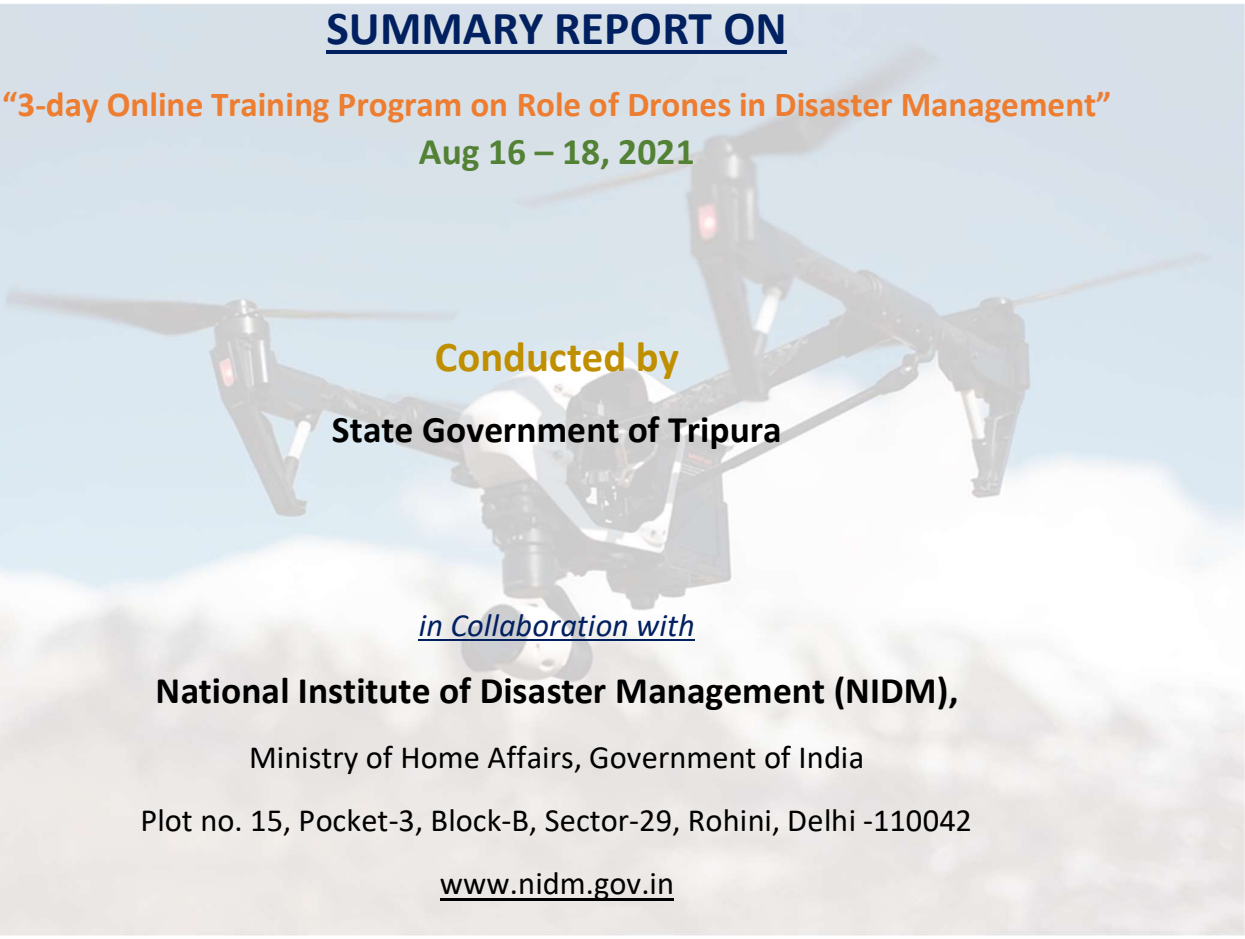
SUMMARY REPORT ON

"3-day Online Training Program on Role of Drones in Disaster Management"

Aug 16 – 18, 2021



Conducted by

State Government of Tripura

in Collaboration with

National Institute of Disaster Management (NIDM),

Ministry of Home Affairs, Government of India

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Flyer:

Organising Team

- **Prof Chandan Ghosh, Head, Resilient Infrastructure Division, NIDM**
- **Dr. Garima Aggarwal, Senior Consultant, NIDM**
- **Mr. Shaad Warsi, Young Professional , NIDM**
- **Shri Sarat Das, State Project Coordinator, Disaster Management, Government of Tripura**
- **Mr Rubaab Sood, Head Disaster Risk Management, FICCI**
- **Mr Akhil Gupta, Joint Director, FICCI**
- **Mr Mainak Majumdar, Deputy Director, FICCI**

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1. ABOUT NIDM

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.

NIDM is proud to have a multi-disciplinary core team of professionals working in various aspects of disaster management. In its endeavour to facilitate training and capacity development, the Institute has state-of-the-art facilities like class-rooms, seminar hall and video-conferencing facilities etc. The Institute has a well-stocked library exclusively on the theme of disaster management and mitigation. The Institute provides training in face-to-face, on-line and self-learning mode as well as satellite based training. In-house and off-campus face-to-face training to the officials of the state governments is provided free of charge including modest boarding and lodging facilities.

NIDM provides Capacity Building support to various National and State level agencies in the field of Disaster Management & Disaster Risk Reduction. The Institute's vision is to create a Disaster Resilient India by building the capacity at all levels for disaster prevention and preparedness.

2. ABOUT FICCI

Established in 1927, FICCI is the largest and oldest apex business organisation in India. Its history is closely interwoven with India's struggle for independence, its industrialization, and its emergence as one of the most rapidly growing global economies.

A non-government, not-for-profit organisation, FICCI is the voice of India's business and industry. From influencing policy to encouraging debate, engaging with policy makers and civil society, FICCI articulates the views and concerns of industry. It serves its members from the Indian private and public corporate sectors and multinational companies, drawing its strength from diverse regional chambers of commerce and industry across states, reaching out to over 2,50,000 companies.

FICCI provides a platform for networking and consensus building within and across sectors and is the first port of call for Indian industry, policy makers and the international business community.

3. ABOUT THE TRAINING PROGRAMME

During Covid-19, we see unmanned aerial vehicles (UAVs, or drones) being used for critical services. These include monitoring crowds, disinfecting contaminated areas, thermal screening of groups to detect fever, broadcasting information and delivering medical supplies.

UAVs provide significant advantages over traditional methods of operations. They minimise physical risks while reducing considerably response time and costs. They also help enhance disaster resiliency. Drones can fly at low altitudes and can reach places where big aircraft cannot. They provide a significant cost advantage in terms of operation and maintenance.

What makes drones highly efficient is their mobility coupled with the capacity to carry payloads such as cameras and sensors., along with in-built advanced navigation systems and basic safety features. It is easier and safer to guide them accurately to inaccessible areas. Drones can capture real-time high-resolution images of disaster zones while covering vast areas in a single operation, generating a vast amount of data. This allows response teams to map areas and conduct risk and damage assessment promptly from remote locations. This also helps in locating victims in real-time, enabling faster and safer search and rescue operations. This expedites relief efforts while making the response more targeted.

Globally, UAVs have been used by various aid organizations during natural disasters. In India, the National Disaster Management Authority (NDMA), an apex body for disaster management, used drones for the first time during the Uttarakhand floods in 2013, and subsequently during the Kerala floods in 2018.

UAVs are also used to transport emergency medical supplies, first aid and essential food items to remote and inaccessible areas for addressing supply chain gaps. Following in the footsteps of Rwanda and Ghana, which use drones to deliver blood and essential medicines to far-flung clinics, Telangana is also working on 'Medicine from the sky' project with the World Economic Forum and Healthnet Global to use drones for delivering medical supplies to remote areas of the State. Fire-fighting drones have proven effective in managing wildfires or structure fires along with conducting search and rescue missions and minimising casualties. Fire departments in many countries have already inducted drones as part of their operations. Mumbai's fire department is considering using drones to assist its personnel in operations. Drones are also being used by law enforcement agencies for crowd surveillance, traffic management and for maintaining security at large events. The Kerala police is deploying drones in the state to track violators of current lockdown orders to fight Covid-19. Rapid deployment of first response within 60 minutes of an incident (known the 'golden hour') can mean the difference between life and death, and drones can be a hugely valuable tool in making a first assessment. While a disaster is ongoing, drones can be extremely useful in aiding emergency services to figure out how best to plan their rescue efforts.

Increasingly, drones are being used to assist these services in various stages of emergency management. In fact, UAVs can assist with managing the impact of a disaster both during and after the event.

The first documented use of aerial drones was in 2005 after Hurricane Katrina in the United States of America. Because roads were blocked by trees, drones were deployed to search for survivors and assess river levels. Aerial drones are currently used for different disaster phases: preparedness, such as

monitoring volcanic activity in order to determine when warnings should be issued; response, such as delivering equipment to locations where ground-based transportation has been disrupted; and recovery, such as photographing disaster areas for damage assessments. Underwater drones were used during the 2018 Hurricane Florence in the United States of America, measuring ocean heat fueling the hurricane and transmitting data to the National Weather Service. An avalanche of data is being generated by sensors, closed-circuit television, smartphones, financial transactions and Internet activities, to name just a few. While many of these data are being mined by businesses for commercial purposes, Big Data analytics holds enormous potential for crisis management.

Disaster management is an ideal use case for IoT applications, since sensors can send alerts about a number of potentially dangerous situations. Tree sensors can detect if a fire has broken out by testing temperature, moisture and carbon dioxide levels. Ground sensors can detect earth movements, which might signal earthquakes. River levels can be monitored by sensors for possible flooding.
AI could have a tremendous impact for disaster management regarding quickening recovery and response times. Humanitarian groups are hoping to speed up map creation by using machine learning to extract objects such as buildings and roads from aerial images. Considerable research is currently being devoted to the use of AI for detecting and possibly one day predicting earthquakes.

CIDM Board at FICCI is working jointly with National Institute of Disaster Management (NIDM), Ministry of Home Affairs, Government of India in this digital convention, called “Online Training Programme on Role of Surveillance Technologies in Disaster Management – Focus on Drones” which will be followed by a series of Thematic Workshops. The broad objective of these activities is to work towards improved preparedness, risk reduction, mitigation and emergency response capabilities by working in close collaboration with all the stakeholders.

This 3-day Online Programme will find gaps and suggest areas for improvements to address gaps still existing in the role and application of surveillance technologies in India – needs, actions, resources, constraints and gaps in use of drone technology in India.

KEY POINTS OF THE 3 Day PROGRAMME

a) Drones and IoT are increasing in application, as experience is gained, and costs fall. Older technologies such as satellite imagery and seismometers are still the most important methods for detecting, monitoring and accessing disasters, and text messaging has the widest reach for communicating with the public.

b) While there is evidence that AI can accurately predict some types of disasters before they happen, the application of disruptive technologies today has a more incremental effect. These technologies are refining processes by spreading critical information more quickly, improving understanding of the causes of disasters, enhancing early warning systems, assessing damage quickly, and adding to the knowledge base of the social behaviours and economic impacts after a crisis strikes. Disruptive technologies are improving situational awareness by providing the crisis community with a clearer understanding of the extent of damage and where to prioritize resources.

c) Reach of digital technologies must be factored into disaster management strategies. In respect to communications among stakeholders, this includes considering the purpose and audience.

d) A global repository featuring information on how digital technologies are being applied for disaster management would raise awareness and understanding. Hundreds of applications of disruptive technology are underway around the world, but experiences are often buried in news articles and research reports.

e) Partnerships with the private sector and academia will be critical for understanding and applying digital technologies for disaster prediction, detection, response and relief. Numerous uses of disruptive technologies are being developed by the private sector. In addition, the private sector controls significant amounts of personal information in Big Data sets that are of immense use for the disaster community. Similarly, considerable relevant research is being undertaken by the academic community. Ties between the disaster community, private sector and academia need to be strengthened.

f) Training is indispensable for the disaster community to understand how to properly deploy new and emerging digital technologies in crisis settings. Manuals are needed for different technologies.

g) Legal ramifications of technological research and interventions for disasters need to be understood. The disaster community has developed codes of conduct in certain areas, including data protection, that can help when laws are vague, such as blurring images of people when filmed by drones.

h) Adequate capacity remains fundamental for properly planning and deploying relevant digital technologies. While digital technologies show great promise for all phases of disasters, on-the-ground planning, management and operations are critical to their success. Disaster agencies do not need to be experts in digital technologies, but they do need to understand enough about them to develop proactive blueprints for deploying them. Disaster agencies might also consider creating a chief technologist post to better understand how to apply disruptive technologies.

TARGET AUDIENCE

The training programme will congregate delegates from various industries/sectors beside experts and relevant functionaries from the central/state government ministries/departments.

PROGRAMME DETAILS & LEARNING METHODS

The online training programme is scheduled for ***Aug 16-18, 2021 (02:30 pm - 04:30 pm)*** and will be hosted on ***Cisco Webex platform***. Participants are requested to install the Cisco Webex App in their mobile or laptop.

4. PROGRAMME SCHEDULE

Day 1: Wednesday, Aug 16, 2021

Theme: Drone Technologies and Disaster Management

Time	Resource Person
Moderator: Mr Rubaab Sood, Head, Disaster Risk Management, FICCI & Prof. Chandan Ghosh, NIDM	
2:00 PM – 2:45 PM	**Inaugural Session** Welcome Address by **Mr Rubaab Sood**, Head, Disaster Risk Management, FICCI Opening Remarks by **Smt Tanushree Deb Barma**, IAS, Revenue Secretary, Government of Tripura Opening Remarks by **Prof. Chandan Ghosh**, Professor& Head, Resilience & Infrastructure Division, NIDM, Government of India Special Remarks by **Mr. N M Prusty,** President, President, Humanitarian Aid International (HAI) Inaugural Address by **Mr Alok Mukherjee, Director, DRDO, Ministry of Defence, Government of India** Keynote Address by **Major General M K Bindal,** Executive Director, NIDM Government of India Special Remarks by **Lt Gen (Dr) J R Bhardwaj,** Chairman, CIDM and Former Member, NDMA, Government of India
2:45 PM - 3:15 PM	Lead Lecture on **"State of the ART of Surveillance tools in Disaster Management"** by **Dr Chandan Ghosh**, Professor & Head, Resilience and Infrastructure, NIDM, Government of India
3:15 PM – 3:45 PM	Presentation on "**Post Flood Drone-based surveys and PDNA- Experience sharing"** by **Mr. N M Prusty,** President, President, Humanitarian Aid International (HAI)
3:45 PM – 4:30 PM	Presentation on **"State of the Art of RS & GIS in Tripura "** by **Mr. Abhishek Dasgupta, Scientist, Tripura Space Application Centre**
Question and Answer: 30 mins	

Day 2: Thursday, Aug 17, 2021

Theme: Role & Application of Drones in Disaster Risk Mitigation an Management - Tripura

Time	Resource Person
2:00 PM – 2:45 PM	Presentation on "**Drone technology and ethical issues in India"** by **Dr. Alok Mukherjee, Director, DRDO, Ministry of Defence, Government of India**

2:45 PM – 3:30 PM	Presentation on **" Advanced AI for Condition monitoring, process optimization & asset management"** by **Abhishek Ghosh**, Director, PAiAS RELIABILITY SERVICES, Kolkata, India
3:30 PM – 4:15 PM	Presentation on " **SMART Application of Drones in Search and Rescue Mission**" by **Mr. Srivatsan Desikan, an IIT-BHU alumni, Founder & CEO of DroneInch, Fremont, USA**
3:30 PM – 4:15 PM	Presentation on **"Application of RGB, thermal, multispectral, LIDAR imageries with Drones"** by **Dr U. Pruthviraj**, Assistant Professor, Dept. of Applied Mechanics, NIT- Karnataka, Surathkal
Question and Answer: 30 mins	

Day3: Friday, Aug 18, 2021

Theme: Robotics, Drone Software, Hardware and Artificial Intelligence

Time	Resource Person	
2:00 PM – 2:45PM	Presentation on "**Potential of Drone Surveillance Technology for Tripura"** by **Prof. Bharat Lohani,** Department of Civil Engineering, IIT Kanpur	
2:45 PM – 3:30 PM	Presentation on "**Use of Drone in Crop Disease surveillance for the Tripura**" by Mr. Srinivasa Karavadi, Head of Market Development India Bangladesh & Sri Lanka, Bayer CropScience Limited, Board of Directors - Croplife India	
3:30 PM – 4:15 PM	Presentation on **"Aerial Survey by LiDAR and Roadmap for Disaster Managers"** by **Mr. Chirag Gupta, NESAC**	
4:15 PM – 4:30 PM	Guest Observer Interaction and Feedback **Dr Sunandan Dutta,** Post Doc Researcher, Hiroshima University, Japan on the "**Light-weight Robotics for Disaster Applications in Japan**"	
Question and Answer: 15 mins		
4:45PM – 5:00 PM	**Vote of Thanks**	**Dr Chandan Ghosh**, Head, Resilience and Infrastructure, NIDM, Government of India **Dr Muzaffar Ahmad**, Former Member, National Disaster Management Authority, Government of India **Mr Rubaab Sood**, Head, Disaster Risk Management, FICCI **Dr Sarat Kumar Das,** SPO-DM, Tripura

5. INAUGURAL SESSION

The 3 day Online Training Programme on began with the welcome address by **Mr. Rubaab Sood, Head, Disaster Risk Management, FICCI**. He thanked Government of Tripura, NIDM and Prof. Chandan Ghosh for giving him opportunity to work with him. He welcomed all the key speakers and thanked them for joining this initiative in the time of COVID for an OTP on "Role of DRONES in Disaster Management". Mr Sood said that Disaster risk reduction, preparedness, response, recovery, relief and rehabilitation form the building blocks of disaster management. Drones help reinforce and amplify the impact of each of these blocks exponentially. Disaster response, in particular, has seen major strides and improvement with these Unmanned Aerial Vehicles (UAVs) or drones.

Prof. Chandan Ghosh, Professor & Head, Resilience & Infrastructure Division, NIDM, Government of India during his opening remarks shared his thoughts from the disaster management perspective. He said that he had just bulleted some information, based on his reading on the subject. He added that he is trying to work on the area on drones and its uses for disaster risk reduction. He further mentioned that he is not a subject specialist in this area, but he can foresee the uses of drones in disaster management. He also added as to what kind of investment, other countries are doing right now and the scientific knowledge and know how and what are the things that need to be identified and what are the interrelations and the future, which is waiting. He mentioned that drones are often referred as vehicles, which do not have a human occupant and that drones operate without human intervention and that they are sometimes classified as robots. He further mentioned that UAVs are also used to transport emergency medical supplies, first aid and essential food items to remote and inaccessible areas for addressing supply chain gaps.

Mr. N M Prusty, President, President, Humanitarian Aid International (HAI) during his special remarks said that it's wonderful to observe the tremendous power of drone technology. He mentioned that drones are going to be the future of this country. He added that this is going to be the technology for good governance. He further mentioned that on the humanitarian ground, it is only humanitarian sectoral subsector of the whole development spectrum. He also added that development and disaster management together will be enormous opportunity for application of drone. He further mentioned that use of drone technology for humanitarian work is a key to effective disaster risk management. He said that they had done about 6 pilot trials from Post cyclone and some posts floods. He further mentioned that they are working with Indian Institute of Science innovation centre and gave an example of Jaipur flood.

Mr Alok Mukherjee, Director, DRDO, Ministry of Defense, Government of India during the Inaugural remarks said that he is working on areas related to mitigation of man-made disaster in DRDO. He said his team is involved in developing Robotic Solutions to handle such kind of exigencies, so that we don't have to endanger soldiers or security person on ground. He mentioned that all the technologies that his organization have made for man-made disaster management have an application in natural disaster as well.

6. TECHNICAL SESSION: DAY 1

Mr. Abhishek Dasgupta, Scientist, Tripura Space Application Centre (TSAC) in his presentation on "State of the Art of RS & GIS in Tripura" gave a brief introduction about TSAC said that TSAC is the nodal agency in Tripura for space technology related activities and has the mandate to employ space technology for the benefit of the state and its people. He said it was established earlier in the year 2000 under the department of Science Technology & Environment, Government of Tripura. He said that in order to overcome the daunting challenges, due to its terrain conditions, Tripura need to enhance the use of Technology, especially space technology, which is of dire necessity. Hence, the prime objective of TSAC is to explore and deploy geospatial technology for the development of the state. Consequently, TSAC boasts of a close relationship with National Remote sensing Centre and the Northeastern Space Application Centre, Department of Space, Government of India that has benefited the state immensely and constantly strives to develop and intensify this productive associations.

7. TECHNICAL SESSION: DAY 2

Dr Alok Mukherjee, Director, DRDO, Ministry of Defence, Government of India during his presentation on "Drone technology and ethical issues in India" spoke on the ethical issues on various aspects of disaster management and use of drone technology. He said that one may have UAV/ USG for surveillance or for other applications provided they are not lethal in nature. He also mentioned about glitches in the software and said that it can be a bug or technologies which have potentially bad ramifications, need to be avoided and looked in detail.

Abhishek Ghosh, Director, PAiAS RELIABILITY SERVICES, Kolkata, during his presentation on "Advanced AI for Condition monitoring, process optimization & asset management" India spoke about PAiAs and said that PAiAs are directed to provide the best services when it comes to pro-active maintenance to achieve zero surprise failure through a dedicated team having decades of experience in the field of condition monitoring. He added that we use technologies like Vibration Analysis, Oil Analysis, Thermal analysis, Ultrasound Analysis and so on. He also added that their technology partners are Symohony Industrial AI which is Artificial Intelligence based company in the field of reliability and Hamar Laser is

worlds number in alignment technology. In small introduction about both the companies he said that Symphony origins dates back, more than 50 years to the inception of technology-enabled industrial asset condition monitoring, pioneered by the US Navy's aircraft carrier fleet. For Hamer laser he mentioned that HL invented the first laser alignment systems nearly 50 years ago and the company that remains on the cutting edge of laser alignment technology, solving alignment problems from very simple shaft alignment application integrated into automated control systems.

Mr. Srivatsan Desikan, an IIT-BHU alumni, Founder & CEO of Drone Inch, Fremont, USA made a presentation on "**SMART Application of Drones in Search and Rescue Mission**". He said that currently he is working with two platforms, the first platform is about sitting and working with Standards committee called ASTMF 38 committee for UAS and this body is working on making policies for Drones in USA. He further mentioned that this board recommends policies to the Federal Aviation Administration that get adopted. He said the other body with whom he is working very actively is NASA and it is also called (TVF) Transformative Vertical Flights and this involves building the rules and processes for maned drones. He further mentioned that Drones are being applied to a vast number of opportunities, primarily for three things Service, Inspections, and deliveries.

Dr U. Pruthviraj, Assistant Professor, Department of Applied Mechanics, NIT-Karnataka, Surathkal in his presentation on "Application of RGB, thermal, multispectral, LIDAR imageries with Drones " said that they would like to showcase all the works and said that he is basically a Civil engineering, where we deal with concrete and cement. Hence, he mentioned that the passion about drones' and electronics was there right from the time, when he had joined and that what he did was true centre for system design, which is entranced disciplinary centre. We try to collaborate with different interested students and start researchers to come up with applications and weather design and development of Drones. So, he mentioned that it's been around 14 years, when we either build drones of different - different capacity or use it for different - different applications or finally water resources and ocean engineering as a part of remote sensing application or flood indentation map or it can be sea erosion studies.

8. TECHNICAL SESSION: DAY 3

Mr. Srinivasa Karavadi, Head of Market Development India, Bangladesh & Sri Lanka, Bayer CropScience Limited, Board of Directors - Croplife India in his presentation on "Use of Drone in Crop Disease surveillance for the Tripura" said that whatever he is going to speak will be for the benefit of the people on this training. He added that he can share a couple of things about Bayer, highlighting the need of innovation in agriculture. He said that he knew about different challenges they are facing and especially in view of most people, one might have seen the United Nations Environment Programme recent report which calls for taking really good and pragmatic steps to ensure that food supplies are retained while maintaining the natural components and contributing factors and specific on innovative technologies by focusing on drones and how it can help. He also mentioned about various drone partners through various agriculture universities in other institutes, moving forward in terms of the corporate history. Bayer is also gone through several transformations, acquisitions and change of the business and creating its global footprint.

Mr. Chirag Gupta, NESAC in his presentation on "**Aerial Survey by LiDAR and Roadmap for Disaster Managers**" shared few important contents on UAV technology, UAV activities at NESAC, UAV application

at NESAC and DGCA regulations for UAVs in India. He said that UAV – Aircraft are those whom we can operate without human pilot. Initially they are used for military purpose but eventually lot of civil applications has come up. e.g., Disaster management, precision farming, surveillance etc. They are also known as Drone, RPAS, UAS. Etc. He spoke on UAV activities at NESAC, he said that NESAC is having total 6 survey grade UAV's along with other experimental UAV's with RGB multispectral and hyperspectral payload. NESAC is equipped with specialized data processing software for UAV such as pix4D Mapper pro, Agisoft photo scan pro along with other post processing software e.g., Arcgis, Erdas Imagine, ENVI etc.

Dr Sunandan Dutta, Post Doc Researcher, Hiroshima University, Japan made a presentation on the "**Light-weight Robotics for Disaster Applications in Japan**" he said that the time line of a disaster can be divided into three basic parts, the first part is the inspection and prevention in which we use different types of robots for example aerial robots and turpentine robots lakes robots and we use them for inspection of different mechanical structures and civil structures but after the disaster outbreak, there is a sudden requirement of survey and rescue that means we need robots for information gathering.

He further added that many years ago when we used to use human beings or human task force for information gathering but with the advent of all these different kinds of robots specially aerial robots and Serpentine robots we are using them for survey and some point of time we are also using them for rescue but there is a slight important thing to note here that we don't use much of the legged robots for rescue operations or information gathering because after the disaster the environment changes a lot and there is a destruction of properties and it changes the surface profile, which changes the topography of the surface and the environment. So it's difficult to use the left robot so he mentioned that there is a need to focus on the controls and the dynamics of the leg robot in this case and of course the third part being the rescue recovery which is done mostly by the Defence Forces.

9. CLOSING REMARKS & VOTE OF THANKS

Shri Sarat Das, State Project Officer, Disaster Management, Government of Tripura thanked NIDM, FICCI, participants and all the other stakeholders who participated in the 3 Day Online Training Programme. During his closing remarks he highlighted the important role of Insurance in Disaster Management, and the historical data can be usefully analyzed and interpreted by the Insurance agencies to draft a concrete DM plan for the state government.

Shri Anindya Kumar Bhattacharya, TCS SSG, Additional Secretary, Revenue Department and Director, Tripura Disaster Management Authority, Government of Tripura, on behalf of the State Government thanked Major General Bindal, Executive Director, NIDM, FICCI and all the speakers, dignitaries and participants for jointly contributing towards a very successful 3 day online training programme. He further extended is heartiest gratitude to the entire team on a very meaningful and impactful conduct of this 3 day training programme

Dr Chandan Ghosh, Head, Resilience and Infrastructure, NIDM, Government of India thanked everyone on behalf of NIDM, Government of Tripura and FICCI for their patience and listening to all the talks by eminent sectoral experts during the 3-day online training program.

Mr. Rubaab Sood, Head, Disaster Risk Management, FICCI gave the closing remarks and appreciated the joint endeavor of NIDM, State Government of Tripura and FICCI towards online training program on Role of Drones in Disaster Management

More than 250 participants from industry, government and academia attended the course online on all the three days of the program.

10. KEY TAKEAWAYS

- Drones are very invaluable systems which aid the personnel tasked with carrying our surveillance, reconnaissance, and relief during disaster management. Hence, there is a need to boost the use of drones in civilian use and for pre and post disaster management.

- Technologies related to autonomous systems and unmanned vehicles in air, ground and in water assumes great importance for future methods to deal with disaster which may be man-made or natural. Hence more innovations in this space are required.

- This program of NIDM, with FICCI and Government of Tripura is heralding a new era on the role of Drones in disaster management. It is an effort to bring academic, researcher, industry, and disaster manager of the country to bring resilience in all forms of disaster management. There is a need for more such type of programs.

- Drones will be a game changer in Development Governance and Disaster Management. Creating a robust drone ecosystem is a necessity. Drone imaging and analysis thereof will provide real-time data for planning, preparedness, and action.

- The historical data and imagery generated by Drones and UAVs play an essential role in DM planning for any state/district and should be used as an important tool for decision making.

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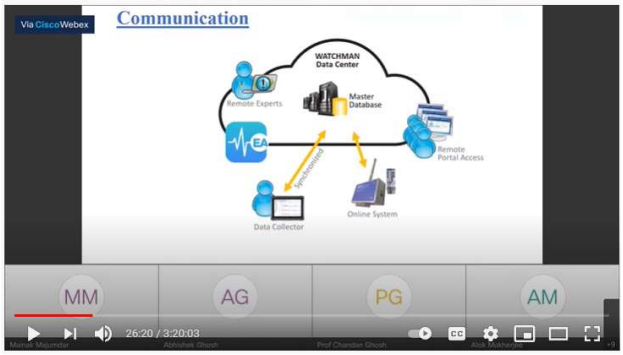
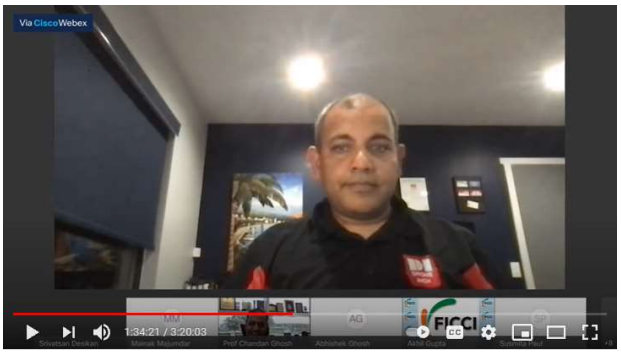
12. PHOTOGRAPHS




Via CiscoWebex
1:34:21 / 3:20:03


Via CiscoWebex
TOOL FOR DECISION MAKING MAKING
TERRAIN & LANDSCAPE
Multicolour 3D printing
LiDAR
Precision Surveying
MULTISPECTRAL/THERMAL
Elevating Intelligence
UAV-DRONE - NPNT
Made in INDIA-
AatmaNirbhar Bharat
MM
FICCI
Mainak Majumdar
Prof Chandan Ghosh
Rubaab Sood
Dr Pruthviraj Umesh

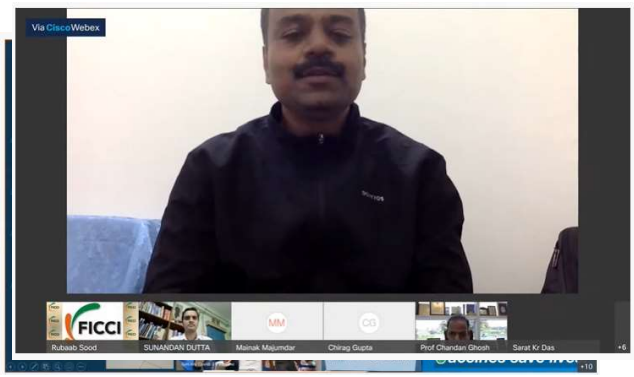

Via CiscoWebex
Prof Chandan Ghosh
Dr Pruthviraj Umesh
Akhil Gupta
Mainak Majumdar
Rubaab Sood
SUNANDAN DUTTA


Via CiscoWebex
10:10 / 3:21:16


Via CiscoWebex
Drones - Promising Technology to transform Agriculture
Advanced Application Technology
all crop all stage (Spraying ,Dripping
,Granule Spreading etc)
Surveillance – Crop estimation etc
Crop Insurance / yield estimation
Broad use of technology
Spraying
Pesticides /fertilizer application
Efficiency & Effectiveness
Safe use of chemicals
Imaging and phenotypical studies
Crop & Pest Info for better advisory
Farm info for efficiency / Precision farming
Data
Sustainability
Water Consumption -95 %
Ensure correct load of chemistry
Socio Economic benefits (
Employment)
RESTRICTED
RR
RS
PG
FICCI
27:38 / 3:21:16


Via CiscoWebex
40:49 / 3:21:16


Via CiscoWebex
RAJVIR RATHI
Prof Chandan Ghosh
Chirag Gupta
Akhil Gupta
Mainak Majumdar
Alok Mukherjee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Rubaab Sood
SUNANDAN DUTTA
Mainak Majumdar
Chirag Gupta
Prof Chandan Ghosh
Sarat Kr Das


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13. YOUTUBE LINKS

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Day 2 - https://youtu.be/Bp7i_zU5zj4

Day 3 - https://youtu.be/hrXDwAQe9Aw