Coordinator

Dr. G. Ch. Satyanarayana, Associate Professor,

National Institute of Disaster Management (Southern Campus) Ministry of Home Affairs, Government of India Kondapavuluru Village, Gannavaram Mandal,

Krishna District, Andhra Pradesh – 521212

1. Background and Rationale

Climate change is increasing the frequency, intensity, and unpredictability of disasters such as floods, cyclones, heat waves, droughts, landslides, thunderstorms, and extreme rainfall events. These climate-induced disasters pose serious threats to human lives, agriculture, infrastructure, water resources, ecosystems, livelihoods, and sustainable development. Traditional disaster management approaches are often insufficient to address the rapidly changing and complex nature of these hazards. Recent advancements in emerging technologies such as Artificial Intelligence (AI), Machine Learning (ML), Satellite Remote Sensing, Geographic Information Systems (GIS), Big Data Analytics, and High-Resolution Weather and Climate Modelling are transforming the field of Disaster Risk Reduction (DRR). These technologies improve hazard monitoring, forecasting, early warning dissemination, vulnerability assessment, risk mapping, and decision support systems. Satellite and remote sensing technologies provide real-time monitoring of weather systems and disasters, while AI-based tools support predictive forecasting and rapid interpretation of large datasets.

High-resolution weather and climate forecasting systems such as IMD-GFS, IITM Bharat Forecast, NCMRWF, and UK Met Office forecast products are increasingly being used for impact-based forecasting and disaster preparedness. These advanced forecasting systems help improve the accuracy of weather predictions, strengthen early warning systems, and support decision-making for disaster mitigation and emergency response. The proposed training programme is designed to provide both theoretical understanding and practical exposure to emerging technologies used in climate-induced disaster risk reduction. The programme covers key areas including Fundamentals of Climate, Weather and Disaster Risk Reduction; Satellite Meteorology and Remote Sensing Applications; Numerical Weather Prediction and High-Resolution Modelling; Artificial Intelligence and Machine Learning in Weather Forecasting; and Disaster Mitigation, Early Warning Systems, Policies, and Decision Support Applications.

The programme also includes hands-on practical sessions on IMD weather chart analysis, INSAT satellite data applications, GIS and Google Earth Engine, IMD-GFS and Bharat forecast products, WRF model visualization, Python programming, AI/ML model development, heat wave identification, disaster risk mapping, and emergency response simulations. These practical exercises will help participants gain technical skills and operational knowledge in applying emerging technologies for disaster preparedness and climate resilience. In this context, there is an urgent need to strengthen the capacities of disaster management professionals, government officials, researchers, scientists, academicians, and practitioners on the application of emerging technologies for climate-induced disaster risk reduction. The proposed training programme aims to bridge the gap between technological innovations and practical disaster management applications through expert lectures, technical demonstrations, case studies, simulations, and hands-on learning.

2. Aim of the Programme

The programme aims to enhance the knowledge, technical skills, and operational capacities of participants on the application of emerging technologies such as Artificial Intelligence (AI), Machine Learning (ML), Satellite Data, Remote Sensing, Geographic Information Systems

(GIS), and High-Resolution Weather and Climate Modelling for effective Climate-Induced Disaster Risk Reduction (DRR), early warning systems, disaster preparedness, and resilience building.

3. Objectives of the Programme

The specific objectives of the programme are:

- To provide a comprehensive understanding of climate-induced disaster risks, extreme weather events, and their emerging challenges in the context of climate change.
- To introduce participants to Artificial Intelligence (AI) and Machine Learning (ML) applications in weather forecasting, disaster prediction, risk assessment, and emergency response systems.
- To enhance knowledge on the use of satellite data, remote sensing, GIS, and spatial technologies for hazard monitoring, vulnerability assessment, and disaster risk mapping.
- To familiarize participants with high-resolution weather and climate modelling techniques, including IMD-GFS, IITM Bharat Forecast, and NCMRWF forecast systems for impact-based forecasting and early warning applications.
- To promote the use of data-driven technologies and decision support systems for evidence-based disaster management and climate resilience planning.
- To strengthen institutional and technical capacities for integrating emerging technologies into disaster preparedness, mitigation, response, recovery, and long-term resilience planning.

4. Programme Structure and Key Themes

The training programme is designed as a five-day intensive capacity-building programme comprising technical lectures, practical demonstrations, hands-on laboratory sessions, case studies, group exercises, and interactive discussions. The programme focuses on both conceptual understanding and practical applications of emerging technologies in climate-induced disaster risk reduction.

The programme consists of five thematic modules covering Fundamentals of Climate and Disaster Risk Reduction, Satellite Meteorology and Remote Sensing Applications, Numerical Weather Prediction and High-Resolution Modelling, Artificial Intelligence and Machine Learning in Weather Forecasting, and Disaster Mitigation, Early Warning Systems, Policies, and Decision Support Applications.

Key Themes to be Covered:

- Climate Change and Emerging Disaster Risks
- Technological Innovations in Disaster Risk Reduction
- Fundamentals of Artificial Intelligence and Machine Learning
- AI Applications in Flood, Cyclone, Heat Wave, Thunderstorm, and Drought Forecasting
- Satellite Data and Remote Sensing for Disaster Monitoring

- GIS-Based Hazard, Vulnerability, and Risk Mapping
- High-Resolution Weather and Climate Modelling
- IMD-GFS, IITM Bharat Forecast, and NCMRWF Forecast Systems
- Multi-Hazard Early Warning Systems
- Data Analytics and Decision Support Systems
- Disaster Mitigation and Climate Resilience Planning
- Case Studies and Best Practices in Technology-Enabled DRR
- Institutional and Policy Frameworks for Technology Integration

5.Training Methodology

The programme will adopt a participatory, interactive, and practice-oriented methodology to ensure effective learning, technical skill development, and operational understanding. The training methodology is designed to combine theoretical concepts with practical applications and real-time forecasting tools.

The methodology will include:

- Expert Lectures and Technical Presentations
- Interactive Discussions and Experience Sharing
- Hands-on Demonstrations of AI, GIS, GrADS, WRF, and Satellite Applications
- Practical Sessions on IMD-GFS, Bharat Forecast, INSAT Satellite Data, and GIS Tools
- Case Study Analysis of Extreme Weather Events and Disasters
- Practical Exercises and Group Activities
- Simulation-Based Learning Sessions
- Exposure to Real-Time Monitoring and Forecasting Platforms
- Early Warning Dissemination and Emergency Response Simulations
- Group Presentations and Feedback Sessions

The programme will emphasize both conceptual understanding and practical application of emerging technologies for disaster preparedness, forecasting, mitigation, response, and climate resilience building.

6. Expected Learning Outcomes

By the end of the programme, participants are expected to gain a comprehensive understanding of climate-induced disaster risks, extreme weather events, and the role of emerging technologies in Disaster Risk Reduction (DRR). Participants will understand the applications of Artificial Intelligence (AI) and Machine Learning (ML) in weather forecasting, disaster prediction, risk assessment, and emergency response planning.

Participants will acquire practical knowledge on satellite data interpretation, remote sensing techniques, GIS-based hazard mapping, and spatial analysis for disaster monitoring and vulnerability assessment. They will also gain exposure to INSAT satellite products, Google Earth Engine applications, IMD-GFS, IITM Bharat Forecast, and NCMRWF forecast systems for operational forecasting and early warning applications.

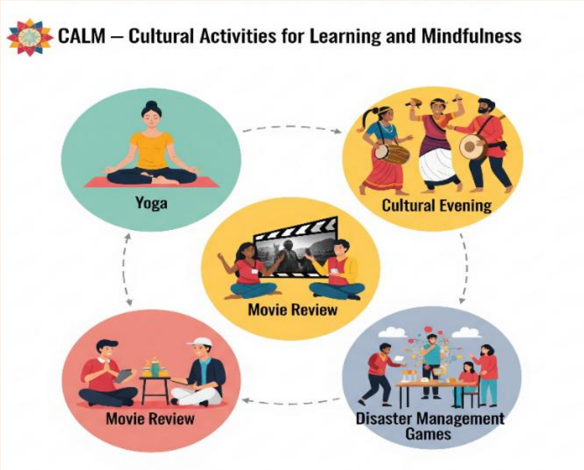
The programme will help participants understand the fundamentals of high-resolution weather and climate modelling, impact-based forecasting, and multi-hazard early warning systems. Participants will develop technical skills in using data-driven tools, forecasting platforms, GIS applications, AI/ML models, and decision support systems for disaster preparedness, mitigation, and response planning.

The training programme is also expected to strengthen institutional and operational capacities for integrating emerging technologies into disaster management practices, climate resilience planning, and sustainable development initiatives. Participants will be encouraged to identify opportunities for innovation, interdisciplinary collaboration, and research in the field of climate-induced disaster risk reduction and resilience building.

CALM – ***Cultural Activities for Learning and Mindfulness***

⇒ **Yoga**

Every day from 6:30 AM to 7:15 AM, a yoga class will be conducted, covering a comprehensive routine designed to promote physical and mental well-being.



⇒ **Cultural Evening**

Participants will engage in both individual and group cultural activities, proudly showcasing the diverse traditions, arts, and heritage of their respective states. These activities will foster cultural appreciation, encourage collaboration, and highlight the rich cultural tapestry within the group.

⇒ **Movie review**

During the weekend, disaster management-related movies will be screened, followed by interactive class discussions.

⇒ **Disaster Management Games**

Participants will be taught disaster management-related games designed to enhance their practical skills in a fun and interactive way.

7. Certification

Participants who successfully complete the programme and attend all sessions will be awarded a Certificate of Participation by the National Institute of Disaster Management (NIDM), Ministry of Home Affairs, Government of India.

8. Organising Institution

The National Institute of Disaster Management (NIDM) was constituted under an Act of Parliament with a vision to play the role of a premier institute for capacity development in India and the region. The efforts in this direction that began with the formation of the National Centre for Disaster Management (NCDM) in 1995. Gained impetus with its redesignation as the National Institute of Disaster Management (NIDM) for training and capacity development. Under the Disaster Management Act 2005, NIDM has been assigned nodal responsibilities for human resource development, capacity building,training, research, documentation and policy advocacy in the field of disaster management.

9. Organising Team

Patron	Shri Madhup Vyas, IAS, Executive Director, NIDM
Co-Patron	Col. P.S Reddy, Joint Director, NIDM-Vijayawada
Course Coordinator (s)	Dr. G. China Satyanarayana, Associate Professor, NIDM
Co- Course Coordinator (s)	1. Dr. Navneet Kumar, Professor, NIDM 2. Shri Rohit Kumar, Assistant Professor, NIDM 3. Shri Manjeet Singh, Assistant Professor, NIDM 4. Shri Amarjeet Kumar, Assistant Professor, NIDM
Program Team	1. Shri Pradeep Goud, Junior Consultant (Training), NIDM (pradeepgoud2025@gmail.com, Mobile: 9963333067) 2. Shri Thakur Deobardhan Kinwar, Librarian, NIDM 3. Shri U Venkatesh, Training Assistant 4. Smt. Harika, D.E.O. 5. Shri Suman, D.E.O

10. Course Structure

I. Total Modules: 5
II. Classes per Module: 3 Theory Classes and 2 Practical/Laboratory Sessions
III. Training Type: Theory, Practical Sessions, and Hands-on Exercises
IV. Target Participants: Researchers, Scientists, Students, Disaster Management Professionals, Officials from IMD/NDRF/SDMA, and Academicians from IITs, NITs, IISERs, Central Universities, and State Universities
V. Mode of Training: Offline
VI. Duration: 15 Theory Classes (each class 70 min) and 10 Practical/Laboratory Sessions (2 to 5 PM)
VII. Mandatory Requirement: Participants must bring their own laptops. Entry to practical sessions will not be permitted without a laptop.

Resilient India - Disaster Free India

Emerging Technologies for Climate-Induced Disaster Risk Reduction:

AI, Satellite Data and High-Resolution Modelling

Venue : NIDM, Vijayawada Campus

Day 1(06 July 2026)

Time	Module	Session Topic	Name of the Resource Person
09:30 – 10:00 AM	—	Registration	
	Inauguration		
	Welcome Address	**Shri Amarjeet Kumar** Assistant Professor, NIDM	
	Programme Overview	**Dr. G. Ch. Satyanarayana** Associate Professor, NIDM	
	Inaugural Address	**Col P.S.Reddy** Joint Director, NIDM	
	Special Address	**Dr. Navneet kumar** Professor, NIDM	
10:00 – 10:20 AM	**High Tea**		
10:20 – 11:20 AM	**MODULE – I :**	**Lecture 1: Introduction to Weather, Climate and Disaster Extremes over India** • Weather vs Climate	Dr. G. Ch. Satyanarayana, Associate Professor, NIDM.

	Fundamentals of Climate, Weather and Disaster Risk Reduction	• Elements and Structure of the Atmosphere • Global Warming and Greenhouse Gases • Climate Variability and Climate Change • Extreme Weather Events and Their Causes • Heat Waves, Thunderstorms, Floods, Cyclones and Droughts in India • Seasonal Weather Systems over India • Impacts of Climate Extremes on Society, Agriculture and Health	
11:20 – 12:20 AM		**Lecture 2: : Climate-Induced Disasters and Disaster Risk Reduction** • Types of Climate-Induced Disasters • Hazard, Vulnerability, Exposure and Risk Assessment • Disaster Risk Reduction (DRR) Concepts • Early Warning Systems and Preparedness • Community-Based Disaster Risk Reduction • Climate Change Adaptation and Mitigation Strategies • Role of NDMA, NIDM, IMD, SDMA and NDRF	Dr. Navneet Kumar, Professor, NIDM
12:20 – 1:20 PM		**Lecture 3: : Meteorological Observations, Forecasting and Disaster Management** • Surface and Upper-Air Observations • Automatic Weather Stations (AWS) and Doppler Weather Radar • Introduction to Satellite Meteorology • Introduction to Numerical Weather Prediction (NWP) • IMD Forecasting Systems and Weather Bulletins • Basics of Disaster Management Cycle • Prevention, Preparedness, Response and Recovery	IMD

		• Role of Forecasting and Technology in Disaster Mitigation	
01:20 – 02:20 PM		Lunch Break	
02:20 to 03:20 PM		**Practical / Laboratory Sessions** **Practical 1** • IMD Weather Chart Analysis • Synoptic Weather Interpretation	Dr. G. Ch. Satyanarayana, Associate Professor, NIDM
03:20 to 03:30PM		Tea Break	
03:30 to 05:00PM		**Practical 2** • Heat Wave Identification using IMD Criteria • Extreme Weather Event Mapping using GIS	

Day 2 (07 July 2026)

Time	Module	Session Topic	Resource Person
09:30 – 10:30 AM	**MODULE – II** Satellite Meteorology and Remote Sensing Applications	**Lecture 4: : Fundamentals of Remote Sensing and Satellite Meteorology** • Electromagnetic Spectrum • Polar and Geostationary Satellites • INSAT-3D/3DR Satellite Systems	NRSC, ISRO, Hyderabad
10:30-10-45		Tea Break	
10:45 – 11:45 AM		**Lecture 5: Satellite Data Applications in Disaster Monitoring** • Cloud Monitoring	NRSC, ISRO, Hyderabad

		• Cyclone Tracking • Flood and Drought Assessment Forest Fire Detection	
11:45 – 12:45 AM		**Lecture 6: GIS and Satellite-Based Disaster Management** • GIS Applications • Google Earth Engine • Satellite Data Integration with Forecast Systems	Dr. Navneet Kumar, Professor, NIDM
12:45-1:45		Lunch Break	
1:45 – 2:45 PM		**Practical 1** • INSAT-3D/3DR Satellite Data Visualization	Dr. G. Ch. Satyanarayana, Associate Professor, NIDM
2:45 – 3:00 PM		Tea Break	
3:00 - 4:30 PM		**Practical 2** • Google Earth Engine and Spatial Applications for Drought, Flood and Heat Wave Mapping	Dr. G. Ch. Satyanarayana, Associate Professor, NIDM
Day 3 (08 July 2026)			
09:30 – 10:30 AM	**MODULE – III** Numerical Weather Prediction and High-Resolution Modelling.	**Lecture 7: Introduction to Numerical Weather Prediction (NWP)** • Fundamentals of NWP • Global and Regional Forecast Models • Data Assimilation Techniques	**Dr. A. Suryachandra Rao, Director, IITM, Pune**

10:30-10-45		Tea Break	
10:45 – 11:45 AM		**Lecture 8: Operational Forecast Systems** • IMD-GFS Forecast System • IITM Bharat Forecast • NCMRWF and UK Met Office Forecast Products	**Dr. A. Suryachandra Rao, Director, IITM, Pune**
11:45 – 12:45 AM		**Lecture 9: High-Resolution Weather Modelling** • WRF Model Basics • Ensemble Forecasting • Cyclone, Extreme Rainfall, Heat Wave and Thunderstorm Forecasting	Dr. Yesubabu Viswanadhapalli, Scientist, National Atmospheric Research Laboratory (NARL), ISRO
12:45-1:45		Lunch Break	
1:45 – 2:45 PM		**Practical 1** • IMD-GFS and Bharat Forecast Product Analysis	Dr. G. Ch. Satyanarayana, Associate Professor, NIDM
2:45 – 3:00 PM		Tea Break	
3:00 - 4:30 PM		**Practical 2** • WRF Model Visualization and Forecast Verification	Dr. Yesubabu Viswanadhapalli, Scientist, National Atmospheric Research Laboratory (NARL), ISRO
Day 4 (09 July 2026)			

09:30 – 10:30 AM	**MODULE – IV** Artificial Intelligence and Machine Learning in Weather Forecasting	**Lecture 10: Introduction to AI and Machine Learning** • Basics of Artificial Intelligence • Machine Learning Concepts • Applications in Weather and Climate Science	Dr. G. Ch. Satyanarayana, Associate Professor, NIDM
10:30 - 10-45 AM		Tea Break	
10:45 – 11:45 AM		**Lecture 11: Deep Learning for Weather Forecasting** • CNN and LSTM Models • AI-Based Rainfall and Heat Wave Prediction • Satellite Image Classification	Prof. P. V. V. Kishore, KL University, Guntur
11:45 – 12:45 PM		**Lecture 12: AI-Based Early Warning Systems** • AI for Disaster Prediction • Big Data Analytics • Decision Support Systems	Prof. P. V. V. Kishore, KL University, Guntur
12:45 - 1:45 PM		Lunch Break	
1:45 – 2:45 PM		**Practical 1** • Python Programming for Weather Data Analysis	Dr. G. Ch. Satyanarayana, Associate Professor, NIDM
2:45 – 3:00 PM		Tea Break	
3:00 - 5:00 PM		**Practical 2** • AI-Based Long Range Rainfall forecasting, Heat Wave and Rainfall Prediction Model Development	Dr. G. Ch. Satyanarayana,

			Associate Professor, NIDM
Day 5 (10 July 2026)			
09:30 – 10:30 AM	**MODULE – V** Disaster Mitigation, Early Warning Systems, Policies and Decision Support Applications	**Lecture 13: Disaster Preparedness, Policies and Mitigation Strategies** • Heat Action Plans • Flood and Cyclone Preparedness • Community-Based Disaster Risk Reduction • National and State Disaster Management Policies • Sendai Framework and National Disaster Management Policies • • Climate Change Adaptation and Mitigation Policies • Urban Resilience and Sustainable Development Goals (SDGs) • Role of NDMA, NIDM, IMD, SDMA and International Agencies	**Shri. Rohit Kumar** Assistant Professor, NIDM
10:30 - 10-45 AM		Tea Break	
10:45 – 11:45 AM		**Lecture 14: Early Warning Systems and Emergency Communication** • Multi-Hazard Early Warning Systems • Warning Dissemination Techniques • Public Awareness and Emergency Response • AI-Based Disaster Early Warning Systems • Disaster Communication Networks and Mobile Alerts • Role of Satellite and Forecast Systems in Early Warning	**Dr. V. S. Prasad, Director, NCMRWF, MOES, Delhi**

		• Emergency Operation Centers and Incident Response Systems	
11:45 – 12:45 PM		**Lecture 15: Integrated Decision Support Systems and Post-Disaster Recovery** • Impact-Based Forecasting • Climate Services for Agriculture and Water Resources • Disaster Management Applications using Emerging Technologies • Disaster Risk Financing and Insurance Mechanisms • Post-Disaster Recovery Planning • Resilient Infrastructure and Sustainable Recovery • Integration of Recovery Planning with Development Policies • Long-Term Climate Resilience and Adaptation Planning	Shri. Amarjeet Kumar, Assistant Professor, NIDM
12:45 - 1:45 PM		Lunch Break	
1:45 – 2:45 PM		**Practical 1** • NDRF Visit	NDRF
2:45 -03:00 PM		Tea Break	
03:15 – 04:00 PM		**Practical 2** • Preparation of Heat Action Plans • Disaster Risk and Vulnerability Mapping using GIS and Satellite Data • Post-Disaster Recovery and Resilience Planning Exercise	Dr. G. Ch. Satyanarayana, Associate Professor, NIDM

04:00 – 05:00 PM	**Valedictory**	
	Welcome Address	**Shri Manjeet Singh** Assistant Professor, NIDM
	Brief Overview of Training Programme	**Dr. G. Ch. Satyanarayana** Associate Professor,NIDM
	Special Address	**Dr. Navneet kumar** Professor, NIDM
	Felicitation of Guest of Honour	
	Guest of Honour Address	
	Way Forward	**Col P.S .Reddy** Joint Director, NIDM
	Vote of thanks	**Shri.Rohit Kumar** Assistant Professor, NIDM
	Certificate Distribution	Chief Guest & NIDM Team