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उत्तर पूर्वी अंतरिक्ष उपयोग केंद्र
North Eastern Space Applications Centre

Reflections

Quarterly in-house Newsletter

India made history, when the Chandrayaan 3 landed on the Lunar surface, making India only the fourth country to land on lunar surface and first country to land near the South Pole of Moon

Congratulations Team ISRO!

From the Director's desk

It was one of the proudest moments for our nation, when the Chandrayaan 3 landed successfully on the lunar surface near to the South Pole. I take this opportunity to congratulate Chairman, ISRO and the entire team for the marvelous feat! This achievement underscores the India's ever growing capability in state-of-the art technology fields, and particularly to the accomplishments that India has shown in the Space sector.

We have witnessed a Glacial Lake Outburst Flood (GLOF) on 3rd October, 2023 in the South Lhonak Lake in North Sikkim, that resulted in downstream flooding in the Teesta River and its tributaries. The NESAC team under the NER-DRR (North Eastern Regional Node for Disaster Risk Reduction) took immediate action to estimate the damage from the GLOF event and submitted the same to the Sikkim State Disaster Management Authority, Government of Sikkim.

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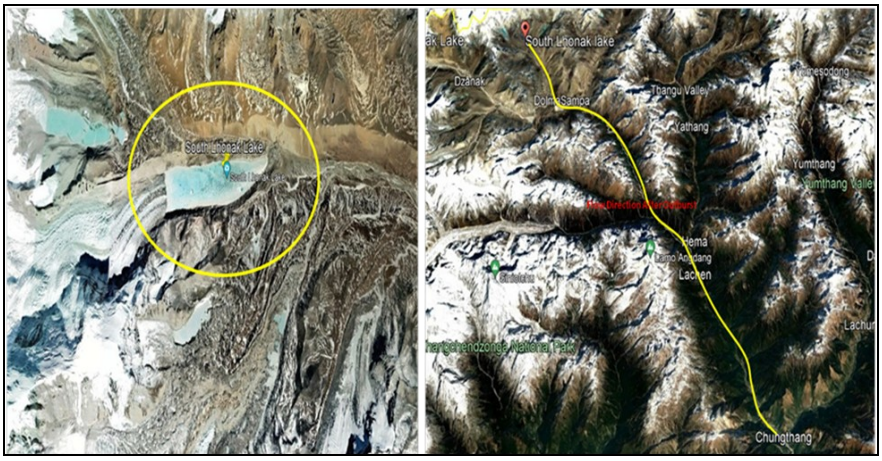
Inside this issue

Space based services in connections with GLOF in South Lhonak Lake

NERDRR Team, NESAC

On October 3, 2023, at approximately 10:40 pm (IST), a devastating lake outburst occurred at South Lhonak Lake in North Sikkim, India. This event resulted in a significant Glacial Lake Outburst Flood (GLOF) that had a severe impact on the Teesta River and its tributaries. The flood's intensity caused a rapid rise in the water level of the Teesta River, leading to the Chungthang Dam in North Sikkim being affected.



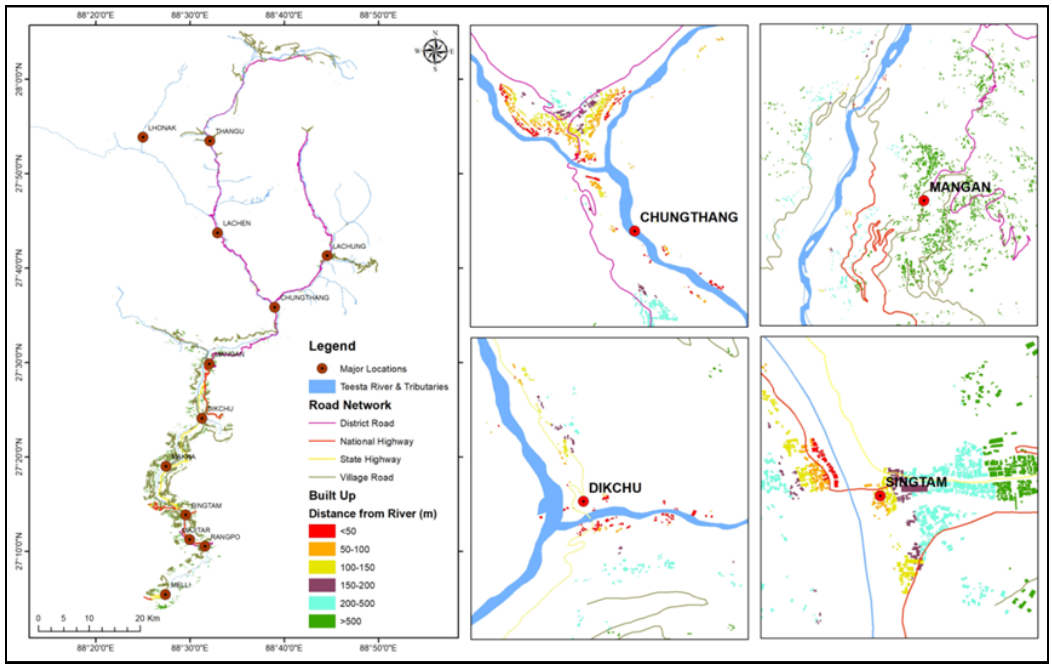
Lhonak Lake in Google earth image (Left). Image showing the path of outburst flow-direction (Right)

As a consequence of the flood, a part of the Chungthang Dam breached, causing a further increase in the river level by 15-20 feet in the downstream areas. This resulted in a major disaster along the Teesta River and its vicinity. The affected areas stretched from Lhonak in Sikkim to Melli in West Bengal, causing widespread chaos and devastation in the society. The event caused significant human and economic losses in the affected regions.

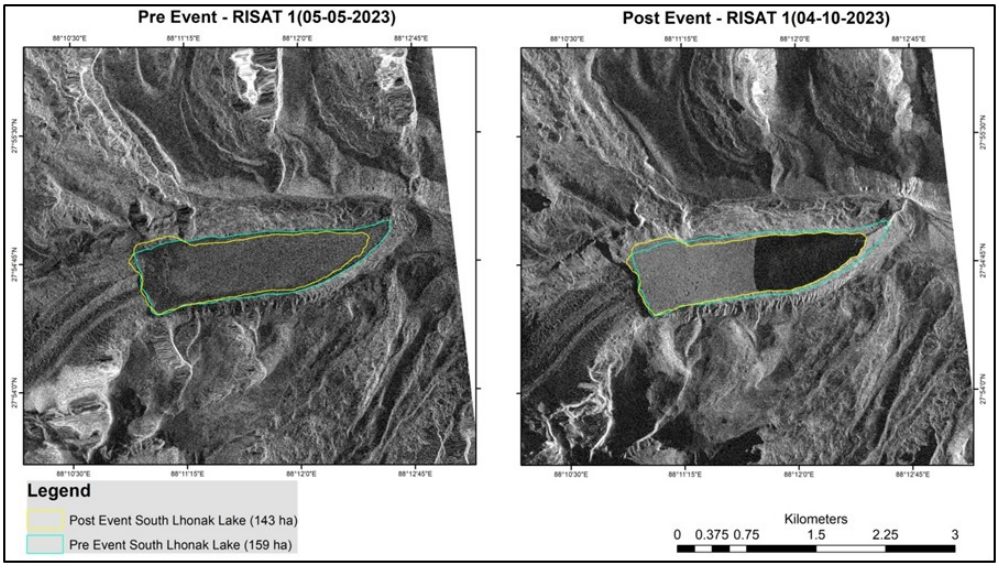
After the outburst, the NER-DRR (North Eastern Regional Node for Disaster Risk Reduction) team of NESAC swiftly took action to provide space-based support to the Sikkim State Disaster Management Authority, Government of Sikkim. The immediate focus was to assess the impact of the flash floods on buildings and infrastructure in order to aid rescue operations and also to understand the cause of the lake outburst.

As part of the initial efforts, building footprints were extracted using Google's open building data and road networks from North Eastern Spatial Data Repository (NeSDR) were overlaid to categorize the buildings based on their proximity to the Teesta River.

A total of 10,294 built-up structures were identified as posing a significant threat in the entire region. Among these, 1,021 buildings were located within a 50 -meter distance from the river, 2,480 buildings at 100 meters, 3,008 buildings at 150 meters, and 2,695 buildings at 200 meters in the stretch from Lhonak to



Building categorization into different classes based upon their distance from the Teesta River



Changes observed in the lake area after the outburst (RISAT-1 FRS)

Melli. Additionally, the locations of 21 bridges were identified as potentially vulnerable to the flash flood.

After obtaining post-event satellite data on October 4, 2023 from RISAT-1, further analysis was performed to determine the number of affected buildings. It was found that 45 buildings had been affected by the floods in the area between the Chungthang Dam and Melli Bridge.

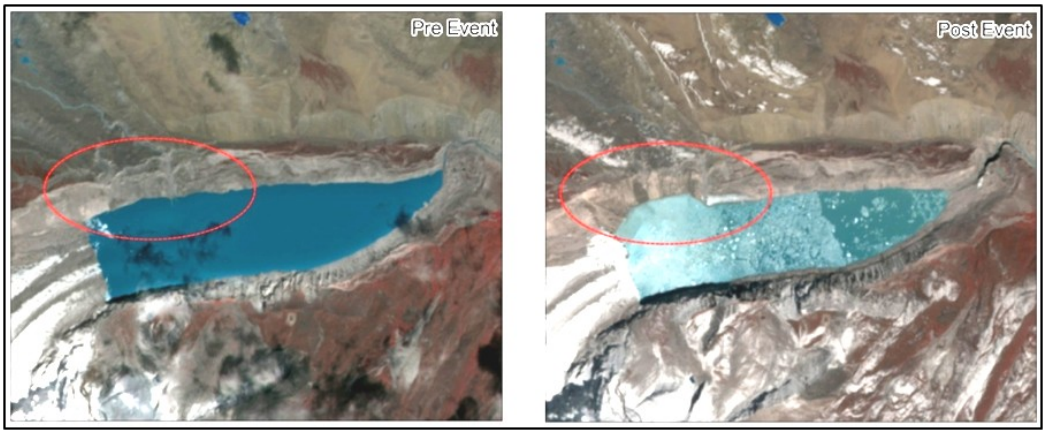
Further, a preliminary change analysis is done using the RISAT-1 and Sentinel (S-1 & S-2) data to see the changes in the lake after the outburst. A total change of approximately 24 hectares has been found in the water area post event.

The change observed in RISAT-1 data has further been confirmed by the Sentinel-2 optical data, obtained on 6th October, 2023. The change analysis performed by the NER-DRR team pointed towards a slope failure at the lake as shown by the red circle in the image.

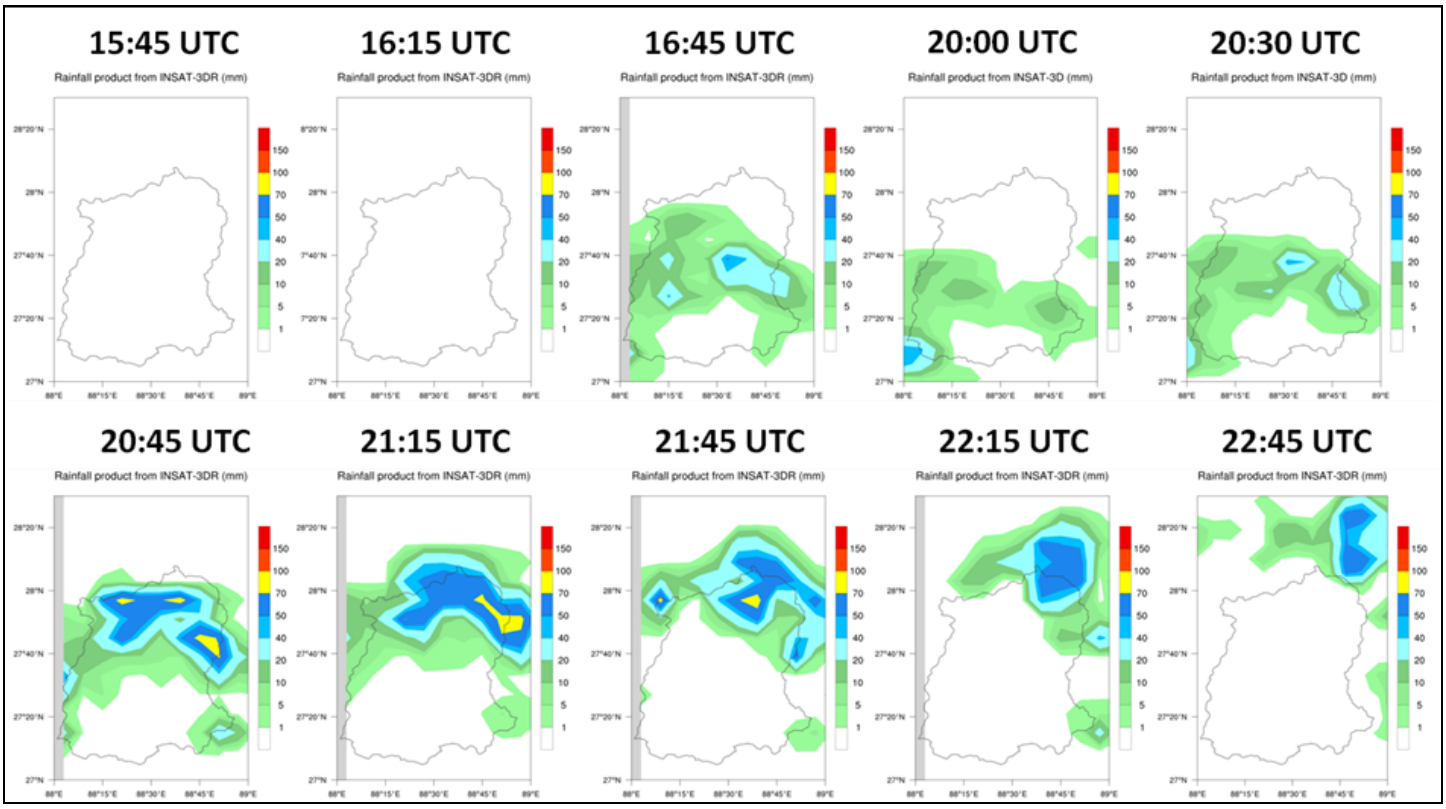
Analysis of land surface temperature (LST) showed fluctuations in temperature during the last two weeks of September and the first week of October before the event. On 2nd October, 2023, the temperature had drastically dropped down to -3.55ºC. These fluctuations may have resulted in freezing and thawing actions in the glacier, leading to the formation of cracks.

The NER-DRR team also examined the synoptic weather conditions as well as precipitation events over and around the lake on 3rd October, 2023, to understand the likelihood of a cloudburst event on that day. Cloudbursts are typically observed in mountainous regions where the orographic effect triggers strong updrafts of warm and moist air, leading to massive cloud formation and heavy downpours. Satellite-based rainfall estimation was used to assess precipitation conditions due to unavailability of in-situ measurements near the lake. The satellite based products from INSAT series of satellites showed significant precipitation over the North Western Sikkim (where the Lhonak lake is situated) starting from 16:45 UTC (22:15 IST), which might have contributed to the GLOF event.

In addition, the available rain gauge stations in Sikkim showed that the closest station to the glacial lake site, Mangan, reported 2.5 mm of rainfall during

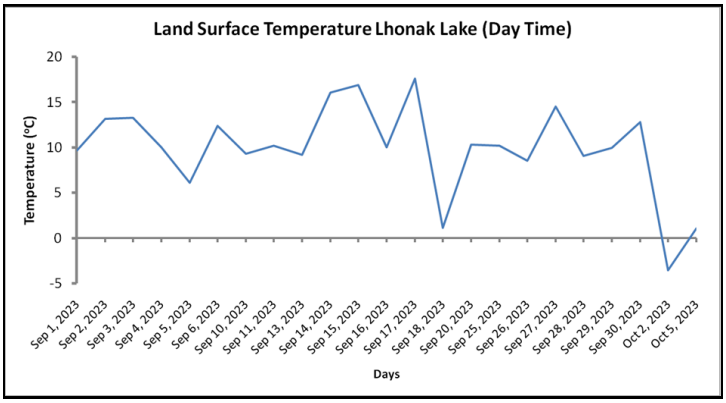


Temporal changes in the lake post event (Sentinel-2 MSI)



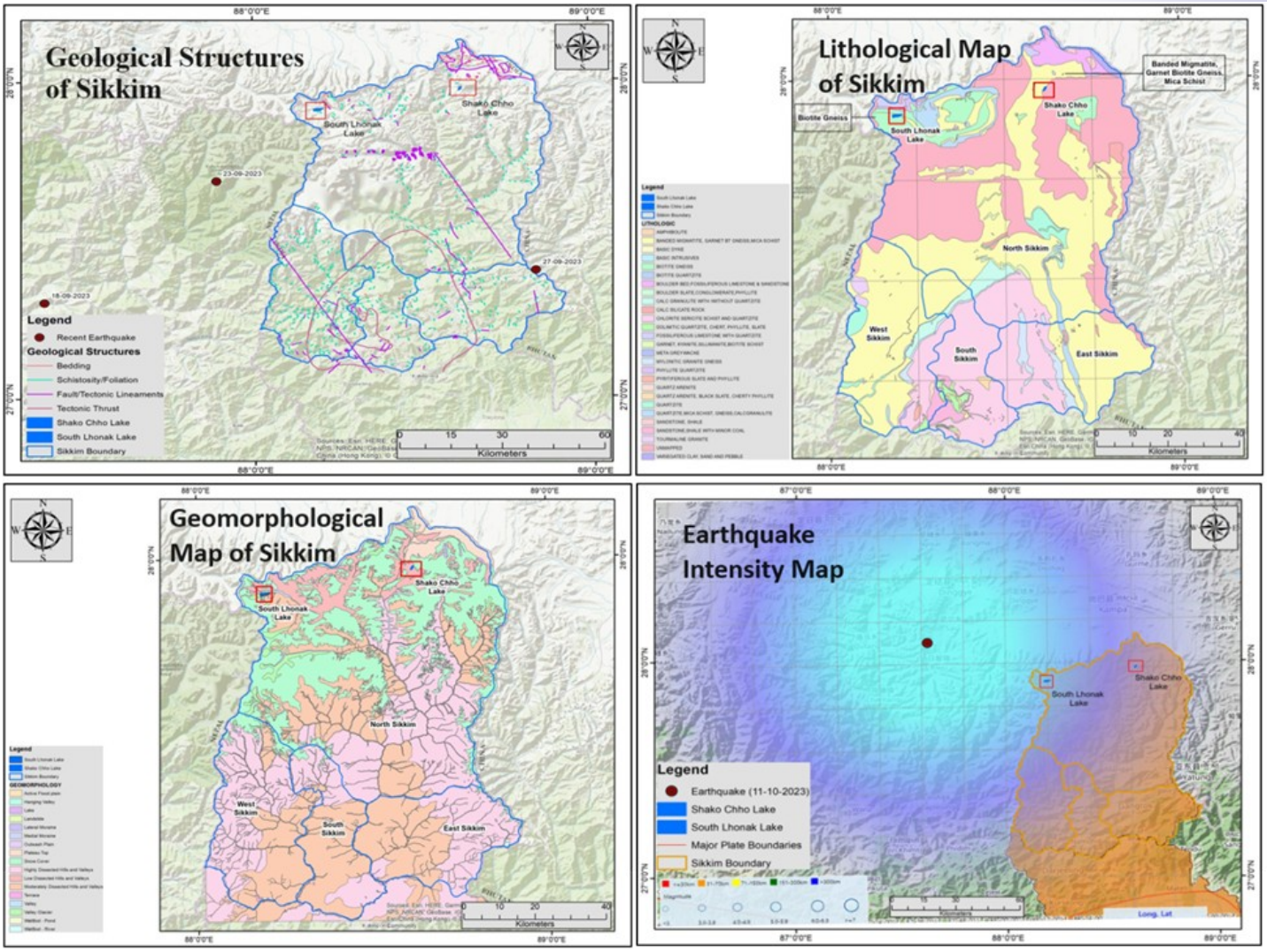
INSAT 3DR HEM products at different hours on 3rd October 2023 over Sikkim

a 24-hour period starting from 03:00 UTC on 3rd October, 2023. However, two stations in South Sikkim, Namchi and Namthang, reported heavy rainfall (>100mm) during the same time. Although the available AWS data indicated heavy rainfall over Sikkim, it did not definitively indicate a cloudburst-type event. Overall, these analyses provided valuable insights into the causes and effects of the event, which can be used as valuable information for future disaster prevention and mitigation efforts.



MODIS Land Surface Temperature at South Lhonak Lake (Day Time)

In response to the request of the Chief Secretary, Govt. of Sikkim, the NER-DRR team conducted daily monitoring of the South Lhonak Lake and Shako Chho Lake from 9th October 2023 to 23rd October 2023. Geological investigations were carried out to assess the impact of lithology, geomorphology, and geological structures in and around both the lakes (*Structural layers are taken from Bhukosh, GSI*). This helped in understanding the potential risks and vulnerabilities associated with the lakes. Daily monitoring of land surface temperature (LST) using MODIS data was also conducted to detect any abrupt changes in temperature that could lead to glacial deformation. Earthquake activity (https://seismo.gov.in/) in the vicinity of the lakes was closely monitored on a daily basis, as it could have a direct or indirect impact on the deformation or weakening of the formation around the lakes. Meteorological data, including rainfall and temperature, was also monitored on a daily basis to identify any anomalous trends that could trigger alerts. The freely available satellite data has also been monitored on regular basis to see any

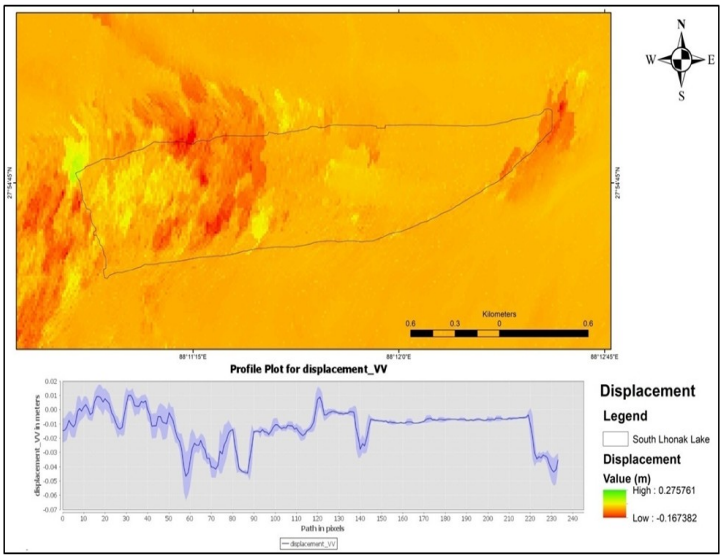


Structural and earthquake related information shared with Chief Secretary, Govt. of Sikkim

changes in and around the lake area. The reports were sent to Chief Secretary of Sikkim on daily basis.

Time series analysis is also performed on regular basis using InSAR to monitor if there is some major deformation which could be alarming. A significant change of displacement and an elevation change of approximately 800m were observed using the Differential Interferometry Synthetic Aperture Radar (DInSAR) method.

The NER-DRR is committed to providing space-based disaster emergency services in the northeastern region and continues to strive towards enhancing their monitoring and response capabilities.



Deformation using DInSAR post event

UAV application in management of fire incident in Shillong

Dr. Jenita M. Nongkynrih, Sumanth, B. C, S Pandit, Sashi B Nayak, B Wanninag, V Saikhom

A fire broke out in the building of Janata Furniture located in Police Bazaar, Shillong, on 14.10.2023 at around 1:15 PM. Dense commercial areas mark the land use of the surrounding areas. This area also has narrow lanes, densely populated, multistoried buildings, and kuccha houses.

Fire Incident- Janata Furniture Building from ground zero on 15.10.2023

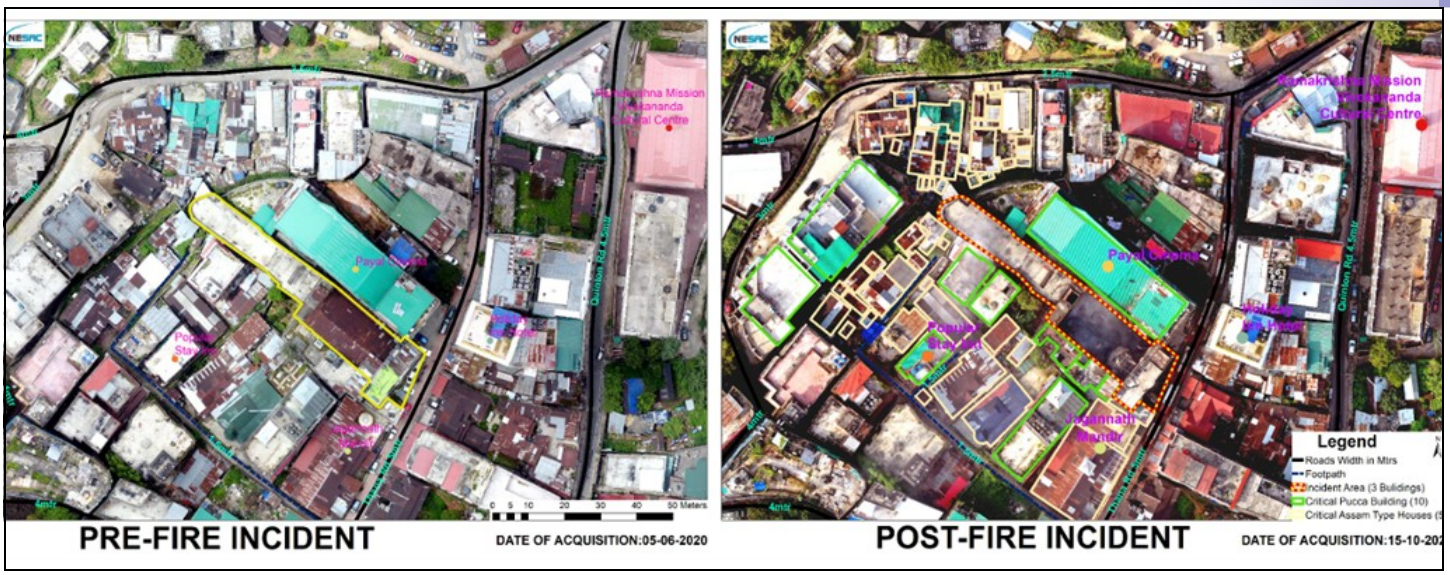
Based on the request from the Addl Chief Secretary to the Govt. of Meghalaya, a survey of the area was conducted using an unmanned aerial vehicle (UAV). Based on the data captured, the URD and UAV team made a presentation at a meeting chaired by Addl. Chief Secretary to Govt. of Meghalaya at SEOC, Shillong on the incident. A series of videos and UAV images were also presented at the meeting.

Build characteristics and narrow lane around the fire incident as viewed from UAV taken on 15.10.2023

NESAC and other officials during the UAV survey

On 16.10.2023, there was a site visit by the Honourable Chief Minister of Meghalaya to the incident site. Chief Secretary to Govt. of Meghalaya and all the officials and personnel involved in the incident response team were present. Dr. Jenita M. Nongkynrih, Head URD, was also presented in the on-site meeting, and the series of videos and UAV images of the post-fire incident were also presented.

On the same day, a meeting was held on de-briefing the fire incident at the Main Secretariat. URD team prepared a report on the incident based on the UAV data and delivered the report to MSDMA, Shillong, which was presented in the meeting. The report analysed the previous UAV data taken on 05.06.2023 and the post-fir incident on 15.10.2023. The same was used as input in the Cabinet meeting.



UAV images of pre and post fire incident

Continued from page 1

This once again demonstrated the effectiveness of space based products and services to address different stages of disaster risk reduction including the post disaster damage assessment. NESAC also provided support to Assam State Disaster Management Authority to map the flood inundated areas in Guwahati city using drones and in another occasion assisted the Government of Meghalaya in quickly mapping the extent of damage from a major fire incident in Shillong city. NESAC has developed the required infrastructure and human resources for such quick and on-demand services in emergency situations. I urge all state governments in NE region to avail the services of NESAC that will definitely help in better planning in disaster management.

NESAC conducted the first ever ISRO Structure Training Program (STP) on Space based inputs for governance with specific emphasis to NE States, for the ISRO/DOS officials. 21 senior Scientists/ Engineers from all major ISRO/DOS centres attended the program. I thank Scientific Secretary, ISRO for identifying NESAC for the STP, as it shows the increasing confidence of ISRO HQ on NESAC. The program was done with support from two major ISRO centres, NRSC, Hyderabad and IIRS, Dehradun. This also adds another feather on the training and capacity building activities of the centre.

ISRO has signed a MoU with the Vijnana Bharati to utilize the Space on Wheels to create awareness on the Space Science and Technology among the school students across the nation. NESAC has been assigned to carry out the activity for the NER of India. We have taken the bus to six schools across the Arunachal Pradesh during the World Space Week wherein thousands of students visited the facility and interacted with the scientists. I thank Vijnana Bharati for the initiative and the support extended to conduct the program. We have made a big program for the state of Tripura to cover more than 25 schools in 30 days during November-December, 2023 covering all districts of Tripura for a massive awareness campaign under the MoU. Other states of NE region shall also be covered under this program in the coming months. The outreach activity of the centre is an integral part and we have been taking several steps to promote the Space Science and Technology to every corner of this part of India.

The scientific activities of the centre is also going on well with several projects are on the verge of completion. We have received approval for a few new projects as well. This is in addition to the several operational services provided from NESAC including disaster management support services.

A report on Celebration of World Space Week

The "Space on Wheels" campaign, which aimed to promote space science awareness in India and to inspire young minds, was successfully conducted as part of the ongoing celebration of Space Week from October 5th to October 11th, 2023, in Arunachal Pradesh. This initiative was jointly organized by VIBHA (Vijnana Bharati) and ISRO.

On October 5th and 6th, the Bus visited Dera Natung Govt. College in Itanagar, where more than 600 participants, including students, faculty members, NSS volunteers, NCC cadets, VRPS School and Govt Higher secondary school, enthusiastically participated in the event. The program was inaugurated by Mr. C. D. Mungyak, the Director cum Member Secretary of the Arunachal Pradesh State Council for Science and Technology, who flagged off the bus.

From October 7th to 8th, the campaign was witnessed by more than 800 students from the North Eastern Regional Institute of Science and Technology (NERIST), KV School, New Galaxy

School, and Alphabet School in Nirjuli. The inaugural program on the first day featured Prof. P. Lingfa, Dean (SA and P&D) at NERIST, who emphasized the potential benefits of the space science campaign for young minds across the country. Dr. N.G. Singh, Chairman of Gymkhana, expressed gratitude to all the participants for their valuable contributions and attendance, making the program meaningful.

On October 10th, the Space Bus attracted over 800 students from various educational institutions at JN College Pasighat. The program was inaugurated by Prof. Tomo Riba, the Vice Chancellor of Arunachal Pradesh University, in the presence of JN College Principal Dr. Tasi Taloh. On October 11th, the exhibition bus visited Independent Golden Jubilee Government Higher Secondary School and Daying Ering Memorial Government Higher Secondary School in Pasighat, where more than 1400 school students had the opportunity to explore the exhibits, nurturing their interest in space science.

ISRO-Structured Training Program (STP) at NESAC

NESAC, jointly with National Remote Sensing Centre (NRSC), Hyderabad & Indian Institute of Remote Sensing (IIRS), Dehradun organized a one week residential Structured Training Programme on Space based inputs for governance with specific emphasis to NE States during Aug 07-11, 2023 at NESAC.

Inaugural ceremony of the program started with a welcome address by Dr. S.P. Aggarwal, Director, NESAC followed by the addresses from Dr. K. Vinod Kumar, Associate Director, NRSC and Dr. R.P. Singh, Director, IIRS. Shri Shantanu Bhatawdekar, Scientific Secretary, ISRO graced the inaugural ceremony as the Chief Guest and addressed the participants. He gave a brief presentation on the role of geospatial technology in various governance applications.

21 Scientists/Engineers from ISRO/DOS Centres participated in the program. The programme covered the basics of Geo-spatial technology and governance applications like natural resources management, infrastructure planning, support in the health and education sector, disaster management support including the state of the art UAV applications. Eminent resource persons were invited from NRSC, SAC, IIRS and state user departments to cover various topics during the program. The program provided a right platform to share the experiences and knowledge gained by experts and stakeholders, challenges and lessons learnt while executing a wide range of space applications projects particularly in NE States. An exposure visit to IIM, Shillong was

arranged for the participants, where Prof. Rohit Dwivedi gave a talk on unique opportunities and challenges of good governance in NER.

The concluding ceremony of the program was graced by Smt. Loya Madduri, IAS, Secretary, Science, Technology and Climate Change Department, Govt. of Assam as the Chief Guest. She appreciated the effort of the NESAC in successful organization of the STP and highlighted the significant support of space technology inputs in planning and development process of the Government of Assam. Dr. S.P. Aggarwal, Director, NESAC addressed the participants and complimented the participants on successful completion of the program. Shri P.L.N. Raju, Special Secretary, Science, Technology and Climate Change Department, Govt. of Assam and Director, Assam State Space Application Centre (ASSAC) also attended the concluding ceremony. The program ended with a vote of thanks offered by Dr. B.K. Handique, Head, PPEG, NESAC and the Course Director.

NESAC conducted one week online course on SATCOM & SATNAV

The third edition of online Course on Satellite Communication & Satellite Navigation: Technologies & Applications was conducted at NESAC during October 09-13, 2023. A total of 55 participants registered for the course mainly from NITs and other Engineering Colleges. The course covered topics like basics of Satellite Communication & Navigation, Ground Station, RF, Baseband technologies, and applications of SATCOM & SATNAV with special emphasis to High Throughput Satellites (HTS) for Internet Services, Mobile Satellite Services (MSS) applications for Disaster Management & NaVIC Applications. The Course was inaugurated by Shri H. Rayappa, Director, SATCOM PO, ISRO HQ. Sri Anjan Debnath, SUD, NESAC acted as the Course Officer while Sri Ramani K. Das, Head, SUD, NESAC was the Course Director for the Course.

NESAC conducted training programme for State Forest Service officers from CASFOS

A two weeks training programme for State Forest Service (SFS) officers on "Application of modern tools and technologies" was conducted at NESAC during September 18th to 29th, 2023 at the request of Central Academy for State Forest Service (CASFOS), Byrnihat, Assam.. Dr. S.P. Aggarwal, Director, NESAC inaugurated the training programme and stressed on the need for empowering the forest officials with geospatial technology for effective management of forests in the country. The inaugural session was attended by Dr. Laishram C. Bandana, IFS, Course Director, CASFOS and other faculties from CASFOS. The topics covered in the training programme were on aerial photography, remote sensing, geographical information system and GPS as tools for forest management. Theory lectures, hands on lab practice and field exercises were conducted during the training. Altogether 47 SFS officers participated in the training programme, out of which 44 were from Rajasthan Forest Service and 3 were from UP Forest Service. Smt. Haobam Suchitra Devi, Scientist/Engineer 'SF', FED was the Course Director and Dr. Pebam Rocky, Scientist/ Engineer 'SF, FED' was the Course Officer for the training programme.

Two week course on "Applications of RS & GIS in Agriculture and Allied areas"

The fourth two week course on "Applications of Remote Sensing & GIS in Agriculture and Allied areas" was conducted from 21st August to 1st September, 2023 at NESAC, Umiam. 29 participants were enrolled for the course which included Officers from state agriculture & horticulture dept, fishery dept, sericulture dept, faculty members from college and Universities, scientists, research fellows, and students. Dr. S.P. Aggarwal, Director, NESAC during his inaugural address highlighted the importance of geospatial technologies in Agriculture and allied areas. Dr. Pradip Kumar Bora, Director, NERIWALM, Tezpur was invited as the Chief Guest of the inauguration programme. A total of 15 theory classes and 11 practical sessions were conducted during the two weeks course. A field visit was also conducted as part of the course. Dr B K Handique, Head, ASD was the course director, while Dr. Pradesh Jena, Scientist, NESAC was the course officer for the course.

NESAC celebrates Hindi fortnight

Hindi Pakhwada was organized at NESAC from 14th to 29th September, 2023 and a number of competitions were organized,such as Essay writing, Hindi poem recitation, Tasveer Kya bolti hai? Translation Competition, Terminology Competition etc. In addition, a creative writing and Drawing competition were also organized for the family members of NESAC employees. During the closing ceremony organized on 29th September, 2023 Dr. SP Aggarwal, Director, NESAC, congratulated everyone for the successful organization of Hindi Pakhwada and also distributed the prizes to the winners of the competitionsWinners of the incentive scheme implemented for the promotion of Hindi in the center (for the year 2022-2023) were also rewarded during the closing program. Employees who have written/typed more than 10,000 Hindi words in daily office work were also rewarded. The program concluded with a vote of thanks proposed by Smt. Namita Rani Paul Mitra, Jr. Translation Officer and Member-Secretary, Official Language Implementation Committee, NESAC.

NESAC organizes a Hindi Workshop on usage of official language in computers

As per the Official Language Policy of the Government of India, Hindi Workshop is organized in each quarter of a year. Shri Rajesh Chaturvedi, Deputy Director (Official Language), State Bank of India, Guwahati was invited to conduct a workshop on the topic 'Usage of Official Language in Computers'. The Workshop was conducted on

21.09.2023 at Outreach Facility, NESAC. The workshop began with the welcome address by Smt. Namita R.P.Mitra, Jr. Translation Officer, NESAC followed by a felicitation of the invited guest by Shri Kumar Anand, Administrative Officer, NESAC. Shri Chaturvedi explained all the participants about various methods of using Hindi language in computers with a PPT presentation. Also, a hands-on training session was conducted for all the participants. A total of 18 officers/employees participated in the workshop. The participants put forwarded their doubts and expressed their views on different aspects of the topic covered. The workshop was concluded with the vote of thanks proposed by the Junior Hindi Translation Officer, NESAC.

NESAC celebrates its 23rd Foundation Day

NESAC celebrated its 23rd Foundation Day with a brief program on 11th Sept, 2023. The program started with a welcome address by Dr. KK Sarma, Group Head, RSAG followed by felicitation of Shri KC Bhattacharyya, Former Director, NESAC by Dr.

SP Aggarwal, Director, NESAC. In his address, Director, NESAC highlighted a 10 points agenda for NESAC to achieve accelerated growth and development. Shri KC Bhattacharyya, Former Director, NESAC delivered the Foundation Day Talk on "Genesis of GSLV from SLV towards launch of Chandrayaan". In his talk, Shri Bhattacharyya explained the outline of how ISRO has mastered the launching capability of GSLV MK-III from the humble beginning of SLV in 1980s. The program was compered by Dr. J Goswami, Program Coordinator, Outreach & Capacity Building and ended with the vote of thanks offered by Shri Kumar Anand, Administrative Officer, NESAC.

National Sports Day Celebrated at NESAC

As per the mandate of Government of India under the 'Fit India' initiatives, National Sports Day was celebrated at NESAC on 29th August, 2023. Various indoor and outdoor events were organized during the day for the staff of NESAC. The program was flagged off by Director, NESAC by administering the Fit India Pledge to NESAC Staff. NESAC staff took part in various competitions such as Plank Challenge, Badminton, Table Tennis, Rope Skipping and Walking. The Events were organized by NESAC Sports & Recreation Committee with support from the Administration Division. NESAC staff wholeheartedly participated in the events to make the celebration a grand success.

NESAC participates in Empowering India-2023 and India Organic & Horti Expo-2023

NESAC took part in the 'Empowering India-2023 and India Organic & Horti Expo-2023' at Maniram Dewan Trade Centre, Guwahati, Assam organised during August 18 – 20, 2023. The event was organized by Bharat Events Pvt. Ltd and saw the participation from various prominent organizations across the country. During the event, NESAC put up a stall showing its range of activities to a wide range of enthusiastic visitors. Distinguished officials and dignitaries from diverse organizations interacted with NESAC's team members. The NESAC team was consisted of Dr. Bijoy K. Handique, Head, PPEG, Dr. Francis Dutta, Scientist-SC and Shri. Pranjal Saikia, Project Associate. The occasion offered a valuable platform for NESAC's scientists to foster connections with fellow researchers and experts from different government departments and other organisations.

Meeting held between Sikkim State Disaster Management Authority and NESAC

A meeting was held on 18th August, 2023 between Sikkim State Disaster Management Authority (SDMA) officials and NESAC to discuss the activities being undertaken at NESAC in the areas of disaster management support and also to look for the areas where both NESAC and SSDMA can work together in reducing the disaster risk in the state of Sikkim. The meeting was chaired by Director, NESAC and attended by the Special Secretary cum Director, SSDMA, Sikkim along with an another official from SSDMA and officials from NESAC. Director, NESAC briefed about the various activities undertaken under North Eastern Regional Disaster Risk Reduction Node (NER-DRR) for disaster management in NER using space technology. Director, SSDMA also interacted with other senior Scientists of NESAC on Landslide mapping, HRVA, UAV support during disasters, GLOF etc. Director, SSDMA expressed that the support of NESAC would really help them to accelerate their activities. He further added that, for better coordination and smooth functioning of disaster specific activities, capacity building is very important and therefore SSDMA will seek support from NESAC on this.

NRSD – 2023 Celebration by ISRS & ISG – Shillong Chapters at NESAC

The National Remote Sensing Day 2023 was celebrated by the Shillong Chapter of the Indian Society of Remote Sensing (ISRS) jointly with the Shillong Chapter of the Indian Society of Geomatics (ISG) with a half day programme at the outreach complex of NESAC on 18th August, 2023. The programme was coordinated by Dr. Diganta Barman, Head, Water Resources Division, NESAC & Secretary, ISRS – Shillong Chapter along with Smt. Haobam Suchitra Devi, Senior Scientist, Forestry & Ecology Division, NESAC and Treasurer, ISRS – Shillong Chapter under guidance of Dr. S.P Aggarwal, Director, NESAC & Chairman, ISRS – Shillong Chapter. The half day event comprised of inter school painting and Space Quiz Competitions, an invited lecture by Dr. John Mathew, Associate Director, EDPO, ISRO H.Q, and felicitation of individual achievers followed by an open concluding session. During the program, Dr. S.P Aggarwal, Director, NESAC was felicitated on being conferred as a Fellow of the Indian Society of Remote Sensing as well as being elected as the lead of working group - V (Disaster Management) under technical commission- IV of ISPRS followed by Prof. Sunil Kumar De, HOD, Geography, NEHU, who was felicitated on being elected as the President of International Association of Geomorphologists. Prizes were distributed among the winners of the Painting and Quiz competitions by the office bearers of both ISRS and ISG Shillong Chapters.

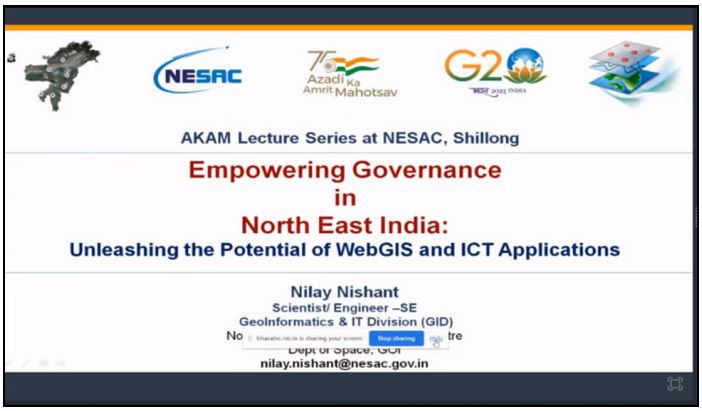
NESAC celebrates the 77th Independence Day of the Nation

NESAC celebrated the 77th Independence Day of the nation with a colourful program on 15th August, 2023. The National Flag was hoisted by Director,

NESAC at 09:00 am at the NESAC office campus followed by singing of the National Anthem. CISF unit, NESAC gave a guard of honour to Director, NESAC, followed by the address of Director, NESAC, where he highlighted the importance of the ongoing nationwide celebration of *Azadi Ka Amrit Mahotsa.* He urged the NESAC community to work in the directions given by the Hon'ble Prime Minister of the Country.. He commended the works being done by NESAC staff in all fields and wished

that even higher quantum of research work would be carried out by the NESAC community. A demonstration of CISF Weapons Drill was made by the CISF Unit as part of the Independence Day celebration. A cultural program was also organized as part of the celebration at NESAC auditorium. CISF Unit and NESAC Staff presented various cultural performances including Singing, Dancing etc.

Lectures by NESAC Scientists under Azadi Ka Amrit Mahostsav (AKAM)



NESAC organized four online lectures in connection with *Azadi ka Amrit Mahotsav* to commemorate 75th year of Indian Independence on August 11, 2023. Dr. Diganta Barman, Head, WRD, NESAC and Smt H Suchitra Devi, Senior Scientist, FED, NESAC coordinated this lecture series. The first lecture was delivered by Dr K K Sarma, GH, RSAG, NESAC on "Space Technology Support for Disaster Management in NER". Dr Diganta Barman, Head, WRD, NESAC delivered the second lecture on "Disruptive technologies – A new paradigm in Water resources & Hydrology". The third lecture was delivered by Sri Chirag Gupta, Sci/Engr-SE from SUD, NESAC on the topic "UAV Technology & Applications". Finally, Sri Nilay Nishant, Sci/ Engr-SE, GID, NESAC delivered the last lecture on "Empowering Governance in North East India: Unleashing the Potential of WebGIS and ICT Applications".

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