tea	

INAUGURAL SESSION

Dr. Pankaj Kumar, Assistant Professor at NIDM and Course Coordinator of the training programme on "Early Warning Systems," warmly welcomed the Chief Guest, Shri Rajendra Singh, Member and HoD, NDMA; Shri Safi Ahsan Rizvi, Executive Director, NIDM; Dr. Mrutyunjay Mohapatra, Director General, IMD; Dr. Surya Parkash, HoD, Geo-Meteorological Risk Management Division, NIDM; Shri Randeep Kumar Rana, Senior Advisor, NIDM; faculty members; and participants from across the country. He expressed heartfelt thanks to all the dignitaries on the dais for taking time from their busy schedules to grace the inaugural session of the training programme. He acknowledged their presence as a great source of encouragement and inspiration for both the organizers and the participants.

Prof. Surya Parkash, Head of the Geo-Meteorological Risk Management Division, NIDM, set the context for the training programme by emphasizing the critical need for Early Warning Systems (EWS). He highlighted the growing frequency and intensity of natural hazards due to climate change and the importance of timely warnings in minimizing loss of life and property. Prof. Parkash elaborated on the role of EWS in strengthening disaster preparedness and enhancing community resilience. He also stressed the importance of capacity building, inter-agency coordination, and the integration of technology and local knowledge for effective implementation of early warning systems across the country.

Sri Safi Ahsan Rizvi, IPS, ED NIDM, highlighted that the Early warning systems (EWS) are integrated frameworks designed to detect potential hazards and issue timely alerts. These alerts enable communities, governments, and emergency responders to take proactive measures before a disaster strikes, reducing the risk to lives, infrastructure, and the community as a whole. In today's world, where climate change, urbanization, and environmental degradation are intensifying the frequency and impact of disasters, early warning systems play an increasingly vital role.

A truly effective early warning system is not a single piece of equipment or an app—it is a holistic approach that combines science, technology, communication, and education. It requires coordination between different agencies monitoring hazards as per their mandates, governments, humanitarian organizations, and local communities. It must also be inclusive, reaching the most vulnerable populations, such as the elderly, children, people with disabilities, and those living in remote areas. Reliable, real-time communication networks are essential, especially during crises when panic can cause misinformation to spread.

These systems save lives—reducing disaster mortality by up to 75%, according to the UN. Beyond that, they lower economic losses, strengthen coordination, and empower communities. For example, country's investment in EWS reduced cyclone deaths from thousands during Odisha's super cyclones in 1999 to just within single digits during latest tropical cyclone, Dana in 2024.

However, the importance of early warning systems extends far beyond just preventing deaths. These systems also play a key role in reducing economic losses. Recognizing the life-saving potential of early warning systems, the United Nations launched the "Early Warnings for All" initiative in 2022. This ambitious global effort aims to ensure that every person on Earth is protected by an early warning system by 2027. In this direction, India's trajectory is rising upward. Achieving this goal requires better infrastructure, inclusive communication strategies, public education, and global cooperation. Only then early warnings can become early actions that truly save lives.

To be effective, early warning systems must also be inclusive. This means providing alerts in multiple languages, ensuring accessibility for people with disabilities, and respecting cultural contexts that influence how people respond to warnings. Equally important are public education and regular disaster drills. People must not only receive warnings—they need to know how to respond. Raising awareness and practicing safety procedures saves lives when every second counts.

Early warning systems are not just about technology—they are about people. They are one of the most powerful, cost-effective tools and can play pivotal role to save lives, reduce losses, and build a safer, more resilient future. I hope this training will address the need of the hour, as felt by the organizations while deputing their officials to attend this training programme. This training programme will equip them with valuable knowledge and skills they can effectively apply upon returning to their respective stations and duties.

Dr. Mrutyunjay Mohaptra, DG, IMD, addressed the gathering with the importance of EWS and how far India has reached and how far has to go. He explained Research and Technological Setup of IMD including -

- Multi-Hazard Early Warning System in IMD
- Observational Network of IMD
- Doppler Weather Radar Network
- Doppler Weather Radar Products
- Satellite Meteorological Services
- Numerical Weather Prediction
- Hydromet Services
- Monsoonal Heavy Rainfall Warning Skill
- Thunder Storm Early Warning System
- Lightning Prediction and Early Warning
- Heat and Cold Wave Forecast and Warning Process
- Heat Wave Climatology, Colour Coded warnings with forecast skill
- Marine Weather Services

- Air Quality Early Warning Services
- Aviation Meteorological Services
- Power Sector
- Agromet Advisory Services
- Climate Services
- Warning Dissemination System.
- Mausam mobile app

He emphasised that IMD provides weather forecasting Services to various stakeholders like –

- Defence,
- Civil Aviation,
- Railways,
- Panchaytiraj,
- Agri and Farmer's Welfare,
- Health and Family Welfare,
- Finance, Transport,
- Fishery & Animal Husbandry,
- Shipping & Ports,
- Tourism,
- Department of Space,
- Labour & employment,
- Environment & Climate Change,
- Housing & Urban Affairs,
- Commerce & Industry,
- New and Renewable energy,
- Communication & IT,
- Water Resource,
- Science & Technology,
- Power,
- Rural Development,
- Home affairs for DRR,
- Chemical & fertilizers.

His conviction was that this training programme on "Early Warning Systems" will provide detailed insights of technological setup. Participants will get acquainted with appropriate response actions upon receiving forecasts, alerts, and warnings, thus, improvement in the overall capacity to manage risks effectively and ensure timely decision-making during disasters.

Shri. Rajendra Singh, Member & HoD, NDMA, extended a heartfelt welcome to all the participants who have come from various departments of the North and North-Eastern States. He reiterated that Early warning for various natural events can minimize a substantial number of causalities that may occur during disasters. The warning time may depend on the type of the events. For example, for earthquakes, it may vary by a few seconds to tens of seconds, for floods – a few minutes to hours, for tsunamis - a few minutes to hours, and for cyclones - a few hours to days. Hon'ble Prime Minister, Shri Narendra Modi Ji has enunciated a ten-point agenda on Disaster Risk Reduction (DRR) during the Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR) held in New Delhi in November 2016. The all-inclusive agenda presents a holistic approach to disaster risk reduction and addresses a whole range of issues, from community preparedness to the use of technology and international cooperation. The 7th agenda of PM's 10-point agenda emphasizes "Utilise the opportunities provided by social media and mobile technologies for disaster risk reduction". And, early warning systems for various natural disasters are the best examples in that sense.

Similarly, the Sendai Framework for Disaster Risk Reduction 2015-2030 was adopted at the Third UN World Conference in Sendai, Japan, on March 18, 2015. The Target – G of Sendai Framework 2025-30 advocates to increase the availability and access to multi-hazard early warning systems. India is already working in this direction and has reached a milestone in establishing early warning systems. Like – India Meteorological Department (IMD) does research on meteorological events such as rainfall, hailstorms, snowfall, humidity, dust/sand storms, thunderstorms, fog, frost, temperature, heat waves, cold waves, wind speeds, sea state, cyclones, lightning & gusty winds, along with the general instructions and agromet advisories and based on the recorded data and scientific approaches, issues the forecast and warnings to the concerned authorities and general public. Central Water Commission (CWC) maintains a network of flood forecasting stations and provides information about the level of water flowing in the rivers and if there is any flood-like situation arising, provides real-time flood forecast in the going to be affected regions. Defence Geoinformatics Research Establishment (DGRE) is the nodal agency for Snow and Avalanche Hazard Assessment, Forecasting, Mitigation & Engineering solutions and provides warning for avalanches. Forest Survey of India (FSI) does the assessment and monitoring of forest resources in India, including forest fires, and provides related warnings. Geological Survey of India (GSI) is doing landslide study in India providing quality geo-scientific information to minimize loss of life and damage to property from landslides. Indian Institute of Tropical Meteorology (IITM) Pune has developed early warning systems to monitor air quality and lightning in collaboration with IMD and NCMRWF. Indian Tsunami Early Warning Centre (ITEWC)

has been established in the Indian National Centre for Ocean Information Services (INCOIS) Hyderabad to provide timely tsunami warnings and advisories to stakeholders. The ITEWC is also providing tsunami services to 25 Indian Ocean Countries as part of the Intergovernmental Oceanographic Commission (IOC) of the UNESCO framework.

Another agency, the National Centre for Seismology (NCS) does the monitoring of earthquakes in the country.

These agencies have developed mobile apps to give forecasts, alerts, warnings, and notifications about natural disasters. Like IMD gives alerts about meteorological events on Mausam mobile app, GSI about landslides on the 'Bhooskhalan' app as well as on a portal 'Bhusanket', IITM Pune facilitates alerts about Air quality on SAFAR Portal and about lightning on Damini app, FSI about forest fires through Fire Alert System (FAST) portal, INCOIS about access to Marine Users for ocean Data Resources and Advisories and Tsunami on SAMUDRA app.

Additionally, the Meghdoot App provides Agromet Advisory Services to the farmers based on the weather information, developed in a joint initiative of IMD, IITM, and the Indian Council of Agricultural Research (ICAR).

Keeping people informed and providing timely warnings and alerts, NDMA under the chairmanship of Hon'ble Prime Minister of India, Shri Narendra Modi Ji, has envisioned a Common Alerting Protocol (CAP) based Integrated Alert System, SACHET. SACHET allows a warning message to be disseminated simultaneously over many dissemination modes, which increases the effectiveness of the warning and simplifies the task of alerting the targeted population along with the responsible officials. To increase the reachability of the disaster early warning message to every person present in the impending disaster area, all the existing possible modes of dissemination media can be used. The media that can be used for public warning are Mobile Phones, TV, Radio, Coastal Sirens, Railway Station announcements and Display Systems, Internet users (Browser Notification), and Mobile Apps.

SACHET is a GIS-based portal based on 3A's principles of 'Alert, Awareness, Action' where the general public can see all the current live warnings present all over the country. The warnings data visible on the portal are the warnings generated by IMD, CWC, INCOIS, DGRE & FSI, and different state/UT disaster management authorities. Users can also see the details of each warning like its impact and severity, area to be affected, course of action, emergency control room numbers, Do's and Don'ts, etc. Users can subscribe to Browser Notifications and RSS Feed through this portal. The SACHET platform, based on the CAP protocol, provides geofencing functionality, meaning that areas where alerts need to be issued can be selected. This enables the capability to issue geo-targeted alerts.

He emphasized that Early Warning systems are most effective only when early warnings are understood properly by the users and prompt action is taken. NDMA has developed guidelines to manage most of the natural disasters. These guidelines also include dos and don'ts to be followed. These dos and don'ts are crucial steps and should be taken care of before the event, during the event, and after the event. These lifesaving actions must be ingrained in the habits of every individual. To instill these practices, mock drills need to

be conducted regularly. NDMA has developed a Standard Operating Procedure (SOP) for this purpose, which includes Mock Exercises, Table Top Exercises (TTE), and Capacity Development Programmes (CDP) across various States and UTs in the country.

He highlighted that Early Warning Systems are among the most effective tools for disaster mitigation. As the frequency of disasters increases and we navigate an increasingly challenging landscape, I urge each one of you—policymakers, engineers, decision-makers, practitioners, and citizens—to join hands in the fight against disasters. In this digital era, information is just a tap away on your smartphones. Stay informed and educate yourself about early warning systems and the essential dos and don'ts. When you return to your respective organizations, create awareness and share IEC material which will be shared in this training programme to your colleagues, family members, and others to make our society well-informed and prepared. Together, we can build resilience against the impacts of disasters and protect our most vulnerable populations from devastating effects. As the saying goes, 'Prevention is better than cure.' Let us commit ourselves to creating a safer, more informed, and disaster-resilient India for all.

Dr. Randeep Kumar Rana, Senior Advisor, NIDM, stepped forward to extend his heartfelt gratitude to the esteemed dignitaries seated on the dais. He recalled the support extended by IMD during his tenure as DIG Operations, NDRF, citing several instances when IMD provided timely assistance in critical situations. He expressed his sincere thanks to Shri Rajendra Singh, Shri Safi Ahsan Rizvi, Dr. Mrutyunjay Mohapatra, and Dr. Surya Parkash for sharing their valuable insights and experiences. He also thanked all the participants for attending the training programme and expressed his belief that they would gain knowledge of new tools and technologies over the three-day course.

GROUP PHOTOGRAPH

A group photograph was taken after the inaugural session with dignitaries, participants, and organizers of the training programme.

SESSION 2: EWS for Rainfall, Hail Storms and Agromet Advisory Services

Dr Sheshakumar Goroshi Scientist-E Agro Met Advisory Services Division, IMD, facilitated a session on Early Warning Systems for Rainfall, Hail Storms, and Agromet Advisory Services. He began his session with the social and economic impacts of climate change and its effects on health, agriculture, water resources, coastal areas, ecosystem and biodiversity, and livelihood. He described mitigation and adaptation principles and strategies. He explained four pillars of EWS: 1. Disaster Risk Knowledge; 2. Detection, Observation, Monitoring, Analysis, and Forecasting; 3. Warning Dissemination and Communication; and 4. Preparedness and Response. He explained the institutional arrangement in India for the Multi-Hazard EWS established for meteorological events. He explained the weather and climate services provided to various socio-economic sectors in India. He elaborated on the detection, observation, and monitoring systems used for weather and climate data collection, and described how primary data is processed and channelized. He also highlighted the seamless analysis and operational forecasting carried out using dynamic modeling systems. Furthermore, he explained how IMD's warning dissemination system functions and the various channels available for receiving these warnings. He illustrated important weather services provided by IMD like General Weather Forecast for Thunderstorm Warning Services; Heat and cold wave Forecast Services; Cyclone Monitoring and Forecast; Agromet Advisory Services; Hydromet Services - Riverine and flash flood forecast; Maritime Forecasting Services; Aviation Meteorological Services; Urban Meteorological Services; Weather services for Power Sector; Impact based forecasting for extreme weather; Web GIS based Information for all types of severe weather events. He explained how the accuracy of prediction has improved over the years and explained how it was improved with the densification of monitoring equipment. He explained how the accuracy of weather prediction has improved over the years, particularly due to the densification of monitoring equipment. He also discussed the classification of rainfall based on precipitation over time. He highlighted the stakeholders of IMD's weather and climate services in India and described the operational climate prediction services, which currently include seasonal and monthly forecasts for the country. He provided details about the Panchayat Mausam Seva Portal, launched for public use in January 2024, and the Krishi & Pashu Sakhis scheme supported by IMD. He emphasized the importance of ensuring the timely delivery of weather and agromet advisories to ministries and Zilla Parishad (ZP) offices for effective grassroots-level outreach.

SESSION 3: EWS for Dust/Sand Storms and Heat & Cold Waves

Dr. Naresh Kumar, Scientist-F from IMD conducted this session on Early Warning System for Heat Waves, Cold Waves, and Dust storms. He outlined temperature climatology by indicating regions on the map of India that suffer from heatwaves. He explained the criteria applied for whether to declare a day heat wave / warm night. He illustrated the trend in heatwave frequency and maximum duration of heatwave over the period. He explained the effects of soil moisture on temperature extremes, Urban Heat Island (UHI) effects, observed temperature and humidity of the day, and features associated with severe heat waves. He elaborated heatwave forecast and warning process, the impacts of heatwave forecasting products, and color-coded impact-based forecasting by IMD. He highlighted the probability forecast of Maximum Temperature for April to June 2025 and the probability forecast of Minimum Temperature for April to June 2025. In Case of yellow alert areas, follow the following – moderate temperature, heat is tolerable for the general public but moderate health concern for vulnerable people e.g., infants, elderly, and people with chronic diseases; and to avoid heat exposure, wear lightweight, light-colored, loose, cotton clothes, cover the head, use a cloth, hat or umbrella. He illustrated the heat index (experimental forecast) of the day 13.05.2025 along with maximum temperature, maximum temperature departed, minimum temperature, minimum temperature departed, maximum temperature percentile, minimum temperature percentile, wind map, and relative humidity. He discussed on winter season, causes, temperature variation, western disturbances and induced systems, sub-tropical westerly jet, and easterly waves. He explained cold waves, their effects, and IMD's criteria for declaring cold waves & cold days. He showed the cold wave climatology from Dec 24 to Feb 2025 through maps, the role of ENSO in interannual variation of cold waves, cold wave spell commence, and related bulletins issued by IMD. He provided details about what is dust storms, how they form, how they travel and occur, and the criteria to declare dust storms. He explained pressure gradient-type thunderstorms, convective-type thunderstorms. The eastern and northeastern parts of our country i.e., Gangetic West Bengal, Jharkhand, Bihar, Orissa, and States in NE India get affected by severe thunderstorms during the pre-monsoon months of March to May. These storms usually travel from northwest to southeast direction and are called "Norwesters". They are locally known as "Kalbaisakhi". These severe thunderstorms have very significant socio-economic importance for the eastern and northeastern parts of the country. He also explained subdivisional and nowcast weather warnings.

SESSION 4: Air Quality Early Warning System

Dr. Gaurav Govardhan, Scientist – D from Indian Institute of Tropical Meteorology (IIITM) Pune took this session on Air Quality Early Warning System: Theory, Design, and Applications. He explained Air Pollution and Air Quality Early Warning Systems developed for Delhi NCR. He outlined reasons for air pollution with examples. He explained the Ministry of Earth Sciences's Air Quality forecasting and monitoring system for Delhi (SAFAR) and gave a live demonstration. He explained the Air Quality Warning and Integrated Decision Support System for Emissions (AIRWISE), Air Quality Early Warning System: (AQEWS) Forecast at 10 km, 2km, 400m for entire south Asia, NCR and Western India, Delhi; Decision Support System for source-apportionment for Delhi, Delhi's eight bordering districts, & Jaipur; Real-time ambient Source Apportionment of Gases and Aerosols for Mitigation (RASAGAM): state-of-art atmospheric chemistry laboratory established at IMD, Delhi; and Performance with Forecast accuracy upto ~75% for AQI > 300, False Alarms ~< 30% for AQI > 400 and Source identification accuracy of ~ 5% deviation concerning observation for vehicular pollution in Delhi. He explained WiFEX project that is for fog EWS and works based on Field Observations (IGI Airport, Hisar, Jewar Airport), Probabilistic Fog Forecast based on Ensemble Model, Realtime Fog Forecast Verification based on the field observations, Data Assimilation with MWR Profile, Satellite sounder, Land Data, & Wind Profile, Development of Nowcasting tool for airports and railways based on AI/ML, and Development of Fog Microphysics & Visibility parameterization. He illustrated the Modeling Air Pollution and Networking (MAPAN-Phase 2) project that is re-developed to continue Air Quality observations across India. Emphasize has been given to Himalayan locations (Srinagar (J&K), Srinagar (Garhwal), Ranichuri, Sikkim (Installed), Devastal, Shimla, Leh (Under process). More planned in Mandi and Arunachal Pradesh; Coastal/ Island locations (Chennai, Trivandrum, Andaman, Lakshadweep, Goa,) (Mumbai and Gujarat covered Under SAFAR to complete coastal network); and Black carbon induced snow albedo effect will be studied in different glaciers (Satopath, Gangotri, Dokriani). He explained the hourly $PM_{2.5}$ forecast at 10 km based on WRF-Chem and driving meteorological IMD-Global Forecasting System (IMD-IITM GFS, T1534, Ensemble-Kalman filtering) at 12.5 km grid resolution. He explained Air Quality Management using AQEWS and DSS and showed results based on the contribution of stubble burning, vehicles, and other industrial activities in air pollution and how policymakers and administrators can take its help in imposing GRAP with levels.

SESSION 5: EWS for Lightning and Mitigation Measures

Dr. Anupam Hazra, Scientist-G, Deputy Project Director, Seasonal Prediction & Lead, TS-Lightning Modeling Team, Monsoon Mission from Indian Institute of Tropical Meteorology (IITM) Pune took this session on Early Warning Systems for Lightning. He started this session with the thunderstorm charge system and lightning fundamentals. He stated that the Lightning sensor over Maharashtra on an experimental basis was started in the year 2024; Damini App and LLN over pan India was launched in the year 2018; and the Dynamical Lightning Prediction/Nowcasting system was launched in the year 2019. He showed the developed System for Thunderstorm Observation, Prediction and Monitoring (STORM) and stated that from 2018 onward (110 sensors have been installed till now and expansion is in progress.), location Accuracy is Avg-300 m and to improve detection across state borders with other nations, we need sensors in those neighboring countries also. He explained that by using valuable information from the lightning location network, a mobile App named DAMINI: Lightning Alert was developed. This App gives the exact location of current lightning strikes around the user location and issues the lightning warning for 20 and 40 km^2 radius in advance. Currently, App information is available in 21 different languages of India. This App also lists various precautionary steps that should be adopted during lightning like crouching on the floor with both feet and knees pressing each other and hands circling the knees with the chin pressing on the knees; advising the people to restrict their movement outside during thunderstorm period; the "30-30 rule": seek shelter if you hear thunder within 30 seconds of seeing lightning, and wait 30 minutes after the last thunder before going outside; advise them to stay inside houses, huts as far as possible and keep the flooring and walls of the houses dry; not to stand below/near trees, install lighting arrestors in tall building and isolated houses; safe shelters for human and livestock during lightning; stay in your automobile if you are traveling - automobiles give you excellent lightning protection; a safe vehicle is a hard-topped car, SUV, minivan, bus, tractor, etc. (soft-topped convertibles are not safe). If you seek shelter in your vehicle, make sure all doors are closed and windows rolled up. Do not touch any metal surfaces, educate people about lighting, and follow the suggestions listed above. He also outlined other early warnings products and Apps based on the IITM LLN and Damini concept developed to cater to regional needs. He explained satellite lightning merged product, national forest fire portal integrated with lightning, and thunderstorm events over the UP-Bihar region.

SESSION 7: Early Warning Systems on Flood Forecasting/ Flash Floods/ Urban Floods – Case Studies

Shri. Suraj Kumar Shaw, Assistant Director of Central Water Commission (CWC) took this session. He started this session with the Flood Forecasting Network of CWC by showing on the map. He mentioned that forecasts with a lead time of up to 24 hours are issued by regional offices based on correlation curves, while advisory forecasts with a lead time of up to 7 days are issued from the headquarters using basin-wise mathematical models. He also briefed on the categorization of floods, with examples such as above normal, severe, high, and extreme. He explained the outline of the satellite communication system in CWC, and methods of flood control which are fundamentally classified further into two – structure and non-structural. He explained conventional forecasting systems that is generally done with Gauge to Gauge correlation based on statistical techniques, having some constraints like fixed and short lead time subject to travel time available, no scientific way to include rainfall between BS and FS, no basin approach, and requires frequent updating of correlation graphs. He outlined the shift from the conventional approach to mathematical modelling in flood forecasting. This transition has led to an increased lead time of up to 168 hours and reduced dependence on real-time river gauge data, and enabled forecast generation at multiple points within the river basin simultaneously. Both water level and streamflow forecasting can now be performed using a basin-based approach, offering a better conceptual understanding of the basin. Additionally, it allows forecasting of responses from hilly and flashy catchments, facilitates easy integration with regulating structures, and can serve as input for inundation forecasting. He showed the River Basin Model in India with its components like Rainfall – Runoff, and Routing in the rivers (Hydraulic Model). He explained the flood forecasting model along with its input data and setup. He also highlighted the constraints of modern techniques, including inaccuracies in satellite rainfall data (both spatial and temporal), inadequate rain gauge coverage and distribution within the catchment, unavailability of real-time reservoir release data, and lack of data for transboundary catchments. He demonstrated the 7-Day Advisory Flood Forecast (AFF) Web Portal. He also explained the means of flood forecast dissemination through the mobile app: Flood Watch India. He explained flood forecasting using examples such as the Water Level Forecast for the Delhi Railway Bridge Station on the Yamuna and the Inflow Forecast for the Hathnikund Barrage.

SESSION 8: EWS for Forest Fire and related Mitigation Programmes

Dr. Sunil Chandra, Deputy Director, Forest Survey of India, Ministry of Environment, Forest and Climate Change, Govt. of India took this session on Early Warning Systems for Forest Fires. He began with the basics of the forest fire scenario in India, explaining that most fires are man-made—both intentional and unintentional. Common causes include non-timber forest product (NTFP) collection, pasture burning, shifting cultivation, encroachment, and the collection of tendu leaves and mahua. In Uttarakhand, fires are primarily caused by people seeking fresh grass for fodder, especially under pine-dominated vegetation. Most of these are ground fires, affecting ground vegetation and the lower story. He highlighted the lack of modern firefighting methods, with most fires being controlled by state forest departments with the help of local communities. Many regions are affected annually, particularly the Western Himalayas, North-Eastern states, Central Highlands, and forests dominated by pine and deciduous vegetation. He showed statistics of fire incidents in India and stated that the total Fire Prone Forest Area is 43.16% of the forest cover (as per ISFR 2023). According to this report, the estimated fire-prone areas under extremely, very high, high, and moderately fire prone are 1.45%, 9.89% 16.63%, and 15.22% respectively. He explained the use of Satellite Technology in forest fire alert generation and dissemination. He mentioned the role of FSI in Forest Fire Monitoring like Alerts Services that includes Pre-Fire Alert based on the Forest Fire Danger Rating System (weekly once), Near Real-Time Forest Fire Monitoring (daily – 4 to 6 times), Large Forest Fire Monitoring (twice a day) and Other Information/Services like FSI Van Agni Geo-portal, WMS services, Identification of Fire-Prone Forest Areas – using historical data, Burnt area Assessment, Forest Fire Risk Zonation Mapping, Fuel Load Estimation and Mapping. He explained the mechanism for the dissemination of pre-fire alerts, which includes providing one-week prior warnings about the possibility of fire outbreaks through pre-fire alert polygons. Initially launched as a pilot in 2016 for 14 states, the system has been operational at the pan-India level since 2019. Alerts are issued every Thursday and remain valid for the following week. This system helps states maintain a high level of preparedness for forest fire prevention. He also highlighted the concept of near real-time forest fire monitoring based on satellite/constellations and in case of fire being detected alerts are issued through email and SMS to the concerned stakeholders. He also explained in detail the van agni geoportal, real-time WMS & WFS Service to State, Burnt Area assessment, ground truthing, fire risk zonation, and Mechanism for registration by the individual for getting SMS alerts using Forest Fire Dash Board.

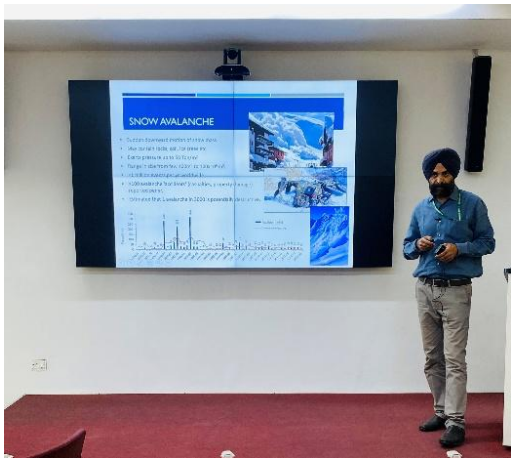
SESSION 9: SACHET Platform

Col. Dheeraj Chandola (retd.), Sr. Consultant NDMA took this session on SACHET Platform. He started his session with the basics of warning systems and stated that early warning systems can prevent natural hazards from turning into human disasters. For early warning systems to be effective, they must work for everyone. He emphasized PM's 10-point agenda which states that leverage technology to enhance the efficiency of disaster risk management efforts and utilize the opportunities provided by social media and mobile technologies for disaster risk reduction. He explained the technology behind the SACHET platform, specifically the Common Alerting Protocol (CAP). CAP is an ITU-T standard (X.1303), approved in 2007. It defines a standardized message format designed for all-hazard, all-media communication. It enables alerts about all types of hazards, such as weather events, fires, earthquakes, volcanoes, landslides, tsunamis, lightning, forest fires, avalanches, and more, across all types of media, including television, radio, telephone, fax, highway signs, email, websites, news feeds, etc. Alerts can be directed to the general public, specific groups (such as civic authorities and responders), or even specific individuals. He briefed about the key facts that CAP carries, such as: What is the emergency? Where is the affected area? How soon do we need to act? How severe will it be? How certain are the experts? What actions should we take? He illustrated that CAP is quicker and easier to issue alerts to a variety of communication channels and media. He explained in detail the responsible stakeholders involved: Sponsorship and implementation are managed by the Ministry of Home Affairs and NDMA; project development, deployment, and sustenance are handled by the Department of Telecommunications and its implementing agencies. Alert Generating Agencies (AGAs) include the India Meteorological Department (IMD), Indian National Centre for Oceanic Information Services (INCOIS), Forest Survey of India (FSI), Central Water Commission (CWC), and Defence Geoinformatics Research Establishment (DGRE). Alert Approving Authorities (AAAs) are the State Disaster Management Authorities of all States and Union Territories. Alert Disseminating Agencies (ADAs) consist of telecom service providers, TV, radio, Indian Railways, mobile apps, social media, GAGAN and NavIC satellite terminals, coastal sirens, and others. The beneficiaries are all citizens. He briefed about Android Earthquake Alert System and Integration with Google Alerts. Integration of the CAP platform with Google Alerts and other Google products is still underway. At present, Google extracts hazard-related data from credible sources like IMD and INCOIS, curates it, and disseminates alerts through platforms such as Google Search (based on relevant queries) and Google Maps (if routes intersect hazard zones).

SESSION 10: Common Alert Protocol and CBS

Mr. Sumit Kumar Jha, Scientist–D from C-DOT, Department of Telecommunication, Government of India, took this session on Common Alert Protocol and Cell Broadcast Service. He started the session with the death toll and loss of livelihood due to disasters and stated that just 24 hours prior notice of an impending hazardous event can reduce damage by 30%. He mentioned that disasters such as earthquakes, landslides, avalanches, and man-made incidents like gas leaks require immediate action due to very short warning times. Tsunamis require alerts within minutes to minimize loss of life and property. Floods demand timely alert dissemination to allow the public to seek shelter. For cyclones, extreme temperature events, and droughts, regular alerts should be issued to keep the public informed and prepared. He stressed that relying on traditional methods for communicating emergency information for public safety can lead to several issues: people missing out on alerts, receiving alerts not intended for them, encountering confusing messages, a lack of trust, messages that are not easily understood, and ineffectiveness during odd hours. He explained the benefits of the Common Alert Protocol (CAP) developed and implemented for connecting the unconnected. He explained the C-DOT CAP Early Warning System (EWS) as an automated platform for disseminating life-saving disaster alerts in geo-targeted areas, in near real-time and in the desired language. Alerts are delivered via mobile phones, radio, TV, satellite devices, and coastal sirens. The system integrates forecasting agencies and disaster managers into a single IT platform, ensuring maximum penetration of actionable information. It is based on the ITU CAP and 3GPP standards and has been operationalized across all 36 States and Union Territories in India. He highlighted the technical aspects of the SACHET-CAP Integrated Alert System, which is designed to automate multi-hazard, multi-media, geo-targeted emergency alerts to the public in local languages. He demonstrated Geo-Targeted Alert message dissemination using CAP EWS in India. He also explained the Cell Broadcast Service, which enables mass broadcast messaging to mobile phones in targeted areas in near real-time. He also detailed the functionality and features of the SACHET mobile app and browser notifications. He explained that the system utilizes GAGAN and NavIC satellites, with satellite receivers paired to smartphones via Bluetooth, making it effective in areas where mobile networks are unavailable. He mentioned that CAP has been integrated into coastal siren alert dissemination and Indian Railways alert systems, and highlighted that casualties have been drastically reduced after the implementation of the CAP-based Early Warning System in India.

SESSION 11: Early Warning System for Avalanches

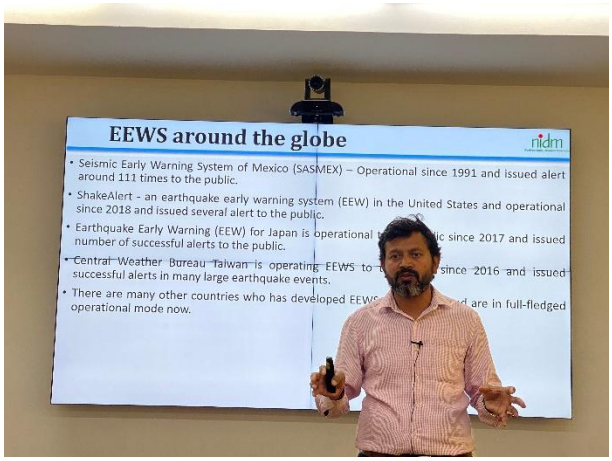


Dr. Amreek Singh, Scientist-G from Defence Geoinformatics Research Establishment (DGRE) conducted this session on Avalanche Hazard Mitigation in the Indian Himalayas and started this session with the basics of avalanches and mentioned Major Avalanche Accidents in the recent past in the Indian Himalayas. He explained avalanche hazard mitigation measures are categorized into two categories: Active measures and passive measures. Active measures comprise control structure and galleries, artificial triggering, and afforestation. While, passive measures include mapping, early warning, and capacity building. Examples of control structures and galleries are Near Banihal Top (J&K) protecting NH-1A, and Snow Gallery near the South portal of Atal Tunnel, Rohtang (HP). Artificial triggering of avalanches is carried out using new 84 mm HE ammunition and UAV-based delivery of explosives. He then discussed the early warning system for avalanches, including infrasonic signature-based real-time avalanche detection, along with the typical installation of geophone sensor networks and their data analysis algorithms in avalanche-prone areas. He also spoke about the Avalanche Doppler Radar and its principle of operation. As an example, he highlighted a Commercial Off-The-Shelf (COTS) Avalanche Radar deployed at a forward location in Sikkim, which is the first such system in India. The radar features include automated real-time detection of avalanches, X-Band Doppler radar, active detection within less than 2–3 seconds of triggering, a range of 3.5 km, coverage area of ≥ 2 km^2, an integrated alarm system, mast-mounted and solar-powered setup, and an installation altitude of 4,522 meters above mean sea level. He explained in detail the three technologies used in the Avalanche Early Warning System, namely: Infrasonic Sensor Array, Geophone Sensors, and Pulse Doppler Radar. He also described the danger scale interpretation using a color-coded system: green indicates generally safe conditions, where any snowpack on slopes is generally stable with isolated instability; yellow signifies partly unsafe conditions; orange represents unsafe conditions; red denotes highly unsafe conditions; and black indicates extremely unsafe conditions. He advised that while passing through avalanche-prone areas, one should proceed with caution and take all necessary safety measures. He mentioned that DGRE issues avalanche warning bulletins for civil users and specified that this service has been integrated with the SACHET alert system. He further emphasized the importance of post-avalanche search and rescue operations and provided an overview of existing technologies for avalanche safety and buried victim search.

SESSION 13: EWS on Landslides - Case Studies

Shri Bhupender Singh, Director, Geohazard Research and Management Centre, CHQ, Kolkata conducted this session on the EWS for Landslides and started with the general definition of landslide classification system defined by Vernes (1978) by showing gif images for clarity in types of landslides. He showcased examples of deep-seated rockslides in the Himalayas, including Mana Khola (Darjeeling), Ambutia (Kurseong), Gitange (Kurseong), and Balason (Darjeeling). He also highlighted slides and flows that occurred in Kedarnath, Bhatawari, Bandarkot, Dharsu Bridge, Kalisasaur, and Sonprayag. Shallow translational debris slides in the Western Ghats were observed in Madikeri, Neriya, and along NH4A between Panaji and Ponda (near Mangeshi Temple). Debris flows in the Western Ghats included incidents at Pettimudi (Idukki, Kerala), Government College Munnar, the Malin landslide (Pune), and the Mundakkai debris flow in Wayanad District. He stated that landslides are a complex phenomenon, and there is a clear distinction between landslide forecasting and Landslide Monitoring & Early Warning Systems (LEWS). He demonstrated various LEWS developed across the world and mentioned that only 23 are currently operational in 10 countries, with 9 of them operating in Italy. He also explained the landslide scenario in India, providing an overview of landslide susceptibility, the LANDSLIP Project, and the development of prototype LEWS for the Darjeeling and Nilgiris districts. He mentioned that the landslide early warning system provides two time-related forecasts: Medium-range (Up to 10 days ahead) and Short-range (Between 1-2 days (24 & 48 hours). He explained the Regional Landslide Forecasting System and the Landslide Forecast Bulletin and demonstrated the Bhusanket Dashboard. He also mentioned that a mobile app, Bhuskhalan, is available to provide landslide-related alerts and other important information. Furthermore, he discussed Regional Landslide Early Warning forecasting, the current status of GSI's Regional LEWS, and measures to improve forecasting accuracy. The improvement of Landslide Early Warning Systems (LEWS) relies on several critical factors. These include access to reliable weather forecasts and a dense network of rain gauges to capture accurate precipitation data. Long-term records of rainfall and past landslide events are essential for model calibration and validation. High-quality, geo-referenced landslide data further enhance forecasting accuracy. Clearly defined roles and responsibilities among stakeholders, along with effective cooperation and coordination, are vital. The seamless communication flow between agencies ensures timely action. Continuous evaluation, research, and development, coupled with technological improvements, are necessary to maintain and enhance the effectiveness of LEWS over time.

SESSION 14: EWS on Earthquakes



Dr. Pankaj Kumar, Assistant Professor, NIDM conducted this session on Early Warning System for Earthquakes. He started this session with a brief about earthquakes, the physics behind them, and their impacts on society and infrastructure. He explained the movement of continental plate boundaries, highlighted regions of high seismic activity, and presented the global seismic hazard map. He also showed the seismic zone map of India, along with a digital seismic hazard map depicting major earthquakes that have occurred in the Himalayan region. He pointed out the Central Seismic Gap and noted that a major earthquake is anticipated in this region. He briefed about commonly used terms that often create confusion when discussing and demonstrating an Early Warning System. These include: Prediction – an assessment of the chances of occurrence; Forecasting – based on scientific principles and operationally proven techniques with inherent predictability; Warning – distinct from a forecast as it conveys specific risk information that necessitates protective actions and is both area- and time-specific; and Alerts – issued as cautionary messages. He mentioned that Earthquake Early Warning Systems (EEWS) are operational in many countries around the globe. For example, the Seismic Early Warning System of Mexico (SASMEX) has been operational since 1991; ShakeAlert in the United States has been operational since 2018; Japan's Earthquake Early Warning system has been providing public alerts since 2017 with numerous successful warnings; and the CWB in Taiwan has been operating its EEWS since 2016. He explained the basic principle behind Earthquake Early Warning Systems (EEWS): P-waves arrive first, traveling at about twice the speed of S-waves, and both are significantly slower than the speed of telecommunications. Based on the difference in wave speeds and warning techniques, EEWS are categorized into two types—onsite and regional. In an onsite EEWS, sensors are installed at the same location where the warning is issued. The warning is based on a single sensor or a nearby group of sensors, which increases the chances of false or missed alarms. This type is mostly used for railways, metro systems, and industrial facilities. In contrast, a regional EEWS has sensors placed near the epicenter, and warnings are issued for locations farther away. Warnings are based on data from at least four sensors located at different sites, significantly reducing the chances of false or missed alarms. He explained the general architecture of Earthquake EEWS, the technical aspects of regional EEWS, lead time, and the algorithms used. He demonstrated a regional EEWS developed for the Uttarakhand region, including its instrumentation, data flow, data streaming, networking, decision-making process, the mobile app 'BhuDEV,' and indigenously developed siren units. He highlighted the success stories of this EEWS, showcasing instances where it issued successful warning alerts and notifications. He also presented a simulation of the system, mock drill activities, and the IEC materials developed for public awareness.

SESSION 15: Group activity: Disaster Scenarios, Do's and Don'ts

"Operation Seismic Sentinel"

Group Activity: Earthquake Simulation Exercise
Background
City: Lakhanpur
Population: ~20 million
Location: At a distance of 300 Km from the Epicenter
Date: 16 July 2024,
Origin Time: 08:16:20 AM IST

Scenario Overview

An earthquake of Magnitude 8.1 has struck in the Himalayan region of Uttarakhand. The depth of this earthquake is 32 Km. The epicenter of this earthquake is ~300 Km from an imaginary city, Lakhanpur. This earthquake occurred during the morning time. This was the time when children were leaving for school or employees were getting ready to go out to work. And the women of the houses were cooking food. People who had installed the mobile app received warnings. Similarly, the warning was issued through SMS, warning messages flashed on TV, and people heard warnings on Radio, or sound from blown sirens. The warning of strong earthquakes was issued ~ 90 seconds in advance. Some people could not understand what was happening while few followed whatever safety steps they could.

Participants were divided into three groups and asked to prepare a plan outlining pre-, during-, and post-earthquake activities, considering the complete disaster management cycle. They presented their prepared plans, and feedback was provided by the coordinator of the training programme, along with other senior faculty members and colleagues.

Few clips of the groups while they were discussing and charting the plans.











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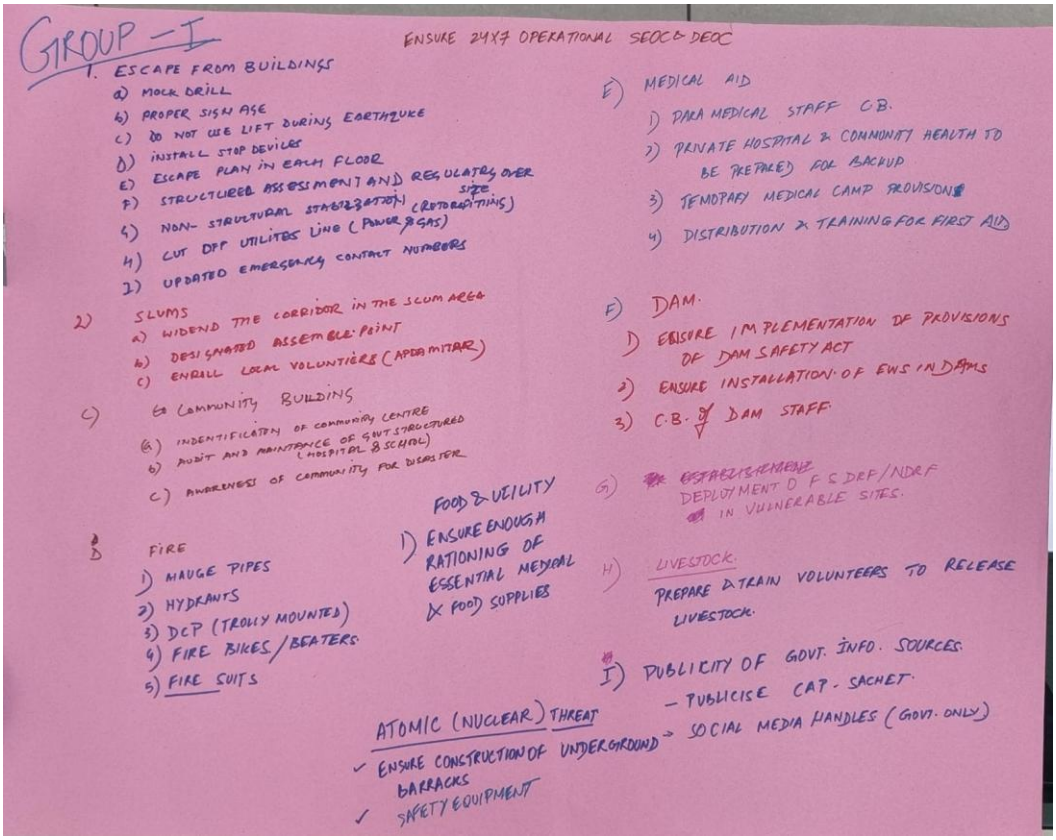
Hostel
Feedback


After the discussion, each group presented their plans, with each member outlining their respective roles during the presentation.

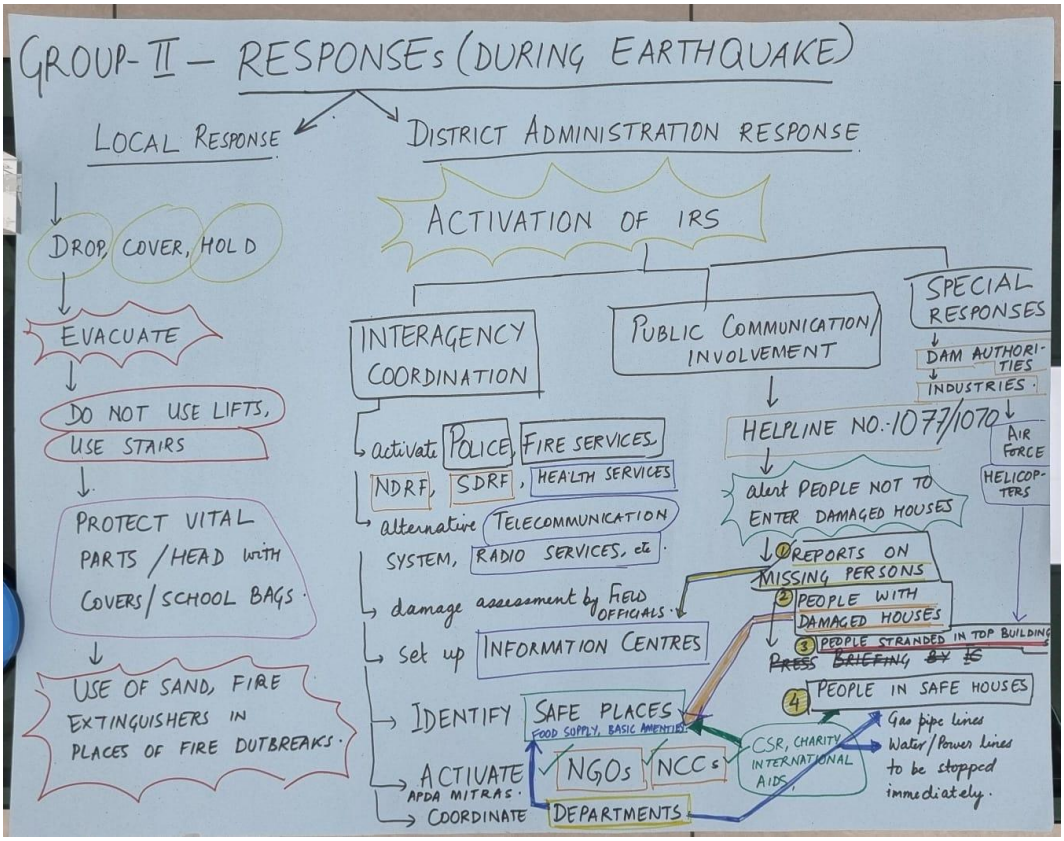
Group 1 chalked out the plan for the post-earthquake phase, as given below, and presented it before all participants. Faculty members provided feedback during the discussion.





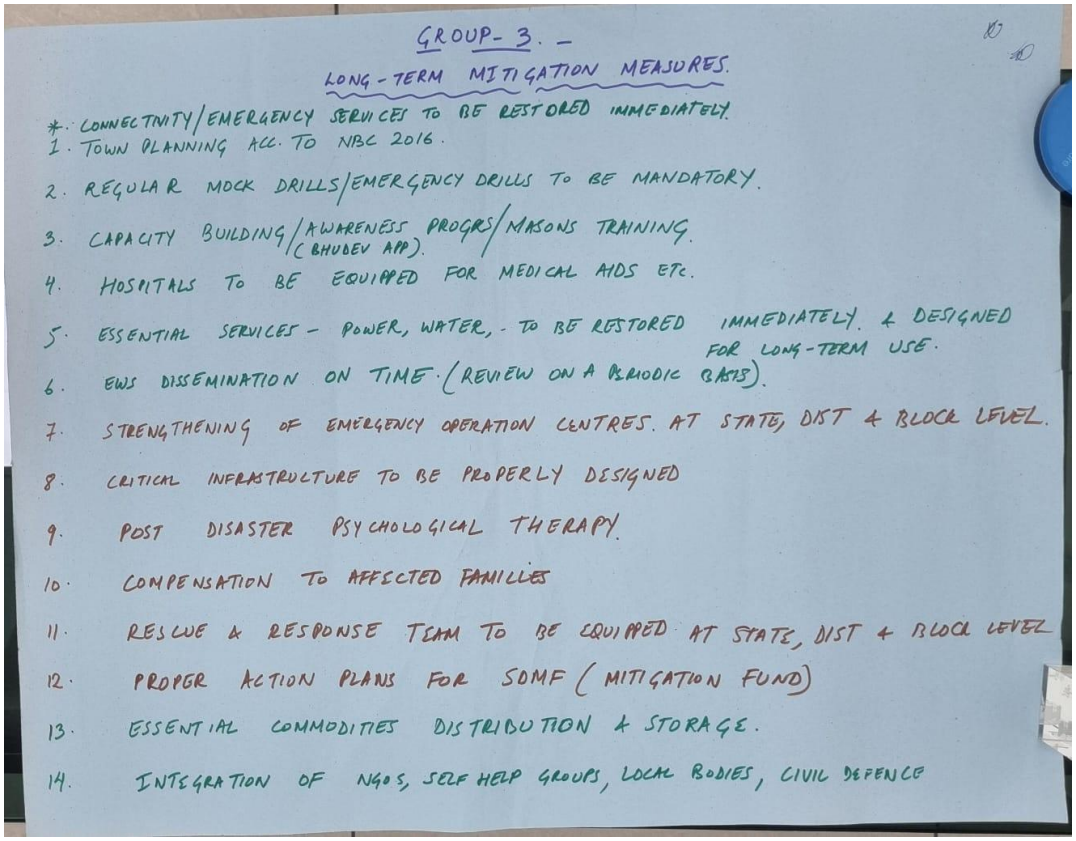

Faculty members giving feedback about the presented plan of Group 1.


Group 2 chalked out the plan for the during-earthquake phase, as given below, and presented it before all participants. Faculty members provided feedback during the discussion.




Faculty members giving feedback about the presented plan of Group 2.


Group 3 chalked out the plan for the pre-earthquake phase, as given below, and presented it before all participants. Faculty members provided feedback during the discussion.



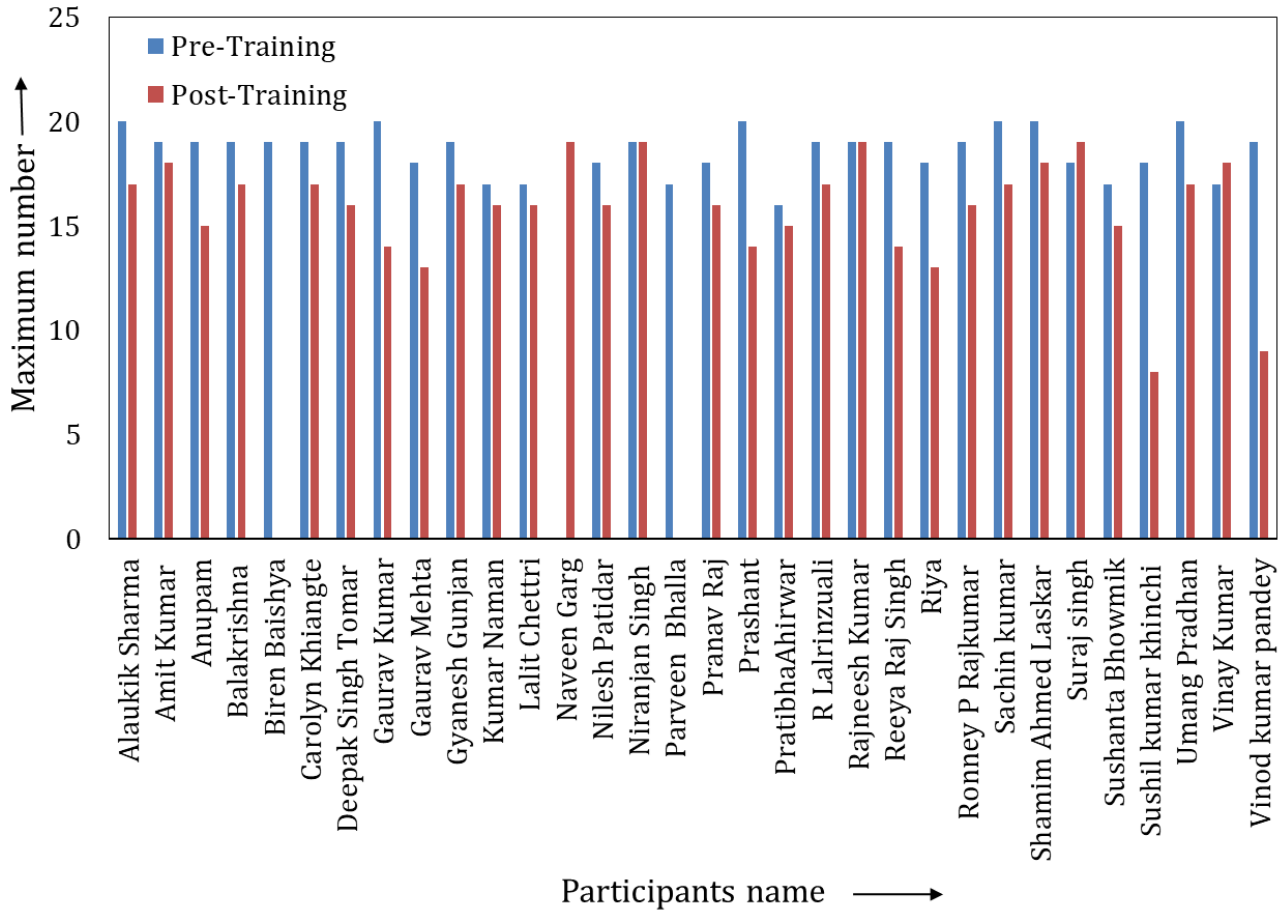



Faculty members giving feedback about the presented plan of Group 3.




PRE- AND POST-TRAINING PROGRAMME ASSESSMENT

A 20-question MCQ was given to all participants to assess their understanding of the topics to be covered in the training programme. Similarly, another 20-question MCQ was distributed after the completion of all the training sessions. A comparative plot of their understanding of the subject matter is provided below.



VALEDICTORY SESSION

The valedictory session was graced by Shri Safi Ahsan Rizvi, Executive Director, NIDM, Prof. Surya Parkash, Head of Division of Geo-Meteorological Risk Management, NIDM and Shri Randeep Kumar Rana, Sr. Advisor, NIDM.

Participants were asked to give feedback about this three-day training programme on the "Early Warning System". Participants provided feedback about the training programme, food, and lodging, and the following major points came out with unanimity:

- The duration of the training programme should be extended.
- Group activity-based learning and discussions should be increased.
- Instead of including all hazards in one training programme, hazard-specific training should be conducted.
- An ice-breaking session should be included at the beginning of the training programme.
- Other co-curricular activities can also be included to enhance learning.
- More practical sessions should be conducted instead of theoretical ones.

Overall, all the participants praised the training programme. They said they learned many new things about early warning systems existing in India, which they were previously unaware of. They appreciated the IEC material provided during the event and mentioned that they are now acquainted with several new tools, mobile apps, portals, websites, government schemes, and nodal agencies working on specific hazards in India. They also appreciated the well-curated training sessions and the selection of resource persons who have hands-on experience in the development and operationalization of the early warning systems mentioned in the schedule.

After the feedback and discussions, ED NIDM presented certificates of participation to the participants. The photographs of the certificate distribution ceremony are given below.

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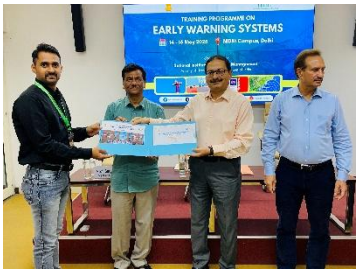
EARLY WARNING SYSTEMS


EARLY WARNING SYSTEMS


EARLY WARNING SYSTEMS

KEY TAKEAWAYS

Here are the **key takeaways** from the participant feedback on the three-day "Early Warning System" training programme:

1. **Extend Training Duration**

   Participants felt the current timeframe was insufficient and recommended a longer training period for better understanding and engagement.

2. **Increase Group Activities and Discussions**

   More interactive, group-based learning methods were preferred over lecture-style formats.

3. **Conduct Hazard-Specific Training**

   Instead of covering all hazards broadly, participants suggested focused sessions on individual hazard types.

4. **Include an Ice-Breaking Session**

   Starting the programme with an ice-breaker was recommended to promote better interaction among participants.

5. **Incorporate Co-Curricular Activities**

   Adding supportive, non-academic activities was seen as a way to make learning more engaging and enjoyable.

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FEEDBACK SUMMARY OF THE TRAINING PROGRAMME

Feedback Summary of the Training Programme	
Programme Title	Training Programme on Early Warning Systems
Date	14 - 16 May 2025
Venue	NIDM Campus, Delhi
Course Coordinator(s)	Dr. Pankaj Kumar

No. of Participants	32
Avg. no. of feedback per session	32.5
No. of Sessions	12
No. of Feedback Responses	390

Name of the Session and Resource Person	Session Rating / 5	No. of Feedback
Session-1: EWS for Rainfall, Hail Storms and Agromet Advisory Services - Dr. DS Pai	3.9	25
Session-2: EWS for Dust/Sand Storms and Heat & Cold Waves - Dr. Naresh Kumar	4.0	32
Session-3: Air Quality Early Warning System - Dr. Gaurav Goverdhan	4.2	30
Session-4: EWS for Lightning and Mitigation Measures - Dr. Anupam Hazra	4.0	29
Session-5: Early Warning Systems on Flood Forecasting/Flash Floods/Urban Floods (Case Studies) - Shri. Suraj Kumar Shaw	3.6	31
Session-6: EWS for Forest Fire and Concerned Mitigation Programmes - Dr. Sunil Chandra	4.2	36
Session-7: SACHET Platform - Col. Dheeraj Chandola	4.2	34
Session-8: Common Alert Protocol and CBS - Ms. Smriti Sachdev	4.4	39
Session-9: Early Warning System for Avalanches - Dr. Amreek Singh	4.3	35
Session-10: EWS on Landslides - Case Studies - Shri Bhupender Singh	4.3	35
Session-11: EWS on Earthquakes - Dr. Pankaj Kumar	4.5	37
Session-12: Group activity: Doâ€™s and Donâ€™ts, Scenarios and Response & Mitigation - NIDM Team	4.5	27

Overall Programme Session Rating	4.2
Overall Hostel Rating	4.4

LIST OF PARTICIPANTS

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TRAINING PROGRAMME ON EARLY WARNING SYSTEMS

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NIDM Delhi Campus

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