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One Day Awareness Workshop on

Disaster Management and Mitigation using Modern Tools and Techniques

Organized by

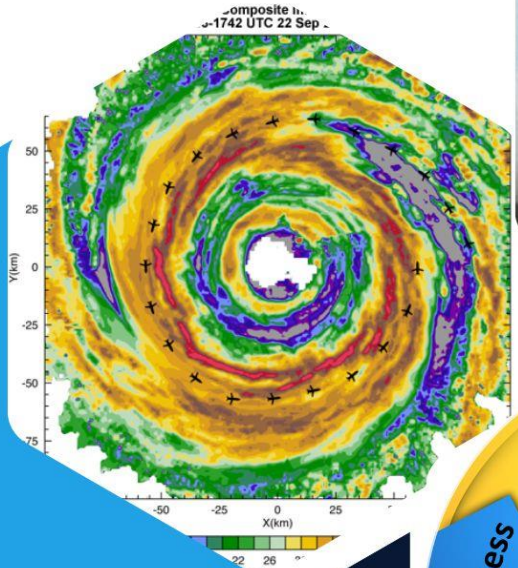
Department of Civil Engineering

School of Engineering and Technology

In association with

Center for Data Science and Machine Learning

13th July 2024



CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, ODISHA

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Overview of the workshop on Disaster Management and Mitigation using Modern Tools and Techniques

Dr. Prafulla Kumar Panda

Workshop Coordinator
Dean, SoET, CUTM, Paralakhemundi

Odisha is particularly vulnerable to a variety of natural disasters, including cyclones, floods, and droughts. The frequency and severity of these events highlight the urgent need for effective disaster management strategies. This workshop will concentrate on providing participants with the latest knowledge and practical skills to manage and mitigate the impacts of such disasters.

Given Odisha's susceptibility to natural disasters, this workshop is of utmost importance. By focusing on modern tools and techniques, we aim to equip participants with the necessary knowledge and skills to effectively manage disaster impacts. The insights gained will not only enhance personal and organizational preparedness but also contribute to the broader goal of building a resilient Odisha.

I extend our gratitude to ISRO-IIRS (Indian Institute of remote sensing) for their support in organizing this one-day awareness workshop on disaster management and mitigation using modern tools and techniques, specifically tailored to the context of Odisha. I also thank Centurion University of Technology and Management, Odisha, for providing the facilities to conduct the workshop. I would like to extend my heartfelt gratitude to all the speakers for accepting our invitation to deliver a lecture in the workshop. Your expertise and insights will undoubtedly enrich the event and provide valuable knowledge to our participants.

Workshop Objectives

Participants will gain insights into:

Enhancing Understanding: The workshop will provide a comprehensive overview of disaster management principles, tailored to the unique challenges faced in Odisha.

Modern Tools and Techniques: Participants will learn about cutting-edge tools and technologies that can be used in disaster prediction, monitoring, and response.

Skill Development: Hands-on sessions will equip attendees with practical skills to apply modern techniques in real-world scenarios.

Preparedness and Mitigation: Strategies for improving disaster preparedness and mitigation efforts will be discussed, focusing on reducing vulnerability and enhancing resilience.

This workshop promises to be an invaluable opportunity for all participants to enhance their understanding, skills, and preparedness in managing disasters effectively. Your participation and engagement are crucial to the success of this initiative, and we look forward to a productive and informative session.

History and Evolution of Disaster Management with particular focus on India

Prof. (Dr.) Surya Parkash

Professor and Head, CBRN and Cyber Disaster Risks Management Division, National Institute of Disaster Management, Ministry of Home Affairs, Govt. of India

Abstract:

The history of disasters on the earth goes back to its origin as pointed out in the big bang theory. Most of the disasters have been related to geodynamic processes as volcanoes and earthquakes which have been described using the plate tectonic theory and the concept of continental drift. However, there have been several instances of disasters like lightning, floods, droughts, desertification, forest fires, hailstorms and other extreme weather events due to atmospheric processes and meteoritic activities that led to extinction of some of the bio-species (e.g., dinosaurs) from the earth. But the invasion of human civilization on this planet through ill planned and unscientific industrialization has resulted in many new forms of disasters like chemical, radiological, nuclear, biological, industrial and cyber disasters etc. The frequency, intensity and severity of these disasters have actually eroded away all the hard-earned gains of development and growth. There is an urgent need to maintain balance between sustainable development and disaster management along with changing climatic conditions.

The matter has been discussed at length in the United Nations General Assembly on 22 December 1989 and a consensus was arrived to launch an International Decade for Natural Disaster Reduction from 1st January 1990 to 31 December 1999. During the year 1994, Japan organized the first World Conference on Disaster Risk Reduction (WCDRR) under the umbrella of United Nations and came out with Yokohoma Strategy for a Safer World. The Ministry of Agriculture and Farmers Welfare, Government of India established a National Centre on Disaster Management (NCDM) on 20 March 1995 at Indian Institute of Public Administration, New Delhi. The NCDM served as a Secretariat for the High-Power Committee (HPC) from the year 1999 to 2001. The HPC identified different types of disasters and grouped them into 6 broad categories. It was realized that disasters are not limited to droughts, floods, famines and pest attacks but also included earthquakes, landslides and cyclones etc. It also proposed an institutional system and funding mechanism for disaster management. Based on the discussions held during the HPC meetings and recommendations of a parliamentary committee, the subject of disaster management was transferred to Ministry of Home Affairs (MHA) during the year 2002. The MHA upgraded the NCDM to National Institute of Disaster Management (NIDM) on 16 March 2003. The country witnessed many disasters like Uttarkashi Earthquake (1991), Latur Earthquake (1993), Jabalpur Earthquake (1997), Malpa Landslide (1998), Odisha Supercyclone (1999), Bhuj Earthquake (2001), Indian Ocean Tsunami (2004) and Kashmir Earthquake (2005). These events led to passing of disaster management bill from both the houses of parliament and it was signed by the honourable President of India on 23 December 2005.

During the year 2005, Japan held the second WCDRR and came out with Hyogo Framework of Action (HFA) for the period from 2005 to 2015. The Administrative Reforms Commission during the year 2005 emphasized on mainstreaming disaster management in education sector. The Disaster Management Act led to establishment of National Disaster Management Authority (NDMA) during the

year 2005 and National Disaster Response Force (NDRF) as well as notification of NIDM as a Statutory Body as per legal provisions. The NDMA worked on national guidelines on management of different types of disasters and came out with a national policy on disaster management during the year 2009. The State Disaster Management Authority (SDMA) and District Disaster Management Authority (DDMA) have been established in all the states and UTs as per disaster management act.

During the year 2015, the third WCDRR was organized at Sendai, Japan wherein the Sendai Framework on Disaster Risk Reduction (SFDRR) was declared for the period from 2015 to 2030. In the same year, the Sustainable Development Goals (SDGs) succeeded the Millenium Development Goals (MDG) and also the COP21 on Climate Change was organized at Paris, France. The Government of India organized the first Post-Sendai Asia Ministerial Conference on DRR (AMCDRR) and honourable Prime Minister of India suggested a 10-point agenda on DRR during the year 2016. The NDMA approved the National Disaster Management Plan during the year 2019 which was revised as per SFDRR after its first release during the year 2016. The Government of India used the provisions of DM Act between the year 2020 and 2022 when Covid-19 pandemics invaded. Thus, there have been lot of development and action at national and global levels that strengthened the capacity on disaster risk reduction.

Dynamics of Climate Change and its Impact on Meteorological Hazards with Mitigation on Odisha Context

Dr. Sarat Chandra Sahu

Director, Centre for Environment & Climate, S O A, Bhubaneswar
Former director, IMD, Bhubaneswar

Introduction:-

Climate change has been realized during 1840s when indisputable evidence of former ice ages was obtained. The climate has altered sufficiently in many parts of the world even within the last few decades which will affect the possibilities for agriculture and settlement. Reliable weather records have been kept only during the last hundred years or so, but proxy indicators of past conditions from tree rings, pollen in bog and lake sediments, ice core records of physical and chemical parameters and ocean foraminifera in sediments provide a wealth of paleo climatic data. A change in climate can occur in several different ways, for example, there may be a shift in the mean level, or a gradual trend in the mean values. The variability may be periodic, quasi-periodic or non-periodic, or alternatively it may show a progressive trend. First, it is important to determine whether such changes are real or whether they are an artifact of changes in instrumentation, observational practices, station location, or the surroundings of the instrumental site, or due to errors in the transcribed data. The standard interval adopted by the World Meteorological Organization for climatic statistics is thirty years: 1901–30, 1931–60 etc. for examples. Now, recent 1981-2010 climate normal of Indian stations are available in IMD.

Causes:-

The factors responsible for climate change are called Climate forcing. The occurrence of Climate change is mainly due to natural and manmade processes but the variability of climatic parameters due to natural ways are very slow and gradual whereas the change in climatic pattern due to manmade or

anthropogenic processes are very acute and fast. The variations in solar radiation, deviations in the earth's orbit, mountain building & continental drift and changes in greenhouse gases concentrations are included in climate forcing. There are a variety of climate change feed backs such as positive feedback and negative feedback which can amplify or diminish the initial forcing. Some parts of the climate system, such as the oceans and ice caps, respond slowly in reaction to climate forcing because of their large mass. Therefore, the climate system can take centuries or longer to fully respond to new external forcing. There are some reasons which increase the global temperature mainly due to deforestation and forest fires. The total increase in terms of tons of carbon was 564 million, which according to the Chicago Sun Times article is higher than the individual emissions of all but three countries across the globe. Those three countries are China, India and the U.S. According to the U.S. Department of Energy, from 2009 to 2010 there was a whopping 6% increase in carbon released into the atmosphere globally. It is the highest percentage of increase since available record of 1751. It is due to burning of fossil fuels.

Moreover, among greenhouse gases, methane is up to 20 times more effective in trapping heat in the atmosphere than carbon dioxide. It is created from a variety of natural and human-influenced sources which include landfills, natural gas, and petroleum sources. The scientists calculated the animals would have collectively produced more than 520 million tons of methane a year-more than all today's modern sources put together. Dinosaurs may have partly responsible for causing climate change as they emitted the potent global warming gas, methane. It is believed that the giant animals spent 150 years emitting methane. In fact, large plant-eating sauropods would have been the main culprits due to the huge amounts of greens they consumed and after breaking down in the animal's stomach it would have produced thousands of liters of the greenhouse gas compared with a modern cow which only produces 200 liters of methane daily, according to the scientists. The climate change was so catastrophic that it caused the dinosaur's eventual demise.

Effects of Climate Change:-

The impacts of global warming on climate will be significant. As temperature warms, more moisture can be evaporated into the air. Semi-arid areas are becoming deserts because of increase in temperature which in turn evaporates critical moisture that is needed for the land. Dry climates are becoming drier and wet climates are becoming wetter. With more moisture evaporating into the air, where it does rain, the rain is more intense. This creates extreme flooding in areas due to moisture advection and rains out with higher intensity. Climate change may cause the collapse of Indus valley civilization around 4000 years ago. The study, combining the latest archaeological data along with state-of-the-art geosciences technologies, suggested that decline in monsoon rains led to weakened river dynamics and played a critical role both in the development and the fall of the Harappan culture which relied on river floods to fuel their agricultural surpluses.

The global average temperature for May, 2012 is the 2nd hottest ever since 1880 as compared to the hot experienced in May, 2010. US National Climatic Data Centre has said that such a hot May was never recorded in the Northern Hemisphere. It is believed that these extreme weather phenomena are along predicted lines of rise in global temperatures. But the misery of rising heat is being felt worldwide with normal weather systems in disarray. If large areas of the western Himalayas in Uttarakhand and have suffered raging forest fires, so has the US-more than 8 lakh hectares have been engulfed in flames. The March-May period for the US has been the hottest ever. Brazil is in the midst of its worst drought in five decades with more than 1,000 towns suffering. Heavy downpours and freak hail has hit China and flash floods have ravaged crops in Ethiopia.

Due to climate change, natural disasters are in increasing trend. Disaster is referred as any sudden, unexpected or extraordinary misfortune regardless of whether it occurs to an individual, a family or other small groups, a community, a region, a nation or the entire world. Natural disasters affect countries large and small, rich or poor, whatever their political persuasion. The toll exacted by natural calamities each year drains the human and economic resources of every nation and stands as one of the formidable barriers of national, regional and world development. It is well known fact that natural disasters are acts

of God but losses due to them are acts of man. Lot of human suffering and misery from a large number of natural disasters can be mitigated by taking timely actions, preventing mechanisms and undertaking capital works of long and medium terms. The social and economic losses of disasters are very high and often immeasurable. The poor and the marginalized like the small and landless farmers and the agricultural laborers are the most sufferers by this. Due to climate change, frequency and intensity of natural disasters are now very much concerned now days by the general public. We have to analyze in the context of Orissa for different type of natural disasters.

Moreover, the devastating toll of natural disasters is rising each year, in spite of our increased understanding of hazards and this is a matter of concern how to mitigate them. Odisha is located in the Eastern coast roughly between Lat. 17049′ N and 22036′ N and Long. 81036′ E and 87018′ E. Odisha is one of the most disastrous prone states in India as well as also in the world by meteorological hazards. In view of its tropical location and the long coast line, Odisha is vulnerable to major natural hazards like Cyclones, floods, heat waves, cold waves and droughts. Besides these, some parts of Odisha also fall under seismic zone III. Due to increase in extreme events, now time has come to predict the extreme weather just before 3 hours of its occurrence for saving the life of human beings and animals. To make aware the people about adverse weather condition IMD provides weather forecast in short range, medium range, extended range and long-range methods but keeping in view the frequent severe weather in recent past, IMD has developed nowcasting system in India including Odisha. To achieve the goal, 55 Doppler Weather Radar (DWR) networks are being established in India and two of such systems at Paradeep & Gopalpur are already in operation and other two at Balasore & Sambalpur to be installed in Odisha in next phase. Moreover, availability of satellite pictures in every 30 minutes with cloud top temperature help meteorologists to predict accurately the extreme weather condition such as heavy rainfall, severe thunderstorm, thunder squall etc. in next three hours in a specific area and technological development also support to forecast severe lightning before 45 minutes of their occurrence though it is now experimental in India but it may be fruitful in reality in next 2 to 3 years.

India with its long coastline is vulnerable to the impacts of tropical cyclones that develop in North Indian Ocean (Bay of Bengal and the Arabian Sea). These systems are classified as depressions, deep depressions, cyclonic storms, severe cyclonic storms, very severe cyclonic storms, extremely severe cyclonic storms and super cyclonic storm. In 2013, four very severe cyclones formed in Bay of Bengal and they are named as Phailin, Helen, Lehar & Madi but only PHAILIN crossed Odisha coast as very severe cyclonic storm which caused devastation in many districts of Odisha whereas rest three cyclones were dissipated in the Bay of Bengal or crossed the coast with reduced intensity. Similar intensity of other cyclones Hudhud, Titli and Fani crossed Andhra Pradesh and Odisha coast 2014(Hudhud-AP), 2018 (Titli-AP) and 2019 (Fani-Puri, Odisha) respectively which caused severe devastation including human/animal casualties as well as crop loss in southern and coastal districts of Odisha.

Odisha is a flood prone state and predominantly a flat deltaic and river-irrigated land. The whole Odisha is criss-crossed by seven major rivers the Mahanadi, the Subarnarekha, the Budhabalang, the Brahmani, the Baitarani, the Vansadhara and the Rusikulya with their tributaries which ripped the state. Rainfall is abundant from June to September and occasionally tropical cyclone strikes the coastal area, bringing the torrential rainfall. Odisha faces flood every year during monsoon.

Heat wave is a recurring phenomenon in Odisha. The last couple of decades have seen several of the hottest years on record. Global warming plus local urbanization are contributors for such hottest years in recent past. As places urbanize, they heat up (urban heat island). Temperature sensors in an urbanizing area will warm more than they otherwise would. Add to this global warming and it is no surprise that the hottest years in history have occurred recently. Temperature recorded every year is indicated as the highest temperature in comparison to previous year’s data.

Conclusion:-

In view of the global environmental changes, it is likely that the frequency and impact of disasters will increase in the world over. The population pressure is causing degradation of environment by interrupting the water flow, hydrological cycles, causing either landslide, floods, soil erosion etc. As a welfare state, the Government will have to take the lead in disaster prevention and reduction and mitigating their impact, enhancing the awareness of the coping mechanisms among the people and to prevent loss of lives and property.

The public awareness will have to be also created through the NGOs apart from the local administration. It should be the combined effort of the Government at Centre, the State, the District and the Panchayats. NGOs and people are to pool their resources, capability and put in their best efforts to face the situation and to mitigate the losses.

Development of Aqua-WISE and GOWATER Platforms for River Basic Inflow Forecast and Disaster response Actions in Odisha

Dr. Debajit Mishra

Consultant Vassar Labs Ltd. Hyderabad/ Odisha Water ERP, Ex Chief Executive (I/C)/Scientist F, ORSAC

Abstract

Integrated Water ERP System (GOWATER) utilises latest technology like IoT, Remote Sensing, Cloud computing, Artificial Intelligence, Machine Learning, Big Data, etc. to process real-time hydrological and climatological data for over-all planning and operation of the water resources of the state. Water ERP is one umbrella system that host all IT systems pertaining to Realtime dashboards, Hydrological modelling, inflow forecast, Planning & operational systems, Project monitoring systems, Irrigation management system, etc. GOWATER have modules for forecasting, and assessment analytics on flood disaster; various Decision support system for planning and operation of Reservoir; Project monitoring system and modules for Canal & other modes of Irrigation Management. Water ERP is mainly for flood forecasting system, Inundation forecast & assessment and real time reservoir operations in all the eleven river basins of the state, namely, Mahanadi, Brahmani, Baitarani, Budhabalanga, Indravati, Kolab, Nagavali, Subernarekha, Bahuda, Rushikulya & Vansadhara. Inflow forecast/Flood forecasting and flood inundation modules are developed to operate on real-time basis for all 11 basins that provides early warning for extreme flood events, and better flood control protocols for major structures and vulnerable zones. Reservoir Operation (ROP) management system is set-up for 50+ reservoirs and dams across the 11 basins in the state, that will create dynamic optimized operation schedules of reservoirs to minimize flood in the downstream reaches, and minimize deficit on drinking, irrigation, industrial demands in its command area.

Revisiting Disaster Risk Management

Choosing a trajectory: Fragility to resilience or the other way around?

Dr. Repaul Kanji
Co-Founder, GRRID Corps
Co-Founder, CRRP India
Co-Chair, U-INSPIRE Alliance
IRDY Young Scientist

Abstract:
The session will explore the critical shift in the domain of disaster management; moving beyond the myth of simply "managing disasters" and delving into the comprehensive idea of Disaster Risk Management (DRM). The evolution of DRM would be traced, with a focus on the Sendai Framework for Disaster Risk Reduction (SFDRR). This session will equip the participants to identify the root causes of disaster risk, which essentially includes climate risks. The session will unpack the process of disaster risk creation, helping the participants to ideate risk reduction, moving away from the vicious cycle of response, recover, rebuild and repeat! The key to building resilience lies not in top-down solutions, but in '**glocal' action**. The session will cite inspiring examples of community-driven initiatives from around the world, demonstrating how local action is at the core of risk-informed sustainable development.

Applications of UAV in Disaster Management

Mr. Narendra Singh Kachhotiya
Independent, International Techno-Humanitarian Professional

(A diverse, seasonal, independent, international, humanitarian, and development professional with a mindset to transform the lives of disadvantaged communities while building a resilient ecosystem)

Abstract:

Disaster frequency has significantly increased due to climate change. Both rural and urban populations face various risks. Responding to disasters is consistently challenging and time consuming. While hazards are natural, their escalation into disasters makes it crucial to swiftly rescue affected populations. Technology, combined with human skills, aims to reduce disaster impacts. UAVs play a vital role pre and post disasters by using real-time data to make critical decisions, aiding affected communities. The rapid evolution and diverse applications of UAVs address escalating concerns effectively.

About Centurion University of Technology and Management

Centurion University of Technology & Management (CUTM), Established in 2010, accredited with NAAC A+ is Odisha's first multi-sector private university, recognized by U.G.C. Its core mission is to empower communities and provide educational opportunities for the underprivileged. CUTM offers diverse graduate, postgraduate, and doctoral programs in fields like agriculture, engineering, management, architecture, media, and vocational education, uniquely combining higher education with skill development.

About Civil Engineering Department

The Department of Civil Engineering at SoET offers B. Tech, M. Sc Geoinformatics and M. Tech programs in various specialized fields. With ample infrastructure and a blend of experienced senior faculty and motivated young educators, it fosters students' learning and knowledge acquisition. CUTM's uniqueness lies in its CBCS curriculum and domain projects like Aerial Surveying and Remote Sensing, allowing students to align their studies with their professional interests.

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