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North Eastern Space Applications Centre
Department of Space, Government of India
Uiam, Shillong, Meghalaya
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Annual Report वार्षिक रिपोर्ट 2024-2025

North Eastern Space Applications Centre
Department of Space, Government of India
Umiam, Shillong, Meghalaya



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Director's Preface



The North Eastern Space Applications Centre (NESAC), an autonomous body under the aegis of the Department of Space, Government of India, has been providing dedicated space-based services to the eight states of the North Eastern Region (NER) for over 25 years. Its geospatial solutions, promotion of new geospatial technology applications, environmental monitoring, support on sustainable development planning and disaster management, capacity building and outreach along with regional collaboration efforts have made significant impact on the region's development. With a focus on continuous innovation and collaboration, NESAC is poised to play significant role in addressing the unique needs of the region in the coming years.

NESAC conducted its 12th Society Meeting on 21st December 2024 at Agartala, Tripura. The meeting was chaired by the Hon'ble Union Minister for Home and Cooperation, Shri Amit Shah, and attended by the Hon'ble Union Minister of DoNER, Shri Jyotiraditya M. Scindia; the Hon'ble Minister of State for the Ministry of DoNER, Dr. Sukanta Majumdar; Hon'ble Chief Ministers from Arunachal Pradesh, Assam, Manipur, Sikkim, and Tripura; the Secretary of the Ministry of Home Affairs, Department of Space, Ministry of DoNER, NEC; Chief Secretaries from the North Eastern states; and other distinguished members and invitees.

The Secretary, Department of Space (DoS) and Chairman, ISRO, Dr. S. Somanath, who is also the Vice-President of the NESAC Society and Chairman of the NESAC Governing Council delivered the welcome address. The Hon'ble Home Minister applauded NESAC for its diverse and extensive contributions across all states and affirmed that the Centre is on course to support the accelerated development of the North Eastern Region of India. He urged NESAC to broaden its scope and enhance its range of activities to address the region's specific needs more effectively. He also expressed satisfaction that 109 departments from the eight North Eastern states are utilizing NESAC's services and encouraged the organization to proactively engage with more departments.

The 19th meeting of the NESAC Governing Council (GC) was held on 17th December 2024 in online mode. Dr. S. Somanath, Secretary, Department of Space and Chairman, NESAC-GC, presided over the meeting. The meeting was attended by the Secretaries of Science & Technology from the North Eastern states, the Additional Secretary (Personnel), Department of Space, the Joint Secretary & Financial Adviser, the Scientific Secretary, ISRO, the Directors of the National Remote Sensing Centre, Hyderabad, and IIT Guwahati, along with senior officials from ISRO/DOS and other central government organizations in the North Eastern Region (NER). The members of the GC approved the minutes of the 18th meeting of the NESAC GC, the Annual Report for FY 2023-24, the audited annual accounts, and the budget for 2023-24.

NESAC witnessed remarkable growth and progress in various domains during 2024-25. The Centre strengthened the application of space technology in diverse sectors and built extensive collaborations with various institutes, boosting its capacity-building efforts. A large number of user-funded projects have been undertaken,



reflecting NESAC's leadership and innovation in space applications. Furthermore, the Centre earned widespread recognition through commendations from different departments and ministries, along with prestigious awards, further enhancing its reputation for excellence.

The Agriculture and Soil Division (ASD) of NESAC leverages advanced geospatial technologies to support sustainable agriculture and land management in the in the NER. ASD undertakes crop acreage estimation, yield prediction, land suitability analysis, and soil resource mapping through various projects such as the Applications of Space Techniques for Agricultural Assessment in NER (ASAAN), Space-Based Support for Integrated Development of Horticulture in NER (SSIDH), etc. The Division works closely with State Remote Sensing Centres, agricultural departments, and research institutions across the North Eastern states to ensure the effective use of satellite and UAV data for planning and monitoring crops such as rice, maize, potato, pineapple, and other important crops. Major activities include rice and maize acreage estimation in Assam, Nagaland, Arunachal Pradesh, and Tripura; oil palm suitability and growth analysis in Mizoram's Mamit and Kolasib districts and Assam's Boginodi and Ghilamara blocks in Lakhimpur district; pineapple mapping in Ri-Bhoi, Meghalaya; and soil surveys in Meghalaya's Garo Hills and selected districts of Manipur. ASD has developed mobile applications and user-friendly tools to facilitate accurate field data collection and informed decision-making. It also contributes to capacity building by organizing training programmes and workshops for officials and researchers from agriculture and allied departments. By integrating remote sensing, GIS, UAV surveys, and AI-based methods, ASD provides reliable information to enhance productivity, manage agricultural resources efficiently, and strengthen the region's agricultural sustainability.

The Forestry and Ecology Division (FED) continues to leverage advanced geospatial

technologies for sustainable forest management and ecological studies across NER. Notable achievements include the development of Land Use Land Cover and burnt area maps for Manipur's reserve forests, estimation and mapping of aboveground biomass using SAR data in Meghalaya, and comprehensive bamboo resource mapping across multiple districts of Assam. FED also undertook agarwood plantation mapping in Tripura using very high-resolution satellite imagery, and analysed forest cover changes in the Nokrek Biosphere Reserve, revealing notable shifts in buffer and transition zones due to shifting cultivation and plantation activities. Additionally, the division provided critical geospatial inputs for preparing Forest Working Plans for Mizoram and Arunachal Pradesh, encompassing canopy density mapping, timber stock assessment, and detailed phyto-sociological analysis. FED's work extends to conservation efforts, such as monitoring Loktak Lake's dynamics and studying ecological factors influencing malaria transmission near international borders of NER. These initiatives contribute significantly to informed policy-making, conservation planning, and sustainable resource management in the region.

The Geosciences Division (GSD) of NESAC supported vital geospatial applications for geology and geohazard management in the NER. A notable study integrated InSAR deformation, geological, and geophysical data to assess earthquake damage susceptibility in the Barapani Shear Zone, identifying high-risk zones having good correlation with GPS measurements. Daily ionospheric Total Electron Content (TEC) anomaly maps were generated from GNSS data of Continuously Operating Reference Stations (CORS), aiding earthquake precursor research and atmospheric studies. An Earth Observation (EO)-based analysis identified calcite-rich rocks in the Sung Valley, Meghalaya, using ASTER data and spectral techniques. Post-monsoon landslide inventory mapping under the Satellite Integrated Landslide Assessment and Alert System (SILAAS) project recorded

336 landslides in Meghalaya, strengthening early warning systems. A study completed on the mapping and change detection of river islands (chars) in the Brahmaputra River across four districts of Upper Assam within Oil India's exploration zones revealed significant shifts in the river to course. The division also used drones and GIS to monitor afforestation in degraded coal mining areas, supporting ecological restoration and sustainable resource management in the NER.

The Urban and Regional Planning Division at NESAC uses advanced geospatial technology to support sustainable development across the NER. This year, the division prepared a Risk-Informed GIS-based Master Plan for Shillong under Atal Mission for Rejuvenation and Urban Transformation (AMRUT), focusing on balanced growth, mobility, and community involvement, while considering hazard zones and eco-sensitive areas. A key initiative is the proposed eco-friendly township near the Makhru River in Tamenglong, Manipur, which aims to improve the lives of 1,000 rural households by providing sustainable housing, livelihood opportunities, and modern infrastructure, inspired by global best practices. The division also completed detailed village-level land use and land cover mapping for Meghalaya to aid local planning. Additionally, hazard, vulnerability, and risk assessments were conducted for eight towns in Tripura, producing accurate flood risk maps validated by recent events. These efforts demonstrate NESAC's commitment to informed urban planning, disaster resilience, and improving the quality of life in the region.

The Water Resources Division (WRD) of NESAC plays a crucial role in providing geospatial support for hydrology and water resource management in the North Eastern Region. The division operates the Flood Early Warning System (FLEWS) for Assam and pilot basis for other NE states, maintaining high accuracy and delivering timely alerts to help mitigate flood. This year WRD prepared a master plan identifying over

1,800 potential sites for small multipurpose reservoirs and water harvesting structures in Meghalaya, supported by detailed soil erosion susceptibility mapping. It has also conducted flood scenario generation and discharge-based impact studies for key hydropower projects such as Ranganadi, Doyang, and Kurichhu, helping to assess downstream risks during high dam releases. WRD team has developed a detailed Water Resources Atlas for Sikkim, covering river systems, glacial lakes, and catchments, along with River Atlases for other NE states (excluding Assam) for better water resource management. In Nagaland, UAV and echo-sounder surveys have been used to update the capacity of the Doyang reservoir. By leveraging satellite data, UAVs, and hydrological models, WRD delivers timely flood forecasts, supports embankment management, and empowers state agencies to take proactive measures, ensuring resilient water resource governance across the region.

The GeoInformatics and IT Division (GID) strengthens NESAC's mandate by developing advanced geospatial data infrastructures, integrated decision support systems, and state-of-the-art IT solutions to address diverse regional planning and management needs of the North Eastern Region. Through the North Eastern Spatial Data Repository (NeSDR), GID has strengthened regional data sharing, hosting over 1,400 vector datasets and AI-powered thematic products, serving more than 137 departments and PSUs. In the tourism sector, the newly developed GeoTourism Dashboard catalogs over 1,200 tourist sites and 21,000 utility points, enhancing sustainable tourism planning and visitor experience. GID also supports public health through the integrated Malaria Surveillance System, featuring the Fever Tracker app and AI-based mosquito species detection, improving malaria early diagnosis and control. In disaster management, the SMART AXOM WebGIS platform and mobile apps provide near-real-time alerts, issuing over 45,000 warnings in 2024. GID has helped boost agricultural productivity through UAV-based crop health monitoring and



the DHaBRt Geoportal, enabling timely delivery of agro-advisories. Additionally, GID's tools for geotagging NEC-funded projects and monitoring transboundary animal diseases demonstrate its commitment to transparent governance and regional biosecurity respectively. The Division has further advanced R&D activities by developing AI models for LULC mapping, cloud removal, and snowmelt estimation. Its capacity building initiatives across the North Eastern states ensure widespread adoption of these technologies, promoting data-driven planning and sustainable development in the region.

The Space and Atmospheric Science Division (SASD) at NESAC continues to strengthen climate and weather research for the North Eastern Region through a blend of in-situ observations, satellite data, and advanced modeling. SASD's studies have revealed how seasonal and vertical patterns of aerosols over Umiam influence air quality and climate, while continuous monitoring of elevated aerosol layers has highlighted their role in pollutant mixing near the surface. Long-term analyses have confirmed rising PM_{2.5} levels, underscoring the need for robust emission control measures. The team is employing pioneering approaches such as Generative Adversarial Neural Networks (GANs) to retrieve aerosol optical depth from INSAT-3DR reflectance data. To improve rainfall forecasts, advanced ensemble data assimilation methods, including HYBRID-DUAL and HYBRID-Multi-EAKF, are being implemented to generate more accurate predictions over the region's complex terrain. In the domain of disaster risk reduction, SASD has developed a dedicated lightning nowcasting system along with deep learning models trained on INSAT data, to provide more reliable early warnings and real-time alerts. SASD has also investigated how electric fields influence raindrop formation and has pinpointed electrified cloud regions to improve severe storm and hail forecasting. Long-term studies on boundary layer trends, blended rainfall products, and temperature anomalies highlight the region's changing climate as one of

its significant findings. SASD remains committed to advancing scientific understanding and strengthening its capacity to monitor weather extremes, enhance forecasting and nowcasting capabilities, conduct cutting-edge atmospheric and air pollution research, and address emerging climate challenges.

The Satcom & UAV Division (SUD) at NESAC continues to strengthen connectivity, technological advancement, and disaster management in the NER. Major milestones include proposals for internet-based Tele-Education and Telemedicine, upgrading Tripura's Tele-Education network, and managing the GSAT-29 HUB in Guwahati, which now supports over 3,000 VSAT nodes. SUD also coordinates ISRO's NETRA Radar, NavIC Ground Station, and MATRIS Station operations. The Electronics & Instrumentation Lab of SUD supports R&D in IoT, wireless sensor networks, and prototype testing. NESAC conducted 23 UAV surveys supporting diverse sectors like hydropower, agriculture, and high-resolution mapping. Dedicated training programmes were organized on SATCOM, SATNAV, and UAV technologies. To build regional expertise, the division organized specialized courses on SATCOM, SATNAV, and UAV technologies, fostering hands-on learning in flight planning, data processing, and application development.

The North Eastern Regional Node for Disaster Risk Reduction (NER-DRR) at NESAC continues to play a pivotal role in enhancing disaster management across the North Eastern Region (NER) of India through advanced geospatial technologies and innovative decision support systems. In 2024–2025, the node achieved significant milestones across all eight states of the region, including timely issuance of flood alerts under FLEWS-NER, emergency flood inundation mapping for Guwahati and Tripura, and continuous monitoring of riverbank erosion and embankment breaches in Assam. A high-accuracy lightning early warning system has been developed, providing village-level alerts



and daily reports to enable proactive measures. The team also contributed to landslide inventories, hazard assessments, and rapid event-based mapping, which aided response efforts along vulnerable highway corridors and in urban areas. This was complemented by experimental rainfall threshold studies to enhance landslide forecasting accuracy in the hilly terrains of the region. Additionally, the division undertook forest fire assessments and alert dissemination, as well as earthquake cataloging to improve seismic understanding in the NER. A detailed inventory of nine high-risk glacial lakes in Arunachal Pradesh was also prepared, providing vital insights into the proximity of downstream settlements and supporting preparedness against potential Glacial Lake Outburst Floods (GLOFs). Furthermore, dedicated geoportals and decision support platforms have been developed, offering real-time hazard monitoring, alerts, and interactive tools that strengthen disaster risk reduction and resilience across the NER.

Outreach and Capacity Building (O&CB) initiatives in 2024–2025 have significantly expanded with the adoption of geospatial technologies across the NER. A total of 23 training programs, including both regular and customized courses, benefited 671 participants from government departments, academia, and industry. These programs covered diverse topics such as remote sensing, GIS, UAV applications, water resources, forestry, agriculture, SATCOM, and climate change studies, with a strong emphasis on hands-on sessions, practical projects, and field visits. Several regular courses were conducted on the fundamentals of remote sensing, UAV remote sensing, and the application of geospatial technology in agriculture, forestry, geosciences, space and atmospheric sciences, and satellite communication, along with user-specific courses tailored to stakeholder needs. Notable highlights include training programs specifically designed for women professionals, CAPF and IB officers, and sericulture scientists, as well as specialized workshops on disaster risk management and GeoTourism. NESAC also actively engaged young

minds through initiatives like the YUVIKA Young Scientist Program and large-scale National Space Day celebrations conducted across multiple states, reaching several thousand students. Participation in prominent exhibitions such as Vibrant NE and the 10th India International Science Festival (IISF) further showcased NESAC's contributions and technological advancements. Through these sustained efforts, the O&CB division continues to foster knowledge sharing, skill development, and the broader use of geospatial tools for regional planning and sustainable development.

The Official Language Implementation Committee (OLIC) at NESAC remained active during 2024–25, meeting regularly to monitor and promote the effective use of Hindi in official work in line with the Government of India's Official Language Policy. As part of its efforts, NESAC conducted Hindi workshops and training sessions to enhance the working knowledge of staff. The Centre also observed Hindi Pakhwada with enthusiastic participation in various competitions such as essay writing, noting-drafting, and quizzes, encouraging the use of Hindi in day-to-day operations. OLIC reviewed the progress of Hindi usage, advised on increasing bilingual correspondence, and oversaw the translation of key documents and reports into Hindi across all divisions.

NESAC remains dedicated to leveraging space technology for sustainable development and resilience in the region. With continued innovation, collaboration, and capacity building, it addresses critical needs and empowers stakeholders, reaffirming its commitment to regional progress.

I compliment the Editorial team for compilation and bringing out the Annual Report 2024-25 in time.

(S. P. Aggarwal)



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ABOUT THE CENTRE

The North Eastern Space Applications Centre (NESAC), an autonomous body under the Department of Space, Government of India, has been providing dedicated space-based services to the eight states of the North Eastern Region (NER) for over 24 years. NESAC plays a vital role in supporting developmental planning, natural resource management, and disaster preparedness in the region through the use of space science and technology. The major objectives of the centre are: 1) To provide an operational remote sensing and geographic information system aided natural resource information base to support activities on development/management of natural resources and infrastructure planning in the region. 2) To provide operational satellite communication application services in the region in education, health care, disaster management support, and developmental communication. 3) To take up research in space and atmospheric science area and establish an instrumentation hub and networking with various academic institutions of NER. 4) To enable single window delivery of all possible space-based support for disaster management. 5) To set up a regional level infrastructure for capacity building in the field of geospatial technology.

Management of the Centre

All policies, affairs, and operations of NESAC are governed by the NESAC Society. Chairman, North Eastern Council (NEC) presides over the NESAC Society and the Secretary, DOS/Chairman, ISRO is the Vice President. Other members of the Society are - Secretary, NEC; Chief Secretaries of the eight NE states, senior scientists from DOS and NEC and academia of North Eastern Region (NER). A Governing Council (GC), under the advice of the Society, manages the activities of the Society/Centre. Secretary, DOS/Chairman ISRO is the chairman of the GC and Secretary, NEC is the Alternate Chairman. Chief Secretary, Meghalaya; representatives of the governments of the NER States and representatives of central government agencies in the region are the other members of the GC.

Scientific Programs

The scientific programs of the centre are guided by the needs of the region and are reviewed yearly by the NESAC Society and GC. During the current year, NESAC has taken up and completed several projects covering the NER states in the areas of natural resources management, infrastructure planning, health, education, satellite communication and atmospheric science research. The centre has implemented a number of application projects sponsored by user agencies in the region, National/regional projects funded/coordinated by ISRO-DOS Centres, research and developmental projects under Earth Observation Applications, Satellite Communications (SATCOM) programs, Disaster Management Support (DMS) program under the North Eastern Regional node for Disaster Risk Reduction (NER-DRR).

Facilities

NESAC is located at Umiam, approximately 20 km from Shillong, Meghalaya. The NESAC Guest House and residential complex are situated about 1 km from the main office campus. The Centre is equipped with state-of-the-art infrastructure to support its diverse activities across various domains, including Remote Sensing (RS), Geographic Information Systems (GIS), Disaster Management, Satellite Communication, and Space and Atmospheric Science Research.

In addition, NESAC has a dedicated outreach facility to promote awareness and understanding of space applications among students, researchers, and the general public. This facility supports exhibitions, training programmes, workshops, and interactive sessions, thereby fostering greater engagement with space science and technology in the NER.

Remote Sensing (RS) and Geographical Information System (GIS)

The Centre is equipped with state-of-the-art servers and workstations for geospatial analysis and digital image processing, along with high-



end systems for photogrammetry, hydrological modelling, and related applications. It also houses advanced GIS and GNSS equipment, echo sounders, high-quality output devices, and other essential tools. NESAC maintains a rich repository of satellite data from both Indian and international remote sensing missions, covering the entire North Eastern Region (NER). This collection is complemented by reference maps and other ancillary datasets relevant to the region. The Centre is well equipped to process data from a wide range of platforms, enabling digital image processing, geospatial analysis, and location-based services. Capabilities and expertise are available in both Commercial Off-The-Shelf (COTS) and open-source software environments for efficient data analysis.

Additionally, NESAC possesses specialized instruments such as a spectroradiometer for capturing spectral reflectance at narrow intervals, which facilitates the development of a spectral library, as well as a well-equipped soil testing laboratory to support research and analysis related to soil health.

Information Technology and Computing facilities

NESAC has state-of-the-art IT facilities comprised of high-end workstations and servers for providing the computing needs of various scientific/technical staff and academic outreach programmes. The Local Area Network (LAN) with 1 Gbps Ethernet backbone is used to connect all the scientific groups and laboratories, administrative departments and other facilities in a secure way. The Internet connectivity having 1 Gbps bandwidth availed through National Knowledge Network is being used to provide internet services to NESAC office and Outreach buildings, including 24x7 operational services for providing data and applications. Apart from providing internet services, NKN is being used extensively for conducting online meetings, discussions and short courses. ISRO's private Space-net connectivity is used for attending official meetings and secure streaming applications within the ISRO/DOS network. The centre has one more internet connectivity with 100 mbps bandwidth as redundant link. NESAC

has established robust web hosting infrastructure to host various web applications, FTP services and other IT services. Recently, NESAC has setup a redundant site for all web applications and data using hyper converged infrastructure (HCI) at the Outreach building.

Latest map plotters, printers, GPS systems and cameras including GAGAN, NAVIC and DGPS for professional grade surveys and ground truthing are part of the IT infrastructure that supports mapping activities by various groups in the centre. A sufficient number of software tools, both in the form of proprietary and open source, for carrying out image processing and GIS projects have been procured and are being upgraded as necessary. The centre now houses multiple high-end servers including redundant servers, storage and sophisticated communication networks guarded by application-aware firewalls for the live hosting of numerous user-centric applications and data sharing gateway in a secure manner. More than 25 governance applications have been successfully developed and deployed for various user groups of the NE region. North Eastern Spatial Data Repository (NeSDR) is one of the major web applications cum single window data visualization and sharing platform which is being used by various Govt. departments for their planning and developmental activities. NESAC also maintains a separate hosting infrastructure exclusively for disaster risk reduction activities in the region. All data delivery and dissemination pertaining to all forms of disaster mitigation are being hosted from this infrastructure. NESAC is also in the process of augmenting its existing High Performance Computing Cluster (HPCC) infrastructure which is being used for weather forecasting, flood prediction models and numerous other R&D models. In addition, the centre has been equipped with a state-of-art GPU server facility along with good number of very high-end servers to perform advanced big data analytics on remotely sensed imagery. Several AI/ML models have been built to automate general remote sensing pipelines for feature extractions. Operationalization of such models is being undertaken for quicker yet precise delivery of user-centric data products for effective decision making.

Satellite Communication

NESAC has got advanced satellite communication facilities to support various developmental programs in eight states of NER. NESAC houses one of the four IRCDR ground stations of NAVIC system for data reception and monitoring on a 24X7 basis as part of the satellite navigation program of ISRO. The MATRIS (MCF Augmented Telemetry & Ranging Infrastructure Shillong) Station of MCF is also housed inside NESAC and giving ranging support for MCF. The Centre has an Electronics cum Instrumentation Laboratory for experimental work in the areas of Internet of Things (IoT), Wireless Sensor Network (WSN), Location Based Services (LBS) etc. The Centre also provides operational support to the GSAT-29 hub located at Dharapur, Guwahati, Assam.

Space and Atmospheric Science Research

The centre has a dual-polarised S-band Doppler Weather Radar (DWR) installed at Sohra (foremarly Cherrapunji), Meghalaya, for studies in early warning of hydro-meteorological disasters, convective systems, cloud and precipitation physics, etc. A network of 38 automatic weather stations (AWS) has been set up to support flood forecasting activities. The group operates and manages three multi-instrumented aerosol observatories (at NESAC, Umiam; Tawang, Arunachal Pradesh; and Lachung, Sikkim) set up in collaboration with Space Physics Laboratory, Thiruvananthapuram, for Spatio-temporal characterization of aerosols and its impact on weather and climate over the Himalayan region. A UHF wind profiler has been installed recently in collaboration with ISTRAC, ISRO, Bengaluru that provides continuous data on 3D wind upto a height of 6-8 km from ground level.

The centre hosts a Multi-Wavelength Radiometer (MWR), Sunphotometer, Aethalometer, MicroAeth, Integrating Nephelometer, Electric Low Pressure Impactor (ELPI), etc. for physical and optical characterization of aerosols. To study the atmospheric boundary layer Physics and dynamics, the centre has Dr. Pisharoty sonde (GPS-based) launching facility with hydrogen gas filled balloons and a 32 m tower with fast response 3D sonic anemometer and other

meteorological instruments at four levels (at the heights of 6m, 10.5m, 18m, and 30m). A Cloud Condensation Nuclei (CCN) counter, Disdrometer, and one Ceilometer have been installed to study cloud microphysical properties and the aerosol-cloud interaction over the NE region. A tethered balloon launching facility is established for vertical profiling of aerosol using lightweight instruments. Two electric field mills have been installed for studying the Physics of atmospheric electricity. The Centre is also in the process of initiating chemical characterization of aerosols and conducting laser-induced fluorescence studies of aerosols.

North Eastern Regional Node for Disaster Risk Reduction (NER-DRR)

NESAC's North Eastern Regional Node for Disaster Risk Reduction (NER-DRR) has been actively engaged in research and development to enhance disaster resilience in the region. The node supports the State Disaster Management Authorities of the NER in real-time flood early warning dissemination, lightning nowcasting, landslide mapping, and identification of embankment breaches. A robust lightning warning system and a seasonal landslide inventory are being developed to strengthen regional preparedness. The dedicated NER-DRR Geoportal, with interactive sub-portals and analytical tools, serves as a vital platform for emergency response, hazard monitoring, and informed decision-making across the region.

Unmanned Aerial Vehicle (UAV) Facility

NESAC has broadened its range of activities in UAV systems development and integration, significantly advancing its applications in Remote Sensing, Disaster Management, Security & Surveillance, Payload delivery, and more. Currently, NESAC has a fleet of ten different types of UAVs, both operational and experimental, including various categories of multi-rotors and VTOL fixed-wing UAVs. The organization is also equipped with a wide range of payloads, such as Lidar sensors (905nm wavelength), Hyperspectral sensors (500-900nm, 100 custom bands), RGB cameras (12-42 MP), multiband multispectral sensors (5/10 bands), thermal sensors etc. The centre has added a 5 Axis CNC machine and a



FFT Gyroscope as new instruments for research and development activities. The 5 axis CNC machine is a versatile tool used in manufacturing and prototyping industries. It is being used for various design & development and operation & maintenance activities at NESAC. The FFT Gyroscope is a state of the instrument used for indoor tuning and testing of the drones. The instrument available at NESAC is able to cater the copter type drones of size 800-1000 mm. The centre is well equipped with cutting-edge data processing facilities, featuring advanced hardware and software to produce high-quality outputs such as 3D Meshes, Point Clouds, Digital Surface Models, and RGB/MX/Thermal Orthomosaics. Additionally, the centre has a polymer-based 3D printer for manufacturing customized UAV components.

Library

The NESAC Library aims to provide “Anytime, Anywhere Access” with state-of-the-art expertise, infrastructure, and services to cater to the information needs of the organisation’s user community. It houses a diverse collection of resources in both print and digital formats. During 2024–25, the library added 600 books, including technical, general, and Hindi titles. A total of 431 periodicals, including journals, magazines, and newsletters, as well as 48 technical/project reports and 9 internship reports, were added during this period. The total holdings of the library have now increased to approximately 16,000. The library continues to provide access to e-journals through the IEEE/IET Electronic Library, Springer Nature, and Scientific American via AntarikshGyaan (ISRO Library Consortium), along with a few physical journals and magazines through direct subscriptions. Additionally, access to the Springer Engineering Collection (2025) eBooks and Earth & Environmental Sciences eBooks (2025) was added to the

existing collection during this period. The library registered a few new members and carried out about 2,000 circulation transactions during the year. The library homepage continues to serve as the gateway to all available information resources. The library also provides off-campus access to subscribed e-resources and offers research support services to its users. It assists young researchers through similarity check and writing assistant software tools.

Sports and Recreation Facilities

NESAC has two well-equipped gymnasiums and various recreational facilities located at its Residential Complex and Outreach Campus. The gymnasiums feature state-of-the-art equipment such as treadmills, elliptical cross trainers, fitness bikes, multi-station gym units, and other fitness gear. A Community Hall at the Residential Complex serves as a venue for cultural programs and indoor sports like badminton and carrom. Additionally, the Outreach Campus includes a dedicated sports room with facilities for table tennis, snooker, carrom, and more. A fully developed, state-of-the-art squash court is also available at the NESAC Residential Complex.

Outdoor sports such as volleyball, football, and cricket are regularly played by NESAC staff and CISF personnel. Both regular staff and students/trainees actively participate in various sports and recreational activities. On occasions such as Republic Day, Independence Day, NESAC Foundation Day, New Year’s celebrations, and National Sports Day, the NESAC Sports & Recreation Committee organizes a variety of games and cultural events for NESAC staff and CISF personnel. A dedicated children’s play area, equipped with swings, a slide, and an open gym, has also been developed to promote recreational engagement for all age groups.

AGRICULTURE AND SOIL DIVISION

The Agriculture and Soil Division (ASD) of NESAC is actively involved in advancing geospatial technology applications for agriculture and allied sectors in the Northeast Region (NER), supporting data-driven decision-making.

ASD undertakes both user-funded and R&D projects focused on crop acreage estimation, soil quality assessment, land suitability analysis, yield prediction, and related activities. The division collaborates closely with State Remote Sensing Centres, Research institutions, and Government departments to ensure the effective implementation of these technologies. Additionally, ASD is exploring emerging technologies, including UAV remote sensing and advanced imaging techniques, to enhance accuracy in agricultural planning and resource management.

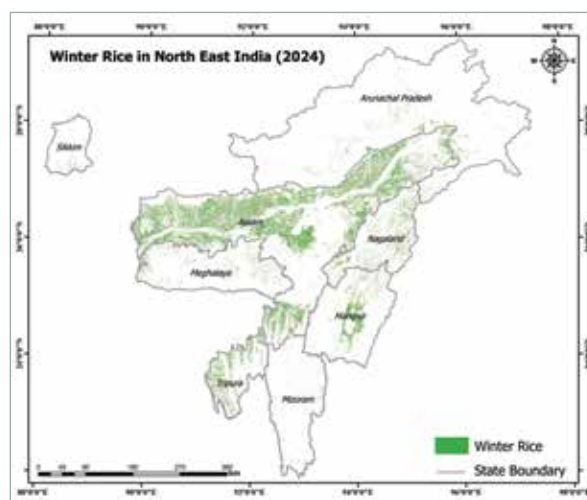
Beyond research, ASD is actively engaged in training and capacity building, organizing basic and curated courses, workshops and hands-on sessions to equip officials, students, and researchers with practical skills in remote sensing and GIS applications.

Applications of Space Techniques for Agricultural Assessment in NER (ASAAN)

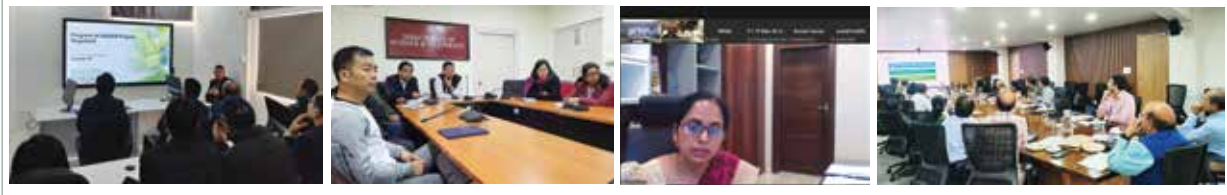
This project has been undertaken under the Plan of Action (PoA) with financial assistance from the North Eastern Council (NEC). The project's primary objectives are to estimate the acreage of rice, maize, and other important crops, analyze cropping intensity, and conduct site suitability assessments for key agricultural crops in the NER. To facilitate efficient field surveys, an Android-based mobile application, 'ASAAN', has been developed. This application can be paired with a GAGAN dongle to enhance positional accuracy. The project achieved key milestones in crop acreage estimation and land suitability analysis across NER. Acreage estimation of winter rice

was completed for Nagaland and Arunachal Pradesh, along with mapping post-kharif rice fallow and long fallow land (2019-2022) in Assam. Comprehensive reports on rice acreage estimation (2022-2023) were submitted to authorities in Mizoram and Arunachal Pradesh, while findings for Sikkim, including maize acreage in East Sikkim (2023), were presented.

Quality control (QC) for rice acreage estimation (2022-2023) was completed for Mizoram, Arunachal Pradesh, Nagaland, Meghalaya, Tripura, and Sikkim. Acreage estimation for summer rice (2024) was conducted in selected districts of Tripura and Meghalaya, while field surveys for sali rice and maize (2024) were carried out in Arunachal Pradesh, Assam, and Nagaland. Suitability analysis for oil palm expansion was completed for Mamit and Kolasib districts of Mizoram. Acreage estimation of winter rice (2024) in Assam, Tripura, Meghalaya, and Mizoram, along with kharif maize in Serchhip (Mizoram), was successfully conducted. Additionally, QC for cropping system and intensity assessment in Assam was performed using GTs collected in October 2024.



Winter rice in North East India (2024)



State level meetings with the officials/ scientists from Dept. of Agriculture and SRSACs at Kohima, Aizawl, Guwahati and Shillong

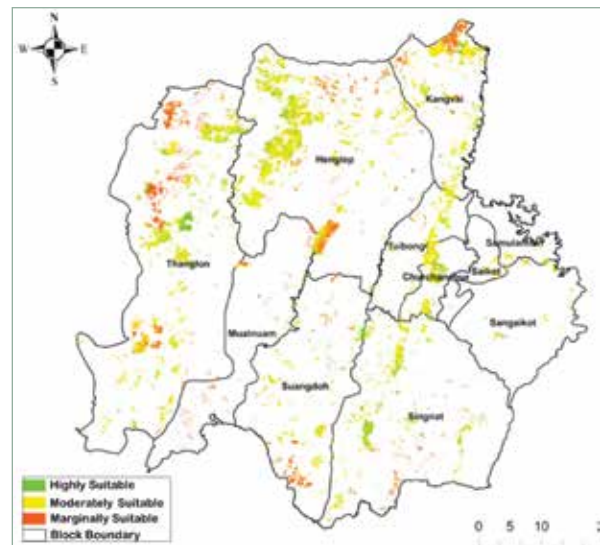
Space based Support for Integrated Development of Horticulture in NE (SSIDH)

The project is being taken up under PoA with financial support from NEC and executed by NESAC in collaboration with the State Remote Sensing Application Centres (SRSACs) of NE. The project aims to conduct site suitability analysis for key horticultural crops, estimate the acreage of selected crops, identify locations for cluster-based farming and post-harvest infrastructure, and map horticultural resources in selected districts of the region. To support these objectives, an Android-based mobile application, 'SSIDH,' has been developed for horticultural resource mapping.

Significant strides in crop suitability assessment, acreage estimation, and stakeholder engagement were made under this project. Accuracy assessment of pineapple and orange suitability areas in Meghalaya was completed, along with the identification of common suitability zones across all districts. A series of one-day workshops were organized to disseminate project findings to horticulture officials—held in Gangtok (May 15), Guwahati (May 22), and Imphal (May 29) for Sikkim, Assam, and Manipur, respectively. An additional workshop was conducted at NESAC on June 20, 2024 for Meghalaya's Horticulture Department. The draft project outputs were

shared with Meghalaya's officials, and an interim project report was prepared.

Quality control (QC) of acreage estimation for apple and orange in West Kameng and West Siang districts was carried out at NESAC from October 21 to 25, 2024.



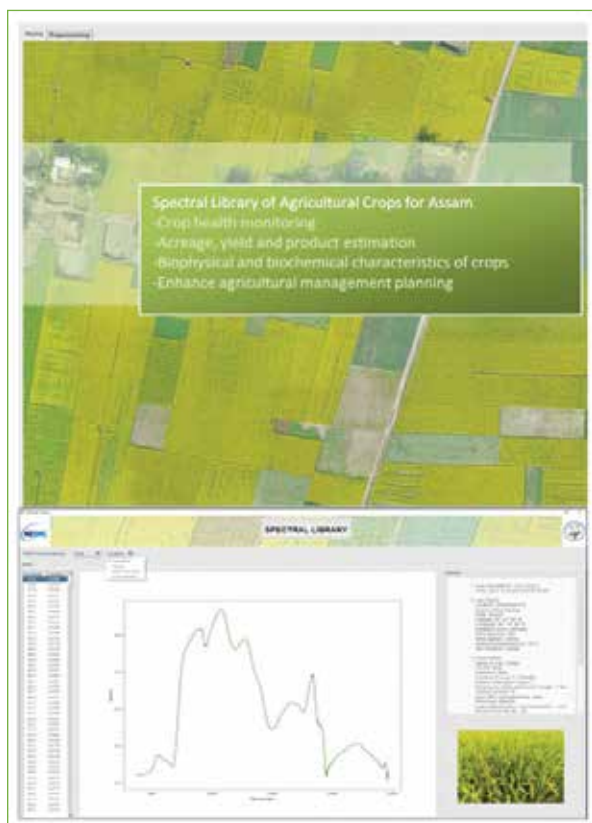
Suitable areas for pineapple in Churachandpur

Development of Spectral Library for Important Agricultural Crops in Assam

The project aims to create a spectral library for selected crops in Assam. This will help improve mapping using airborne and spaceborne hyperspectral imagery. As part of project, a Graphical User Interface (GUI) has been developed for vegetation spectra analysis of selected field crops.



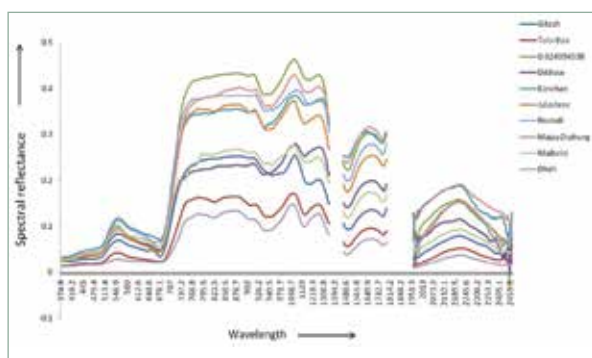
State level workshops with the officials/ scientists from Dept. of Horticulture & SRSACs at Imphal, and Aizawl



GUI for vegetation spectra analysis of selected crops

Detecting Crop Responses to Elevated CO₂ and Environmental Stresses with Close-Range Hyperspectral and Thermal Imaging

This project, jointly undertaken by NESAC and Assam Agricultural University, Jorhat, aims to assess the potential of hyperspectral and thermal imaging for detecting stress in rice crops and identifying tolerant genotypes. Under this project the effects of abiotic stress on crop growth using advanced remote sensing techniques and physiological tools were studied. As part of the study, 10 genotypes have been selected from an initial pool of 100. Hyperspectral data for



Spectral reflectance curve of rice genotypes

these genotypes were collected and processed at 60 and 90 days after sowing (DAS) to analyze submergence and light stress responses. Preliminary findings indicate that the 'Gitesh' genotype exhibits the highest tolerance and resistance to submergence. Additionally, the Light Stress Index (LSI) has shown the greatest sensitivity to structural and biochemical changes under light stress.



Biophysical data collection and thermal imaging

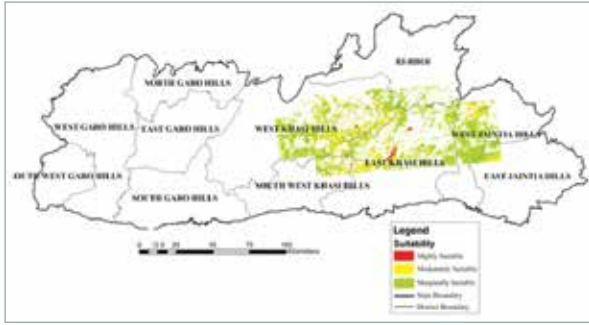


Data collection with spectroradiometer and plant canopy analyzer

Baseline survey of areas suitable for expansion of fruit crops in Meghalaya using Geospatial Technology

The project, funded by the Directorate of Horticulture, Government of Meghalaya, Shillong, aims to identify suitable areas for cultivating priority horticultural crops across the state. These crops and their suitability criteria were finalized after consultation with the State Horticulture Department.

Suitable areas for eight priority crops (Blueberry, Apple, Kiwi, Walnut, Plum, Peach, Apricot and Pear) for all the districts of Meghalaya have been identified under this project using geospatial techniques.



Detailed soil survey for scientific land use planning for Meghalaya

This joint project, undertaken in collaboration with the Soil and Land Use Survey of India (SLUSI), Kolkata, is funded by ISRO. As part of the study, a physiography-based map has been prepared for soil survey activities, and quality control of the base layer has been completed. Fieldwork for the soil survey has commenced in the Garo Hills district of Meghalaya.



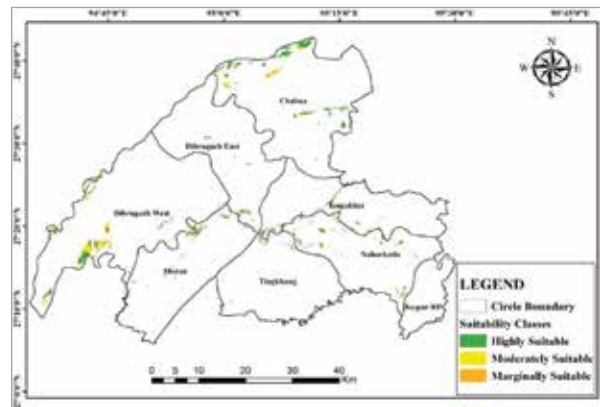
QC of the base layers at SLUSI, Kolkata



Soil profile studied at one of the different locations of Garo hills districts

Applications of RS & GIS in Sericulture Development

The project, funded by CSB, Bangalore, aims to identify suitable areas in Assam and Meghalaya using geospatial technology to support sericulture expansion. Site suitability studies have been completed for Muga food plants in nine districts and Eri food plants in twelve districts of Assam. Additionally, a capacity-building program for officers of the Sericulture Department, Tripura, was conducted on December 6, 2024, at NESAC.



Potential sites for Muga food plants in Dibrugarh



Capacity building for the officers of Sericulture Department

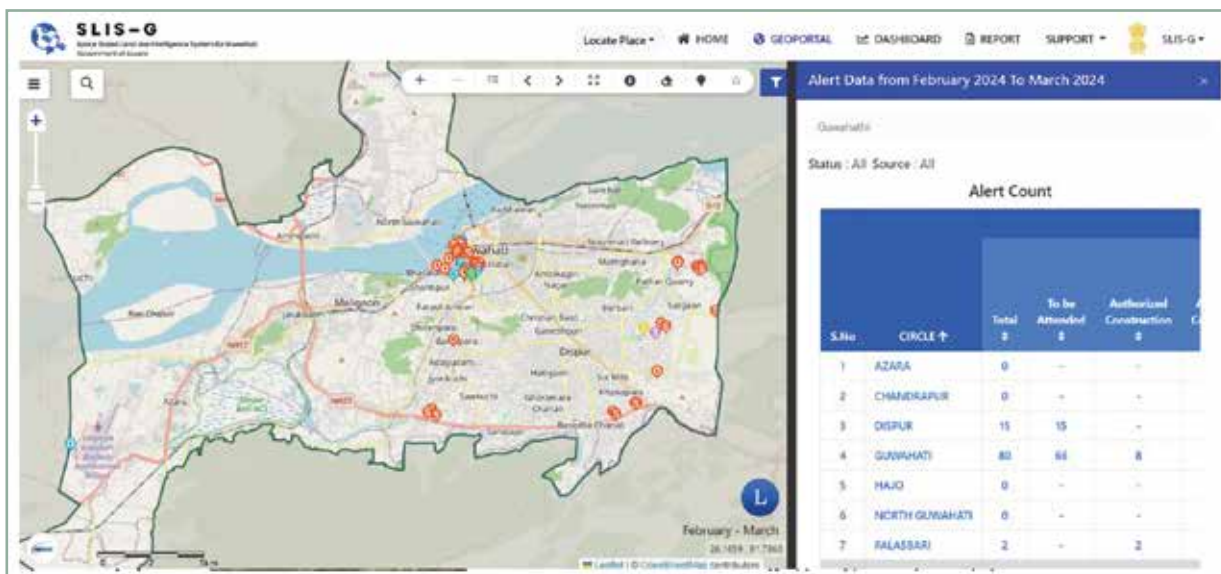
Space-based Land-Use Intelligence System for Guwahati

The project, funded by NEC, aims to tackle the challenges arising from Guwahati city's rapid expansion, particularly encroachment on government lands. The main objective is to develop a web-enabled land utilization intelligence system that utilizes high-resolution satellite imagery, drone data, and AI/ML technologies. As part of this project, cadastral

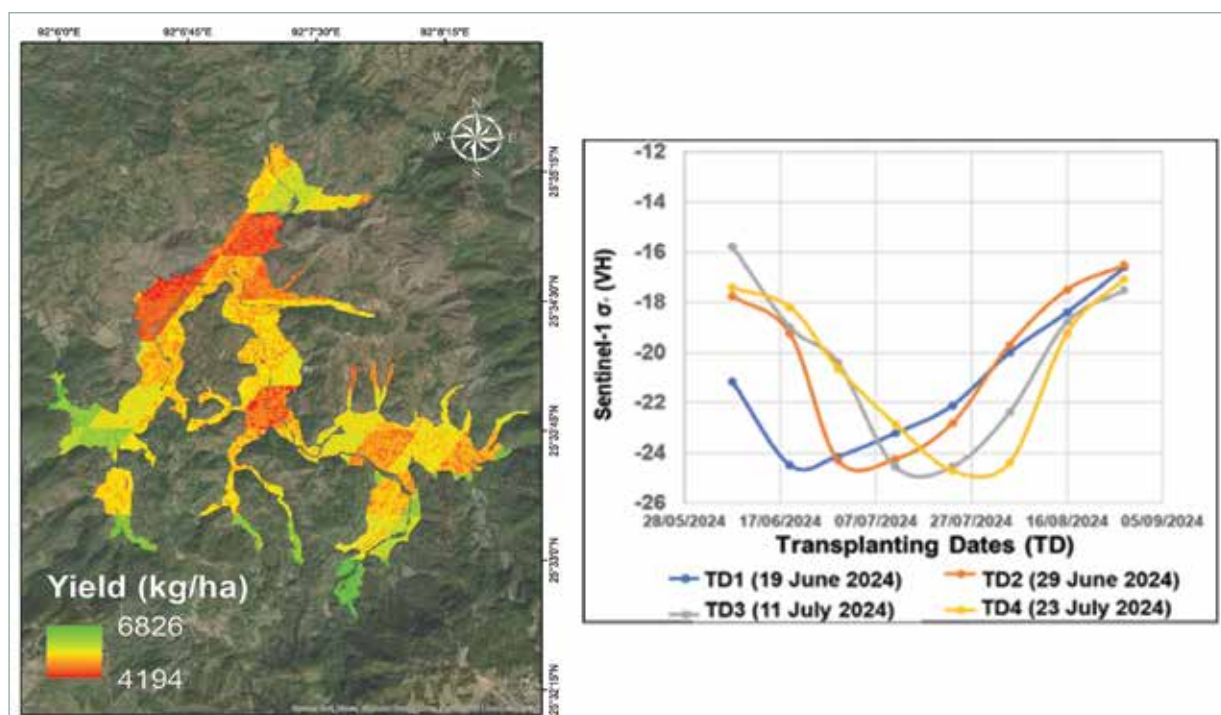
maps have been updated at a 1:1000 scale, and government and non-government land parcels have been categorized, with 31,784 government land parcels identified. Additionally, a mobile application and dashboard system have been developed to monitor encroached land parcels, enabling efficient tracking and management of unauthorized land-use changes.

Remote Sensing-Based Rice Yield Prediction in NE India's Hills

The project aims to simulate and predict rice yield in the hilly terrain of Northeast India using remote sensing-based models. The Sung Valley region in Meghalaya has been selected as the study area, as it is a major rice-producing region of the state and represents the hilly agro-ecosystem of the



SLIS-G Dashboard for monitoring alerts



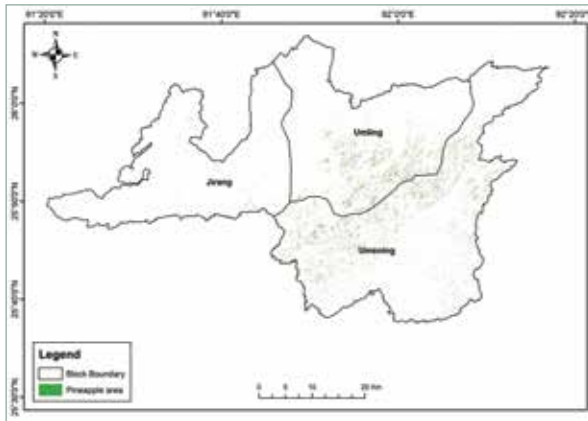
Rice yield estimation (2024)



Northeast. An assessment has been conducted on the transplanting window in the study area for 2023 and 2024, along with the estimation of the area under different transplanting periods. Additionally, rice yield estimation has been carried out using a semi-physical model and the DSSAT model.

RS-Based Method for Pineapple Acreage, Production Estimation, and Post-Harvest Site Selection in Hilly Areas

The project focuses on estimating pineapple acreage and production in hilly cropping systems using satellite imagery and very-high-resolution UAV data. It also includes the application of



Mapping of pineapple areas (2024) in Ri-Bhoi district

cropping scenarios has been developed by incorporating phenological information of pineapple, spectral and textural features from Sentinel-2, multitemporal cross and co-polarized bands from Sentinel-1, and digital elevation model (DEM) features.

Indian Potato Crop Monitoring (IPCM)

The Indian Potato Crop Monitoring (IPCM) initiative is a nationwide project, with NESAC focusing on satellite data processing, ground truthing, algorithm implementation, and the generation of potato crop maps and health indicators specifically for six districts of Assam. Additionally, the project involves a comparative evaluation of proposed yield models for the state.

As part of this project, participation in the Technical Meet on the development of the Indian Potato Crop Monitor was undertaken at MNCFC, New Delhi, on April 24, 2024. Field surveys were conducted in potato-growing areas of Lakhimpur, Biswanath, and Sonitpur districts from December 21 to 27, 2024, and in Barpeta, Darrang, and Udalguri from January 7 to 10, 2025.



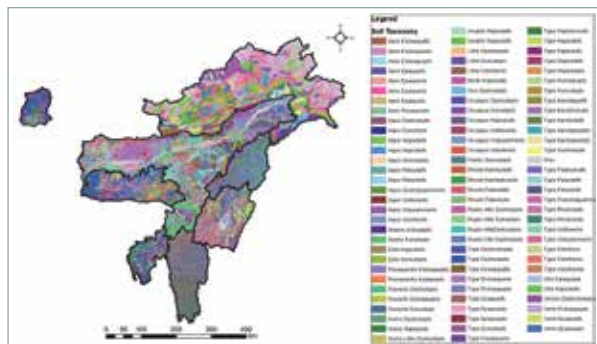
Field survey of Potato growing areas

geospatial technology for planning post-harvest infrastructure to enhance efficiency in pineapple cultivation and distribution. The methodology for acreage estimation of pineapple in different

Soil Resource Atlas: Eastern India Regional Coordination

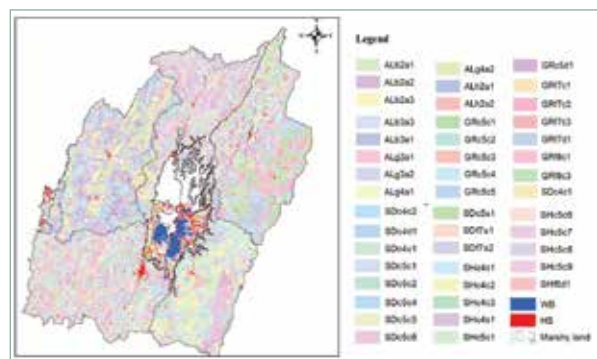
As part of the Soil Resource Atlas of India project, funded by ISRO, a harmonized soil resource map

at a 1:50,000 scale was developed by integrating datasets from NESAC and SLUSI. A common taxonomic classification was established for the eight states of NER, along with West Bengal and Odisha. Additionally, a uniform digital soil database was created for the study area.



Soil Resource Mapping (SRM) on 1:50K for 7 districts of Manipur

Under the ISRO-funded Soil Resource Mapping (SRM) project, soil resource maps at 1:50K scale were prepared for seven districts of Manipur. Additionally, Land Capability, Land Irrigability, and Soil Irrigability maps were generated to support sustainable land use planning and agricultural development in the region.



Geospatial Applications for In-Situ Muga Silkworm Conservation in West Jaintia Hills, Meghalaya

Under this NEC-funded project, a 100-hectare Muga conservation site was delineated in Lura village, East Jaintia Hills. Land cover types were classified, and Muga host plants were identified within the site. A soil fertility map was generated for five key soil parameters: organic carbon (OC), pH, nitrogen (N), phosphorus (P), and potassium (K). Additionally, an Automatic Weather Station

(AWS) was installed within the conservation area for continuous environmental monitoring.



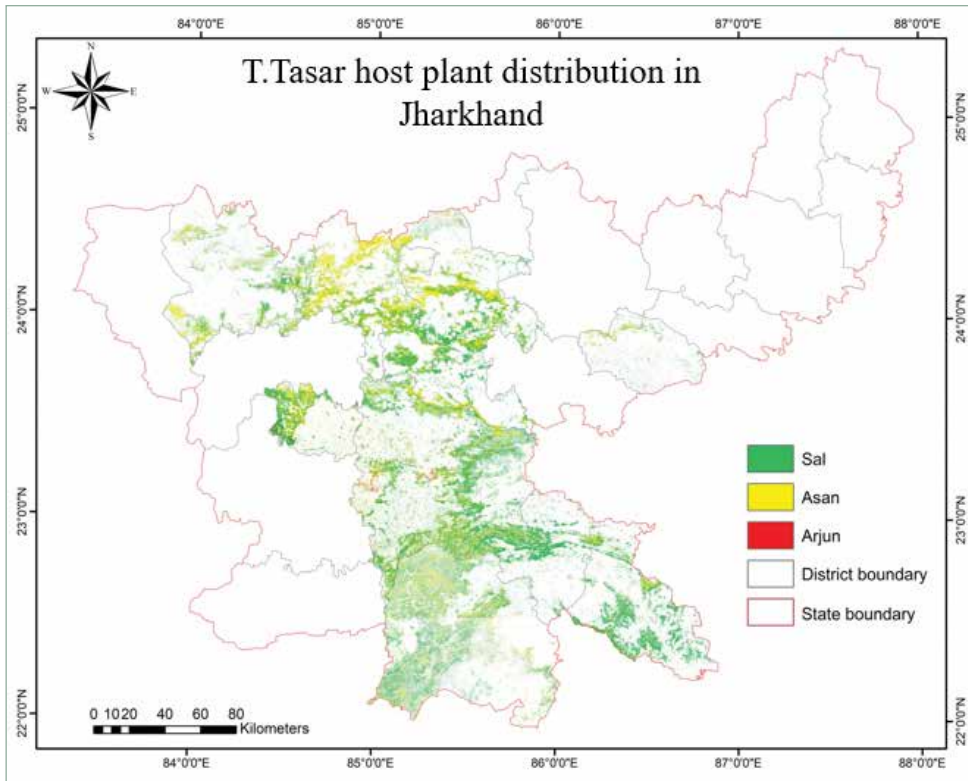
Establishment of AWS at Lura, East Jaintia Hills

Study on Existence of Tropical Tasar Silkworm Ecoraces and their Subsist Places with the Help of Geospatial Technology

This CSB-funded project is a collaborative initiative between NESAC and the Central Tasar Research & Training Institute (CTRТИ), Jharkhand. As part of the project, NESAC developed a methodology for identifying Tropical Tasar host plants, including Sal, Arjun, and Asan. Additionally, NESAC designed the 'TASAR' mobile application, which can be paired with a GAGAN dongle for accurate field data collection, along with a dashboard for real-time monitoring and analysis.

Space technology support for expansion of Muga sericulture in Assam

This PoA project, funded by the Government of Assam, aims to utilize geospatial technology to support Muga sericulture in the state. Following consultations with the Directorate of Sericulture, Dhemaji district was selected for the study due to its significance as a traditional Muga silk-producing region and the recent challenges



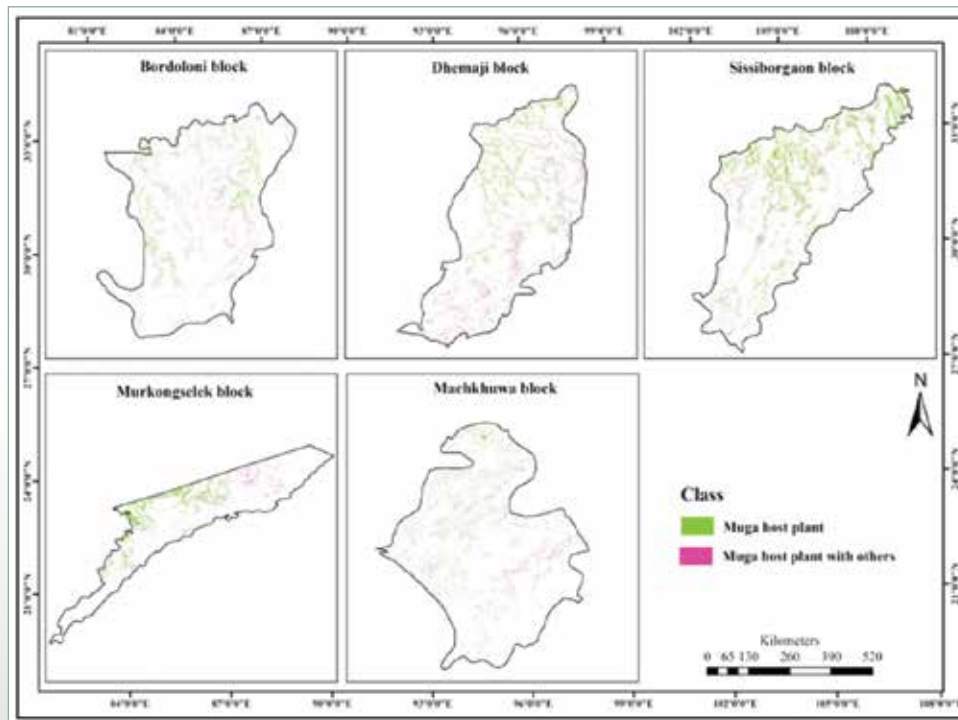
Tropical Tasar host plant distribution in Jharkhand



Tasar mobile app

faced in its cultivation. As part of the project, 167 private farms spanning 109 hectares and five government farms covering 61 hectares were geo-tagged. Additionally, an acreage

estimation of Muga host plants was conducted for Dhemaji district. The Random Forest (RF) classifier demonstrated the highest accuracy in distinguishing between two categories: Class 1 –



Spatial distribution of two classes of Muga host plants with RF classifier; (a) Bordoloni block; (b) Dhemaji block; (c) Sissibogaon block (d) Murkongselek block; and (e) Machkhowa block.

pure Muga host plants and Class 2 – Muga host plants mixed with other vegetation.

Thermal Infrared Imaging Satellite for High-resolution Natural Resource Assessment (TRISHNA)

The Thermal infraRed Imaging Satellite for High-resolution Natural resource Assessment (TRISHNA) is a planned collaborative satellite mission between the Indian Space Research Organisation (ISRO) and the Centre National d'Études Spatiales (CNES), France. As part of its calibration and validation (Cal-Val) activities, NESAC provided UAV support



UAV survey at Berambadi watershed site, Karnataka during 29.04.2024 to 04.05.2024

to the project. A UAV survey was conducted at the Berambadi watershed site, Karnataka, from April 29 to May 4, 2024, and UAV-thermal data from a flight on May 1, 2024, was subsequently submitted to SAC, Ahmedabad, on May 30, 2024. The findings from this survey were presented during the ISRO-CNES Meeting at

SAC, Ahmedabad, on June 20, 2024. Additionally, a follow-up UAV survey was carried out at the Cal-Val site from June 18 to July 12, 2024. Also, scientists from ASD participated in the ISRO-CNES Cal-Val interface meeting on August 14, 2024, in which, Assam Agricultural University (AAU), Jorhat, was proposed as a potential validation site.

UAV survey of oil palm plantations under NMEO-OP

At the request of the Government of Assam, NESAC conducted a UAV survey on December 20, 2024, in the Boginodi and Ghilamara blocks of Lakhimpur district to assess oil palm cultivation in both converted and prospective areas. The survey revealed that Boginodi's converted plots have a well-established tree density, indicating successful plantation growth, while the prospective plot shows potential for future expansion. In Ghilamara, a 16.39-hectare prospective plot was identified, highlighting significant scope for large-scale oil palm cultivation. Utilizing high-resolution UAV data, NESAC mapped plantation boundaries, monitored tree density, and assessed overall plantation health, providing critical insights for informed decision-making. These findings will support the National Mission on Edible Oils-Oil Palm (NMEO-OP), aiding the Government of Assam in strategizing expansion efforts to enhance domestic edible oil production.



FORESTRY AND ECOLOGY DIVISION

The Forestry and Ecology Division (FED), NESAC carries out various research and application projects using geospatial technology such as mapping of forest gap area, canopy density assessment, area under bamboo, shifting cultivation, wildlife habitat assessment, estimation of forest above ground biomass and carbon stock. The division has been providing important information pertaining to forests of North Eastern Region to various stakeholders to support in preparing management plans for forest resources in the region. The division also conducts customized capacity-building programs on request from Forest Departments in addition to the regular yearly course. Some of the major projects are highlighted as follows.

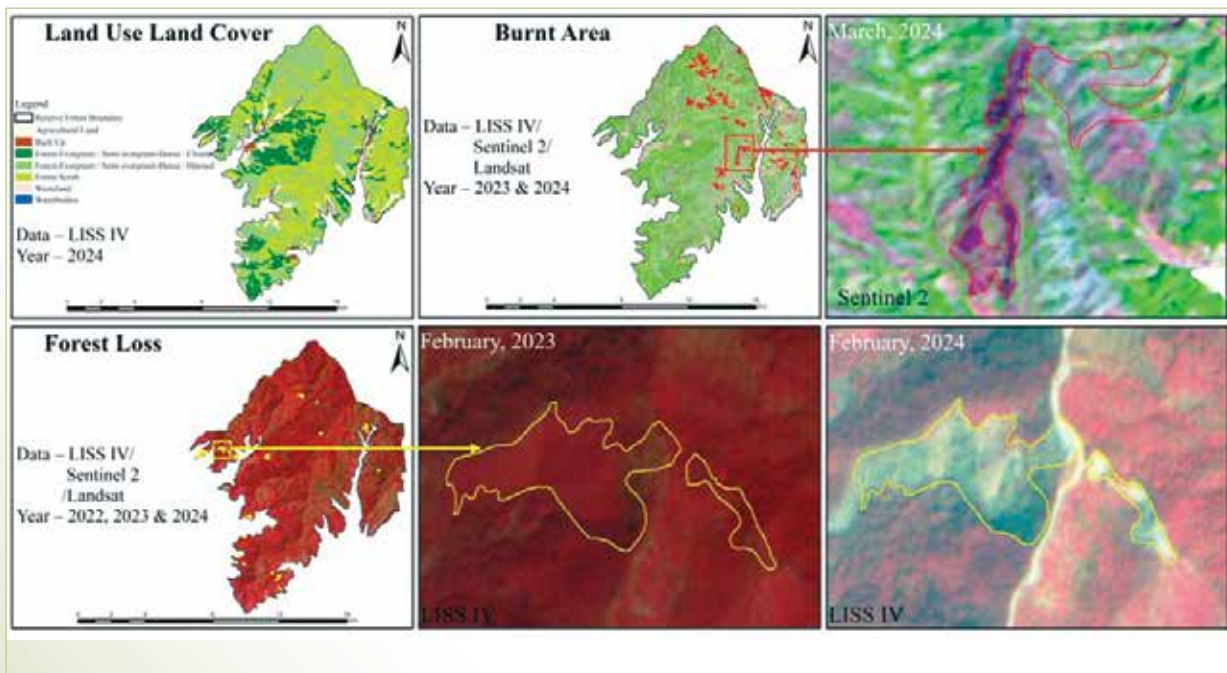
Integration of Forest Resource Information under Forest Resource Analysis and Monitoring System (FRAMS) for Manipur

As part of the project, Land Use Land Cover (LULC) map for the year 2024 has been successfully generated for Reserve Forests (RFs) in the Central Division using high-resolution LISS IV satellite

imagery. Additionally, a burnt area assessment has been carried out for the period 2022–2024 using multi-source satellite datasets, including LISS III, Sentinel-2, and Landsat 9. The forest loss from 2022 to 2024 has also been mapped by using Pre and post- LISS IV imagery. This analysis provides critical data on forest loss, fire frequency, and land cover dynamics, supporting effective management, conservation, and policy decisions. The geospatial database developed through these analyses will serve as a foundation for an automated monitoring system, enabling near real-time tracking of forest changes and ensuring efficient dissemination of critical information to relevant stakeholders.

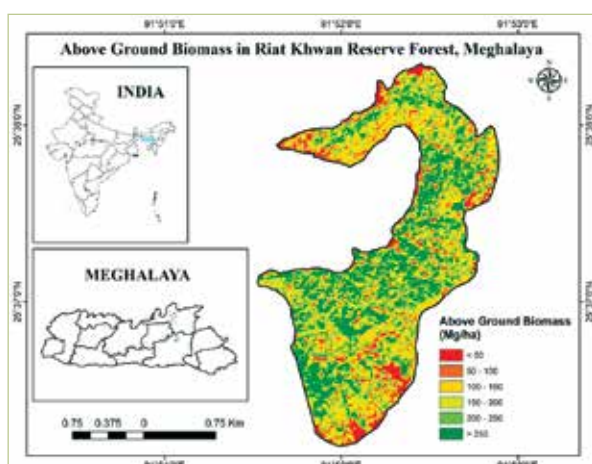
Estimation and mapping of above ground biomass in selected forest types in different altitude zones of North East India

Aboveground biomass (AGB) was estimated in the Reserve Forests of Meghalaya using field inventory, remote sensing, and statistical modeling. The study has been carried out in the mixed moist deciduous forest of Meghalaya



Land Use Land Cover, burnt area and forest loss map for the year 2024 of Khamenlok Gwaltabi Reserve Forest under Central Forest Division, Manipur

where ground data was collected from 90 sample plots. The highest biomass was found in the *Tectona grandis* species. C-band (EOS-04) and L-band (ALOS-2 PALSAR-2) SAR backscatter (HH, HV) were used for remote sensing analysis. A multi-linear regression model combining HH and HV polarizations showed a moderate ($R^2 = 0.7$) predictive strength. HV polarization ($R^2 = 0.6$) exhibited a stronger correlation with AGB than HH ($R^2 = 0.3$). The study demonstrates the effectiveness of integrating field data with multi-frequency SAR remote sensing, enabling the development of spatial AGB maps for sustainable forest management and climate change mitigation. The AGB spatial distribution map for Meghalaya is now complete, while field inventory data collection is ongoing in Assam and Sikkim.



Spatial distribution of Above Ground Biomass in Riat Khwan Reserve Forest of Meghalaya

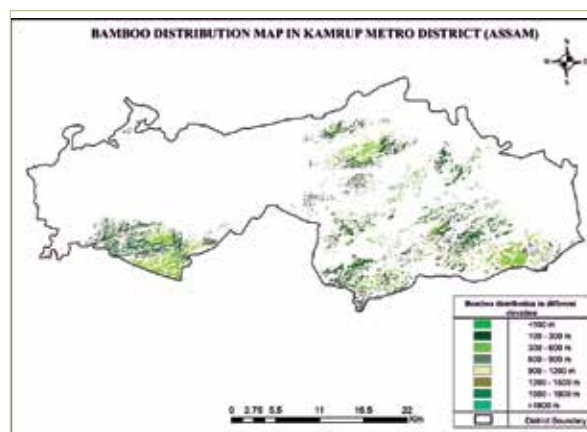
Bamboo Resource Mapping in the State of Assam

The project is being carried out with funding from North Eastern Development Finance Corporation Limited (NEDFi), Assam for mapping the bamboo resources and estimating the bamboo growing stock in both Recorded Forest areas and non-Forest areas of Assam. IRS R2 LISS IV and Sentinel 2B imagery is being used for mapping the bamboo growing areas. Mapping of distribution of bamboo-growing areas has been completed for four districts (Kamrup Metro, Nagaon, Sibsagar and Sonitpur), while number of bamboo culm estimated for seven districts

(Darrang, Golaghat, Jorhat, Kamrup Metro, Sibsagar, Morigaon and Nagaon).



Bambusa sp. in Golaghat district, Assam



Distribution of bamboo in Kamrup Metro district

The total area under bamboo in Kamrup Metro district is 4520.85 ha contributing 2.97 % of the total district area and bamboo covers an area of 7265.60 ha in Nagaon district constituting 3.17% of the total district area. In Sibsagar district, bamboo covers an area of 14375.14 ha which is 9.0 % of the district area while Sonitpur district has 13830.89 ha area under bamboo contributing 2.60 % of the total district area.

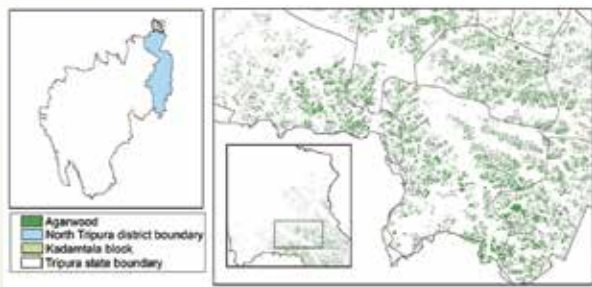
Agarwood Plantation Mapping in Non-Forest Areas of North Tripura & Unokoti Districts of Tripura

The project is being carried out with funding from the NTFP Centre of Excellence (NCE),



Agarwood plantation in Unakoti district, Tripura

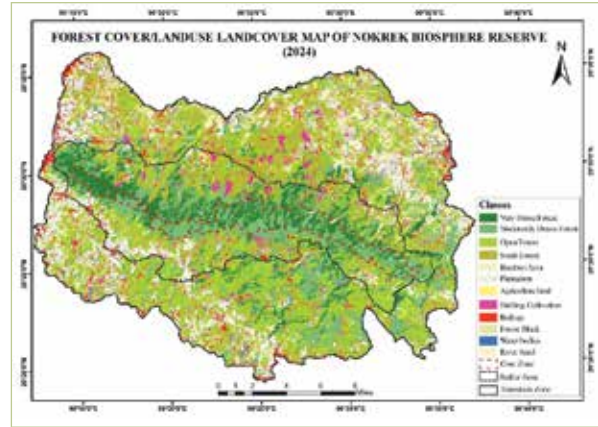
Agartala for mapping the agarwood plantation in the non-forested areas of the two districts of Tripura (North Tripura and Unakoti districts) and it is being carried out in collaboration with Tripura Space Applications Centre (TSAC). Very high-resolution Worldview data of 2020-22 (0.3 m resolution) is being used for mapping the distribution of agarwood plantation as the size of the agarwood plantation area in most of the non-forest area is quite small which is normally less than 1 ha. Preliminary mapping of agarwood plantation in Kadamtala block of North Tripura district has been completed. Field data information on agarwood plantation has been collected from 43 sample points.



Distribution of agarwood plantation in Kadamtala block, North Tripura district

Forest cover and associated Landuse/Landcover change analysis in Nokrek Biosphere Reserve, Meghalaya

The project is being carried out with funding from



Forest covers and associated Landuse/Landcover map of Nokrek Biosphere Reserve

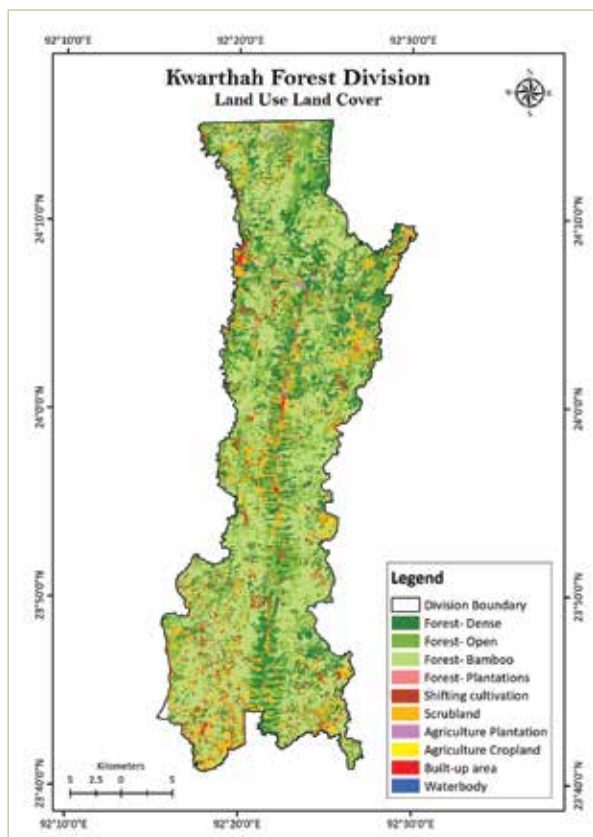
Forest Dept., Govt. of Meghalaya for mapping the forest cover and associated Landuse/Landcover in Nokrek Biosphere Reserve and also to analyse the changes in forest cover during 2009 and 2024. Mapping of forest cover and Landuse for the year 2009 and 2022 has been completed and analysed the changes taken place during the study period. It was observed that the core zone of the biosphere reserve has remained intact whereas significant changes in the forest cover were observed in both the buffer and transition zones. The major Landuse category that has contributed in the loss of forest covers in the buffer and transition zones are: shifting cultivation (701.38 ha in transition zone and 1,748.13 ha in the buffer zone) and plantation (573.47 ha in transition zone and 4,377.20 ha in the buffer zone).

Forest Growing Stock Assessment for Kwarthah Division, Mizoram Using Geospatial Techniques

Under this project the forest canopy densities were mapped at 1:10,000 scale for the area falling within the four RFs, namely, Langkaih Riverine Reserved Forest (RRF), Teirei RRF, Khawlangtuipui RRF and Lungkhul RF. There were 64 compartments in all and based on the field data provided by the user department, the growing stock of timber and bamboo, biomass and carbon stock of all the 5 pools of carbon have been estimated for all the compartments. The related thematic maps for the division like land use land cover, area under jhum, burnt area, precipitation maps, contours,



, slope, aspect, roads and settlements, bamboo bearing area, drainage, soil depth and texture etc. have been provided to the department to aid in preparation of the forest working for Kwarthah division.



LULC of Kwarthah Division, Mizoram

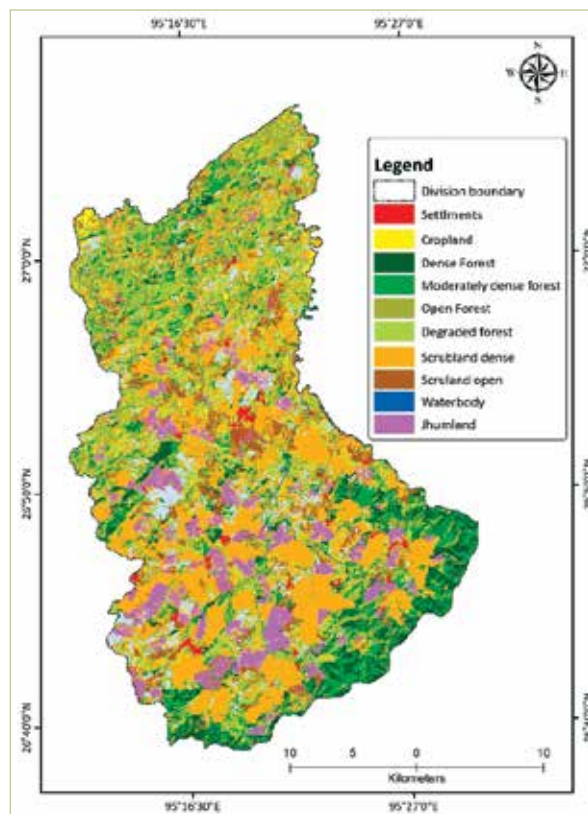
The phyto-sociological analyses of the trees, shrubs and herbs for the RRFs have also been provided to the department. The total carbon stock was found to range between 53.88 to 120.21 t/ha in Langkaih RRF, 72.75 to 108.98 t/ha Teirei RRF, 79.31 to 104.40 t/ha in Khawtlangtuipui RRF, while it was higher (124.85 to 171.14 t/ha) in Lungkhul RF as compared to the RRFs.

RS & GIS Inputs for Forest Working Plan of Arunachal Pradesh

This project is being carried out to provide geospatial inputs for the preparation of Forest Working Plan for the state of Arunachal Pradesh. In modification of the earlier procedure micro-watershed based forest compartment boundaries have been prepared for the entire

geographical area of the state for all the divisions. The updation of forest canopy density and stratification of forests has been completed for six divisions of the state. The regeneration status of trees in different strata and derivation of unified mean timber volume and mean stem density for all the forest strata is ongoing.

The wasteland maps and jhum maps for the whole state and area under bamboo for thirteen divisions of the state has also been provided to the department. The current forest cover status in compensatory afforestation areas identified by the department has also been provided to help in decision support by the department.



Updated canopy density and other LU map of Longding division (AP)

Study on Temporal Dynamics of Loktak Lake with Space based Inputs for Conservation Planning

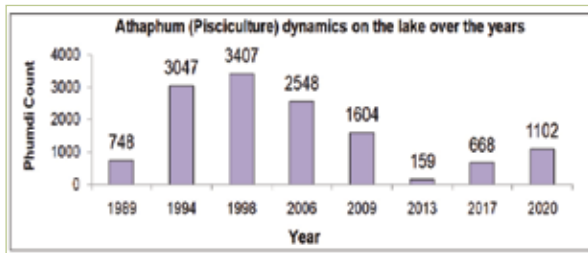
The project is being carried out as a part of the PoA projects to understand the temporal changes around Loktak Lake (Manipur) and its surrounding using geospatial techniques.



The information generated will assist the lake management authority in conservation planning and management of the lake. The work is being carried out in collaboration with National Institute of Technology (NIT), Manipur.



The atha-phum pisciculture in Loktak Lake



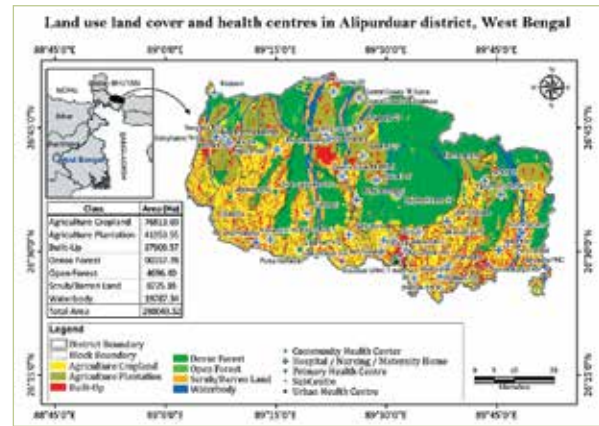
The dynamics of atha-phums in Loktak Lake

The bathymetry survey of the lake using dual frequency echo sounder is ongoing by NIT Manipur. The practice of 'atha-phum' farming (circular fish culture floating ponds) has changed over the years. Based on temporal data, it was found that the circular atha-phums were maximum in 1998 and least in 2013 which has again shown an increasing trend.

Ecological mapping in selected international border districts in NER to understand the malaria situation and transmission

The project is funded by the ICMR and jointly executed with Regional Medical Research Centre Dibrugarh. Under the project the different ecological maps have been prepared for the study districts which are sharing international border and have higher incidence of malaria in the region. The proximity of different malaria

cases to various land uses like jhum lands, tea gardens, forests and plantations in Meghalaya, Tripura, Mizoram and Alipurduar districts have been prepared.



LULC and the health centres in Alipurduar district (WB)

The forest cover loss (vegetation loss) in Changlang district which is suspected to be a factor for the change in the distribution of the vector in the study sites have been assessed for 5 years period of 2019 to 2023 using Sentinel-2 data.

Mapping and Monitoring Shifting Cultivation in NER Districts

As a continuing work under the ISRO funded project "Mapping of area under shifting cultivation in NER", mapping work for shifting cultivation fields (jhum) at 1:25,000 scale for different districts of NER has been carried out using Sentinel-2 data and LISS IV data for the period 2022 and 2023.

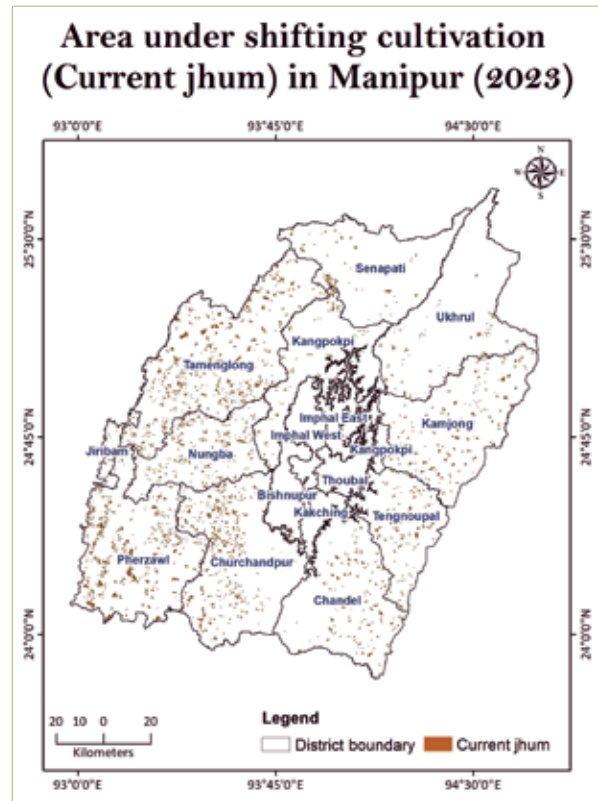


Jhum fields in Chandel district, Manipur

Updation of jhum fields in the districts of



Chandel, Tengnoupal, Tamenglong, Noney, Kangpokpi, Senapati and Jiribam in Manipur state; Kiphre, Longlen, Mokokchung, Woklha, Peren and Dimapur in Nagaland state; Longding, Changlang, Sagalee and Kurung Kumey in Arunachal Pradesh; Kolasib, Aizawl, Serchhip, Lunglei, Lawngtlai and Saiha in Mizoram have been completed. Delineation of jhum fields for other districts is ongoing.



Area under shifting cultivation in Manipur

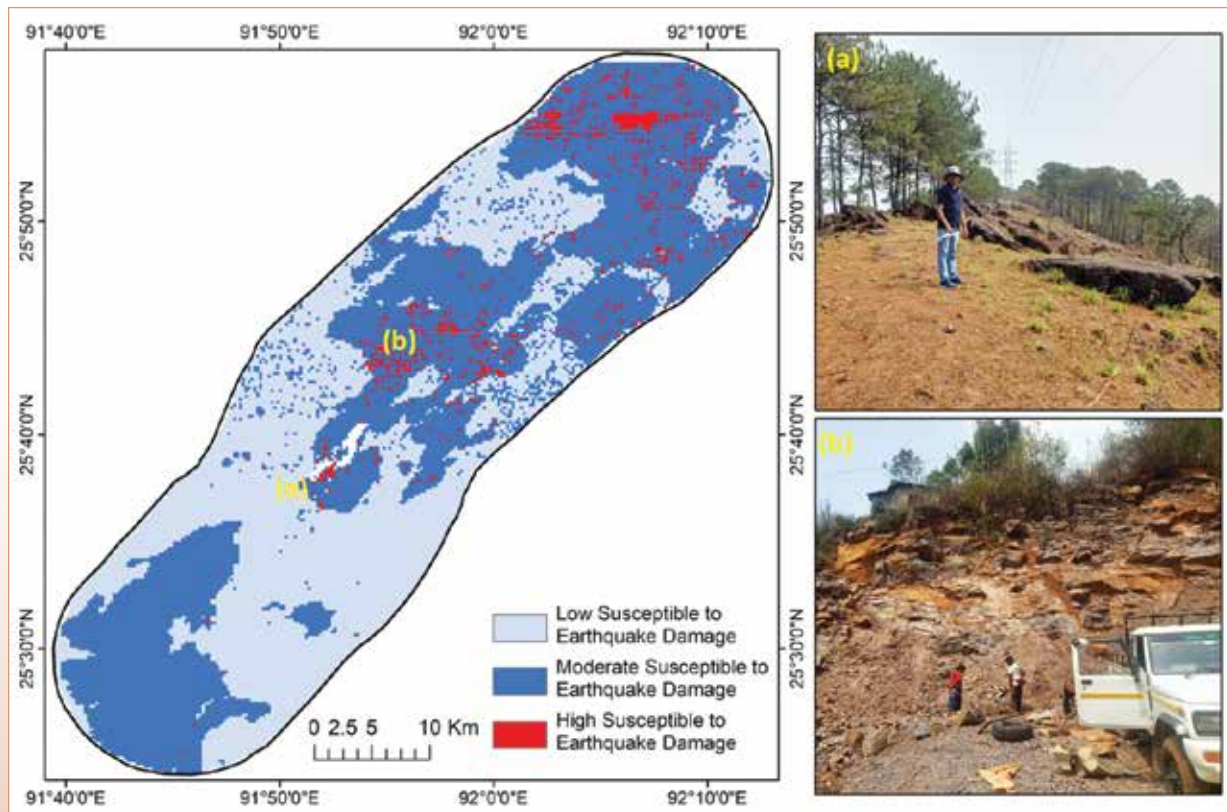


GEOSCIENCE DIVISION

The Geosciences Division (GSD) of NESAC provides geospatial technology for geology and geohazards management support in the North Eastern Region (NER). The division has been carrying out a number of applications projects required by the user, R&D projects as well as operational projects for supporting in disaster risk reduction of the region. Major activities include assessing afforestation status in degraded areas, mineral resource mapping, crustal deformation studies, earthquake precursor studies, seasonal landslide inventory mapping etc. The division is also providing professional training, inputs, and supports state departments involved with geosciences applications. A brief highlight of the completed and ongoing projects of the division during 2024-25 is given below:

Earthquake Damage Susceptibility Analysis in Barapani Shear Zone Using InSAR and Geophysical Data

The identification of areas that are susceptible to damage due to earthquakes is of utmost importance in tectonically active regions like Northeast India. This may provide valuable inputs for seismic hazard analysis; however, it poses significant challenges. The present study emphasized the integration of Interferometric Synthetic Aperture Radar (InSAR) deformation rates with conventional geological and geophysical data to investigate earthquake damage susceptibility in the Barapani Shear Zone (BSZ) region of Northeast India. We used MintPy v1.5.1 (Miami INsar Timeseries software in Python) on the OpenSARLab platform to derive time series deformation using the Small Baseline Subset (SBAS) technique. We integrated geology, geomorphology, gravity, magnetic field, lineament density, slope and historical earthquake records with InSAR deformation rates to derive earthquake damage susceptibility using the weighted overlay analysis technique.



Earthquake damage susceptibility map derived from a combination of InSAR and geological and geophysical parameters. (a,b) Two locations (among many) of field surveys showing corresponding field photographs on the right of the map (source Sharma et al., 2025).

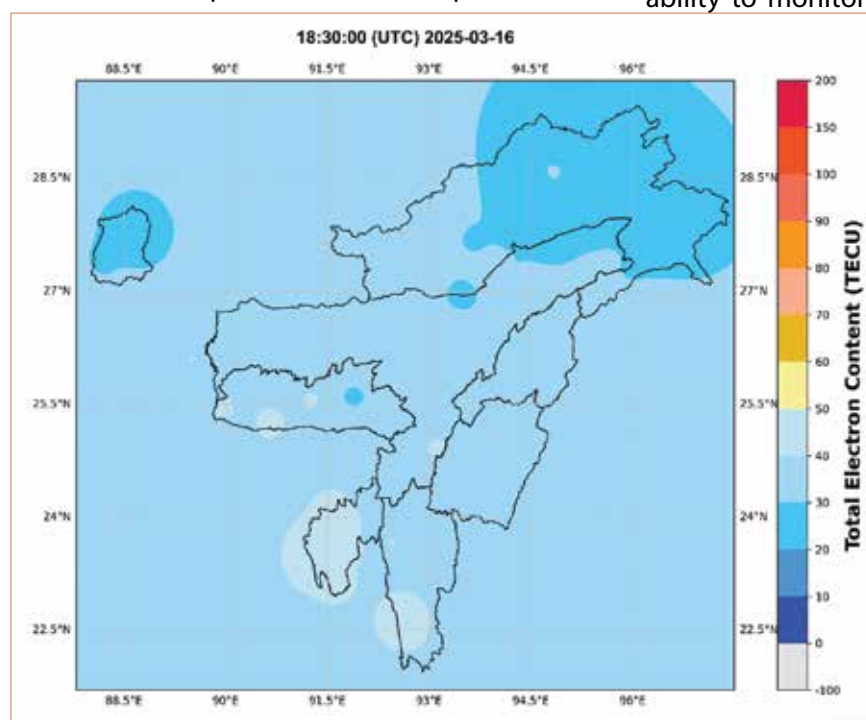
InSAR time series analysis revealed distinct patterns of ground deformation across the Barapani Shear Zone, with higher rates in the northern part and lower rates in the southern part. The deformation values ranged from 6 mm/yr to about 18 mm/yr in BSZ. Earthquake damage susceptibility mapping identified areas that are prone to damage in the event of earthquakes. The analysis indicated that about 46.4%, 51.2%, and 2.4% of the area were low, medium, and high-susceptibility zones for earthquake damage zone. The InSAR velocity rates were validated with Global Positioning System (GPS) velocity in the region, which indicated a good correlation ($R^2 = 0.921$; ANOVA p-value = 0.515). Additionally, a field survey in the region suggested evidence of intense deformation in the highly susceptible earthquake damage zone. This integrated approach enhances our scientific understanding of regional tectonic dynamics, mitigating earthquake risks and enhancing community resilience.

Ionosphere Total Electron Content (TEC) data analysis for earthquake precursor study in NER

The relationship between ionospheric TEC

variations and seismic activity are investigated on daily basis utilizing GNSS signals from 120 Continuously Operating Reference Station (CORS) operated by Survey of India (SOI) in North Eastern Region (NER) was investigated. A python code was developed to calculate the mean and standard deviation data utilizing past 15 days TEC time series data. These statistical measures were used to define daily limits for TEC deviations. This proactive approach enhances the system's capability to promptly respond to abnormal data patterns, ensuring timely analysis of huge data. Upon identifying the anomaly, we generate spatial anomaly map of NER. The resulting anomaly map highlights areas and specific times where the TEC values significantly deviated from the normal, providing valuable insights for further investigation. The generation of Total Electron Content (TEC) maps were automated on a daily basis for every 30 minutes resolution which are available at www.nerdr.gov.in.

This process of daily analysis and anomaly mapping has proven effective in enhancing our ability to monitor and respond to irregularities



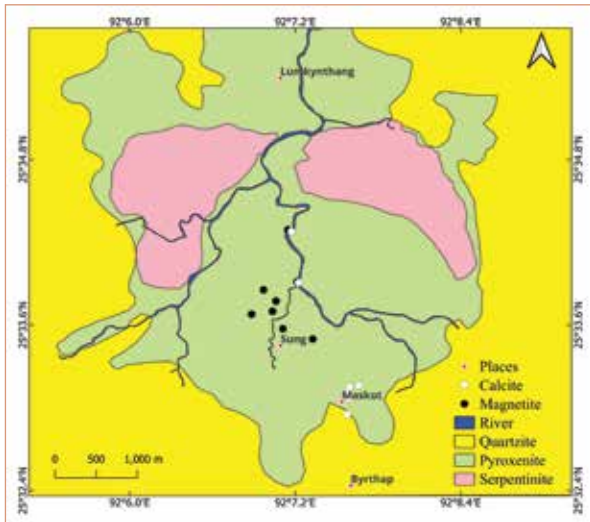
Example of Daily TEC map generated by NESAC which are made available via NERDRR webportal (www.nerdr.gov.in).

in TEC data, thereby improving the accuracy and efficiency of geospatial data processing. It aids earthquake researchers in identifying potential precursors to seismic activities. It also benefits those studying solar flares by correlating ionospheric disturbances with solar events. Furthermore, the anomaly maps are useful for lightning research, helping to understand the relationship between ionospheric conditions and lightning occurrences.



Other fields such as atmospheric science, space weather prediction, and telecommunications also benefit from these insights, as they rely on accurate ionospheric data for their studies and applications.

EO Based Mineral Resource Mapping of Sung Valley, Meghalaya

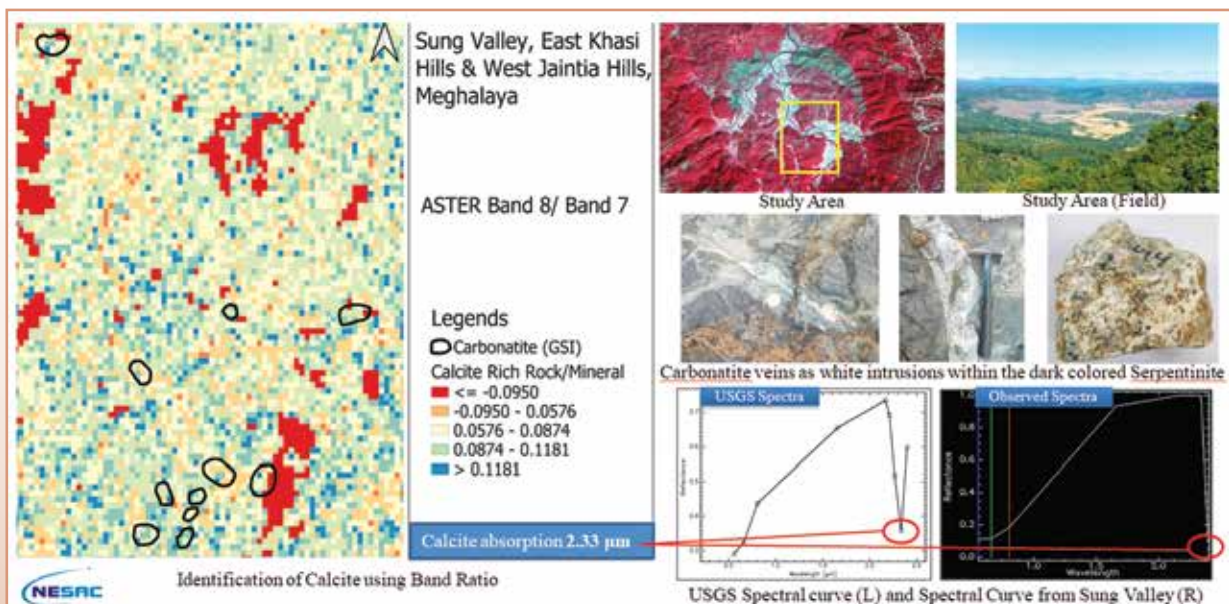


Geology Map of Sung Valley, Meghalaya

The study focuses on identifying calcite-rich rocks in Sung Valley, Meghalaya, using ASTER data and geospatial techniques like band ratio and spectral analysis. The Sung Valley is located in Meghalaya, India, on the border between the districts of East Khasi Hills and West Jaintia Hills.

It is a bowl-shaped body covering approximately 35 square kilometres. The study's chosen location is located in Survey of India Toposheet No. 83C/2. The Sung valley is about 48 km from Shillong and is well connected by road via National Highway 44. The area is characterized by hilly and rugged terrain. The complex forms a wide bowl-shaped depression surrounded by ridges composed of quartzites from the Shillong Group. Several seasonal and perennial streams flow into the complex, converging to join the Sung Nala, which runs in a northeast-southwest direction and meets the Um Klen River to the north of the complex.

Geological Survey of India has delineated the presence of carbonatite rock in Sung Valley, characterized primarily by calcite and dolomite minerals, with minor occurrences of oxides and phosphates. Calcite is identified by its absorption band at 2.33 μm , which corresponds with ASTER band 8. The ASTER band ratio $b8/b7$ serves as a reliable method for distinguishing these minerals. Calcite's high susceptibility to weathering means it can also form placer deposits along river banks. The spectral curve of calcite has been validated against the USGS spectral library, affirming the accuracy of ASTER data in identifying this mineral.



Identification of Calcite using ASTER Band Ratio and Spectral analysis

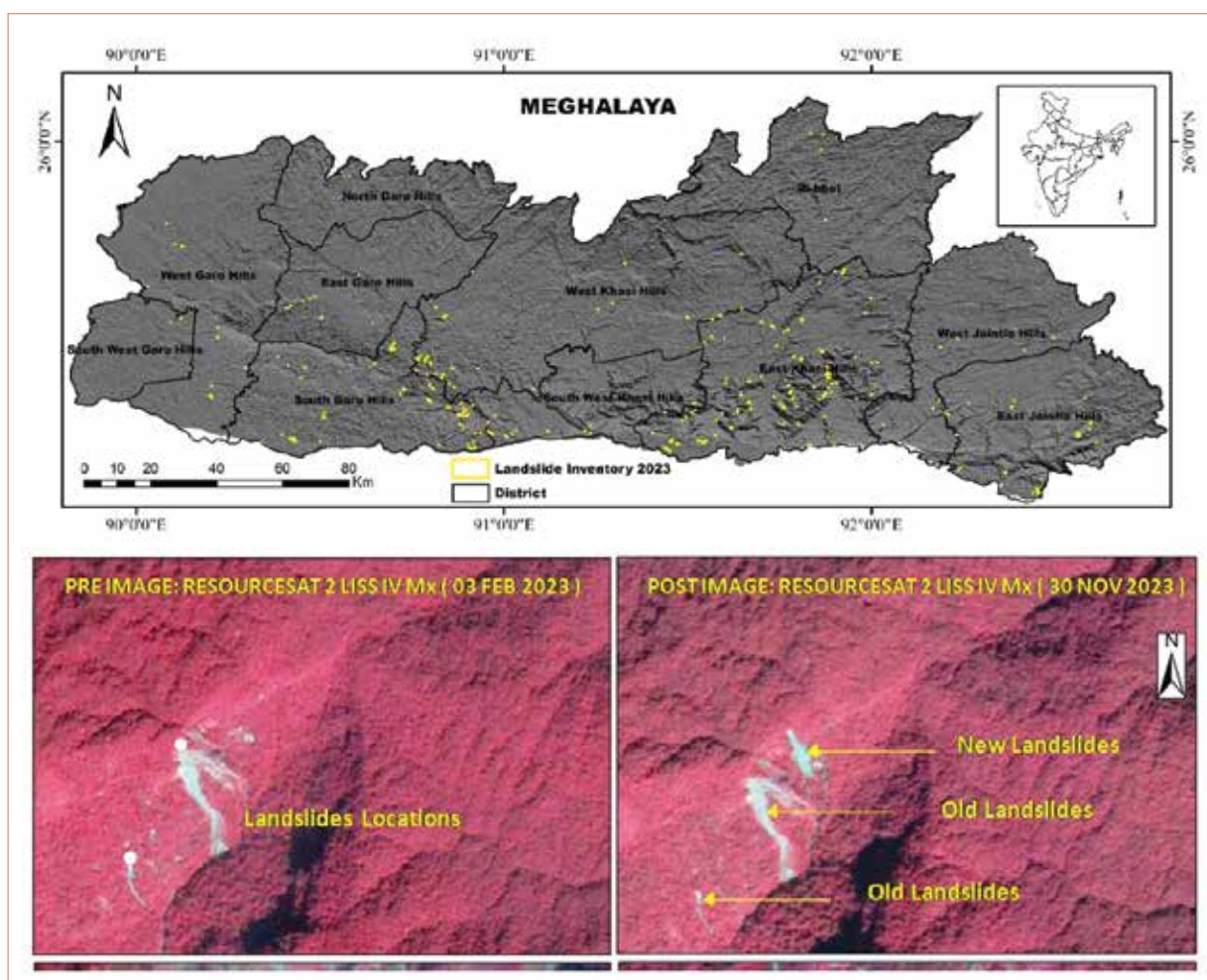
Post Monsoon (2023) Landslide Inventory mapping - Meghalaya under SILAAS project

A landslide inventory database gives information about the type, volume, magnitude, date and place of occurrence, cause of landslide, damage due to landslide etc. The triggering factors linked with the landslide inventory help in understanding the temporal relationship with the landslide. The project 'Satellite Integrated Landslide Assessment and Alert System (SILAAS)' is being executed by NRSC, Hyderabad to develop an early warning system for landslide affected areas of India. Mapping of landslide inventory triggered during 2023 monsoon in the State of Meghalaya is carried out using the Landslide Mapping Tool and the Field Landslide Inventory Mapping (FLIM) app and is one of the sub-systems under SILAAS project. Pre- and post-data of Resourcesat 2, LISS IV MX and high

resolution DEM are used for mapping exercise and total 336 landslide polygons having minimum 100 sq meter area are finalized post field visit, internal as well as external quality checking. Out of the 11 districts, East Khasi Hills recorded the highest number of landslides, with 151 mapped.

Mapping and change detection of river islands (char) of the Brahmaputra River in and around petroleum exploration license areas of OIL

The study was taken up for Oil India Limited (OIL) to identify stable sand bar/island (Char) of the Brahmaputra River within identified petroleum exploration license areas of OIL was a period of 5 years. The Mapping exercise is carried out mainly using Resourcesat-2 LISS IV MX data of 2019 to 2024. The char areas of the Brahmaputra River have been systematically classified into



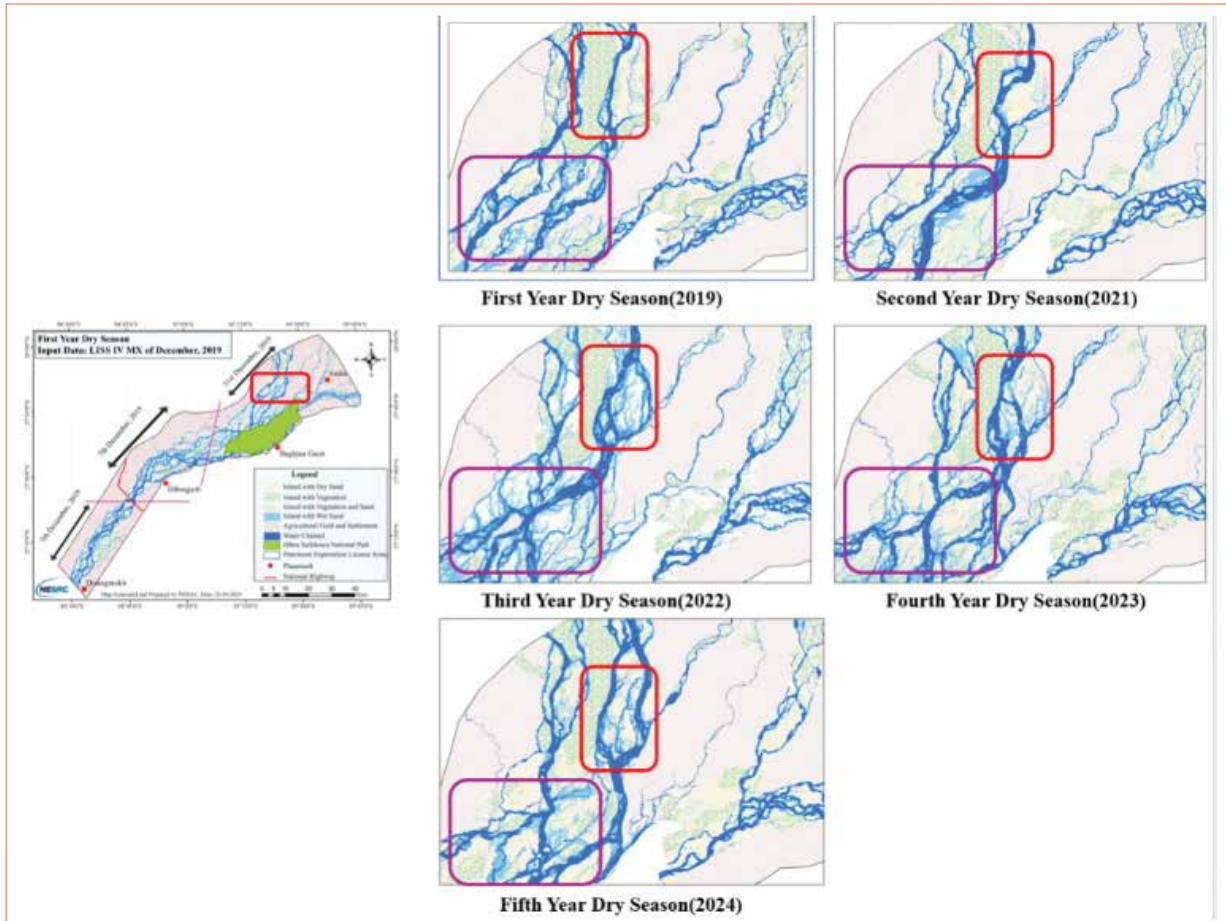
View of spatial distribution of landslides being mapped; pre- and post-monsoon images showing landslides from East Jaintia Hills



four distinct categories: islands with dry sand, islands with vegetation, islands with vegetation and sand, islands with wet sand. From 2019-2024 significant variation in island characteristics was observed in the study area indicating the dynamic interplay of natural processes. At certain locations significant shift in river course is also prominent as shown in figure.

to ecosystems, making the landscapes less habitable for humans and wildlife.

The state Meghalaya is endowed with rich mineral resources such as coal, limestone, uranium, quartz, REE, etc. Amongst the mineral resources, the mining of coal is extensively carried out for many years in some of the

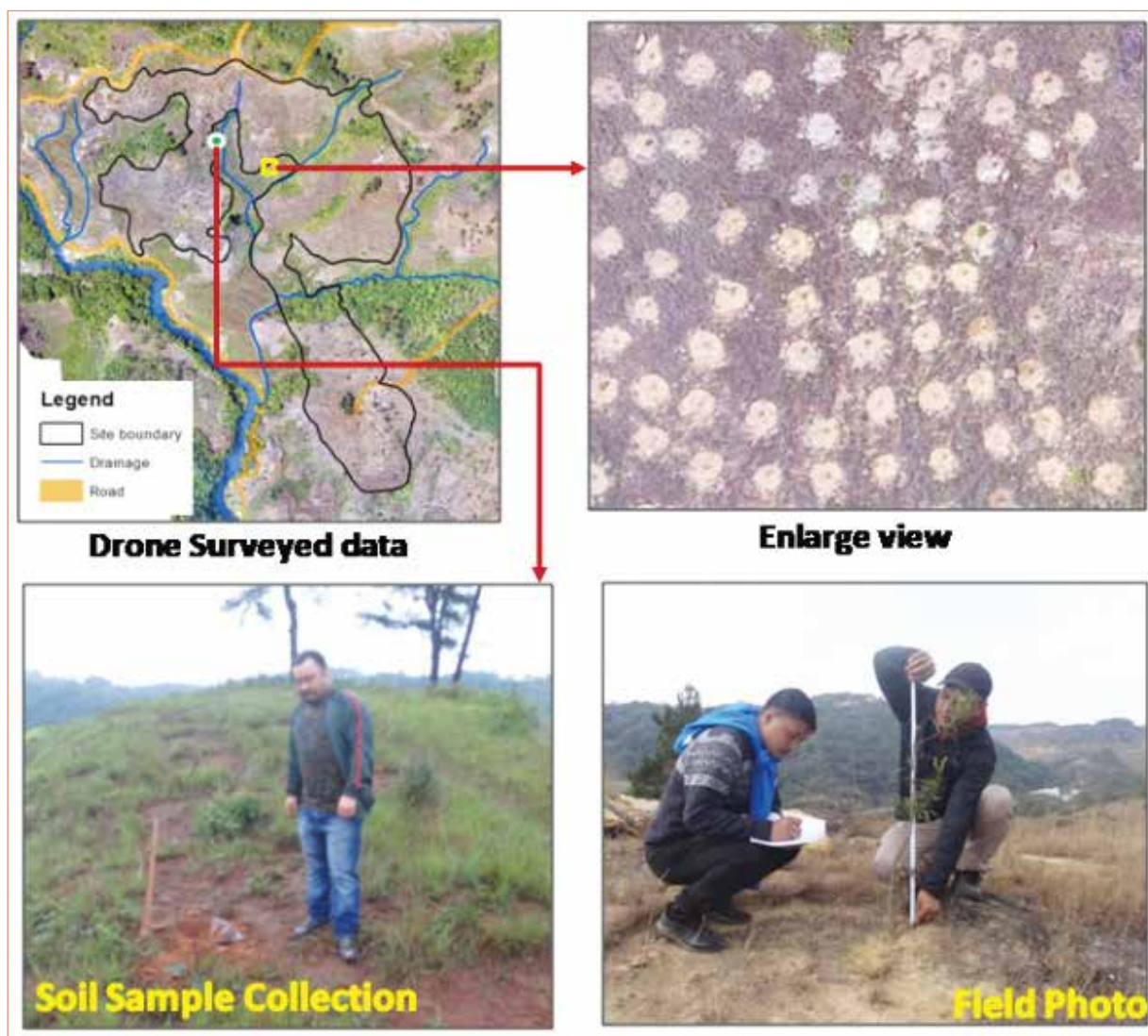


View of shift in river course during the span of 5 years

Monitoring of Afforestation Status in Degraded Areas of Meghalaya with synergistic use of Drone Data & GIS

Degradation is the process of deterioration, breaking down, or declining in quality, condition of something over time. Environmental degradation is the deterioration of the natural environment due to natural processes and human activities. Sudden impact of natural disasters may accelerate the process. It results in the depletion of natural resources, loss of biodiversity, pollution and damage

districts of the state without any proper scientific methods. This prolonged activities of mining lead to the degradation of the environment especially to land and water to such an extent that it may take decades to bring it into a normal condition. Keeping in view of the current scenario, the Department of Forest, Environment & Climate Change (Social Forestry), Govt. of Meghalaya initiated the afforestation works in six districts of the state. The afforestation work has been undertaken as part of a restoration programme under the direction of the Oversight Committee constituted by the Hon'ble National



Plantation site, Mustem Village, West Jaintia Hills District

Green Tribunal (NGT) and NESAC was identified to monitor the status of the plantation with the help of geospatial and drone technology.

As a part of this monitoring exercise, the survey of fourteen plantation sites covering an area of 416 ha, (4.16 sq km) using drone has been completed. In addition, demarcation of plantation sites, preparation of base maps, drainage, and delineation of abandoned mine pits, collection of soil samples and laboratory

analysis has also been completed. From the result of the analysis, it is observed that the pH value of the soil ranges from 3.81 to 4.78 at all the plantations sites which are strongly acidic in nature and less suitable for the growth of trees.

Measurement of survival percentage of the sapling will be carried out subsequently as one of the objectives in the exercise. The duration of the project is four years as suggested by the user department.



URBAN AND REGIONAL PLANNING

Urban and regional planning plays a crucial role in addressing societal challenges by strategically managing physical and economic growth. Effective planning requires extensive, high-quality data to guide decision-making processes. In this context, geospatial technology has emerged as a vital tool, facilitating the seamless integration of geographic and thematic information. By combining high-resolution satellite imagery with on-the-ground data collection, planners can gain a comprehensive understanding of urban and regional dynamics.

The demand for geospatial data is significant at both urban and regional levels. Harnessing this technology, the North Eastern Space Applications Centre (NESAC) has been actively engaged in various planning initiatives. Our efforts include supporting the development of master plans infrastructure projects, transportation networks, and environmentally sustainable urban designs. Through detailed site suitability analyses, we provide critical insights to optimize land use and infrastructure development, ensuring more efficient and sustainable planning outcomes.

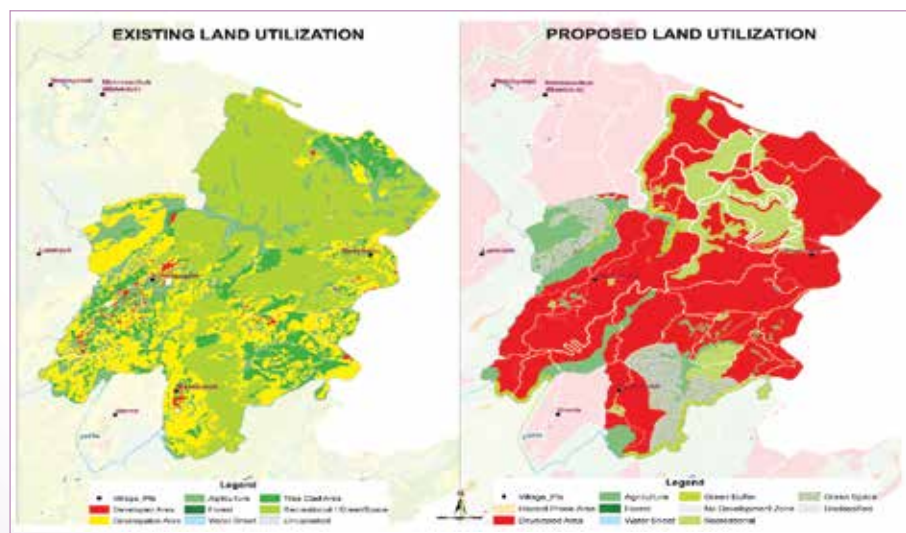
Risk-Informed GIS Master Plan for AMRUT in Shillong

The project Atal Mission for Rejuvenation and Urban Transformation (AMRUT) was taken up for the Department of Urban Affairs, Govt. of Meghalaya, towards preparing a Risk-Informed GIS-based Master Plan (RIMP) for Shillong, Meghalaya. The Master Plan promises to lay a foundation for transforming the city's

aspirations into reality and has been formulated, considering the vision of developing Shillong as a vibrant tourist city while preserving its rich legacy. With a prime focus on enhancing mobility, sustainability and livability, the plan pursues to shape the city's future in a holistic manner.

The preparation of the Master Plan leveraged geospatial technology to develop an extensive urban database, combining spatial and non-spatial data for in-depth analysis. By integrating data within a geographical information system (GIS), the plan identifies patterns and trends across the planning area. Beyond technical assessments, the plan also engages local stakeholders, allowing community participation and feedback in the planning process. This inclusive approach ensures that the plan reflects both expert analysis and public aspirations.

The land suitability and zoning framework serves as the foundation for identifying appropriate land uses based on existing and proposed development patterns. A key priority of the plan is the re-densification of the city core, aiming to create a balanced and sustainable environment for future development, particularly around



A map of proposed land utilization. It presents the proposed land utilization plan, highlighting developed areas (in red), green buffers, recreational zones, and hazard-prone areas.

the New Shillong township. Additionally, it integrates market-driven strategies and promotes mixed land use along transit corridors, fostering a dynamic and equitable urban landscape.

A crucial component of the plan is its emphasis on risk-informed planning, taking into account hazard susceptibility, eco-sensitive zones, steep slopes and agricultural areas. A total of 51.58 km² has been earmarked for development, with proposals covering physical infrastructure, socio-economic amenities, transportation, and more. The Master Plan divides Shillong into 45 planning districts to facilitate effective zoning regulations and future urban management.

The figures shown represent the proposed land utilization horizon for the year 2041.

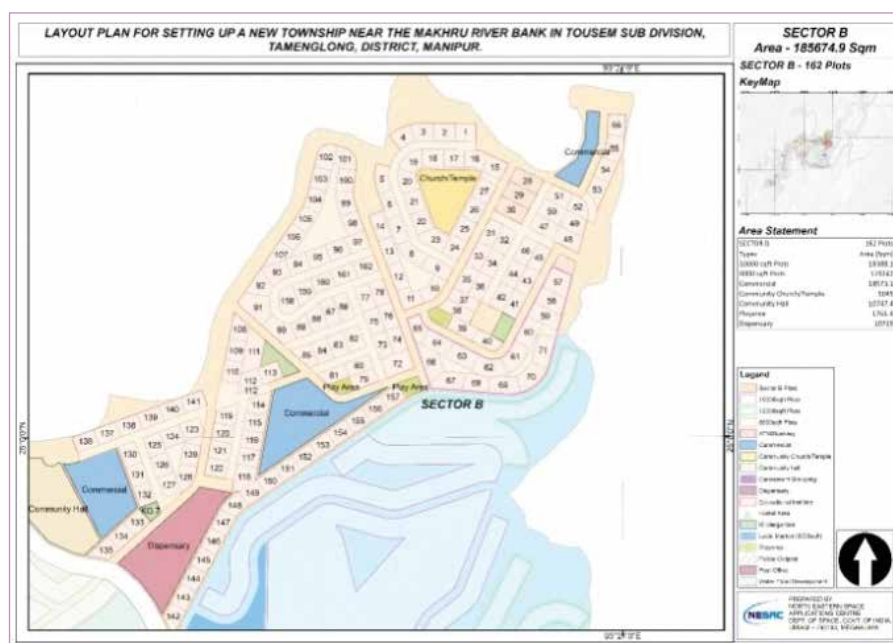
Setting up a new township near the Makhru River Bank in Tousem Sub division, Tamenglong District, Manipur; Mapping the prospects and potential of developing an Eco Hub

The proposed Greenfield development project aims to establish a sustainable and eco-friendly township near the Makhru River Bank in Tousem Sub-Division, Tamenglong District, Manipur. This initiative seeks to transform the lives of 1,000 rural households currently engaged in shifting cultivation by integrating them into a modern, environmentally conscious community. The project addresses key challenges such as environmental degradation, limited livelihood opportunities and inadequate infrastructure. It

envisions a 1,000-household township that promotes sustainable practices, develops Micro, Small, and Medium Enterprises (MSMEs) and enhances the quality of life for the Zeme community.

The project draws inspiration from successful global models like Brond by Have By in Copenhagen and Barcelona Superblocks, emphasizing community building and sustainable design. The development process involves four phases: identification of suitable land, survey, analysis, and planning and design.

The framework for the model township envisages land use allocations based on slope analysis and site characteristics, including residential, commercial, institutional, recreational, green spaces, and forest/agricultural areas. The design aims to create a vibrant and livable community, considering connectivity, accessibility and environmental impact. Strategic recommendations include investing in sustainable infrastructure, enhancing educational and vocational training and promoting organic agriculture and forest-based industries.



A layout plan of Sector B for a new township near the Makhru River Bank in Tousem Subdivision, Tamenglong District, Manipur. The map shows 162 residential plots, commercial zones, community spaces (church/temple, community hall, dispensary), and play areas. It includes a legend, a key map, contour lines, roads, and pathways.



Overall, this transformative project aims to foster economic prosperity, environmental sustainability and a better quality of life for the Zeme community, with the collective effort of government agencies, private institutions, NGOs and the local community.



Bird's-eye view of a planned township

Village Level Mapping for Meghalaya using High-Resolution Geo-Spatial Data

The Village Level Land Use/Land Cover Mapping for Meghalaya using high-resolution geospatial data was initiated in December 2021. Under this project, a detailed database has been prepared at a 1:4000 scale using a classification schema beyond Level IV. Base information and large-scale land use/land cover maps have been generated at the grassroots level for the hill districts of Meghalaya using high-resolution satellite imagery.

Additionally, the AMRUT 1.0 design standards—originally intended for urban areas—were adapted and enhanced to better capture the rural land use/land cover patterns of Meghalaya. This includes mapping categories such as broom cultivation, shifting cultivation, and forest classification following Forest Survey of India (FSI) standards.

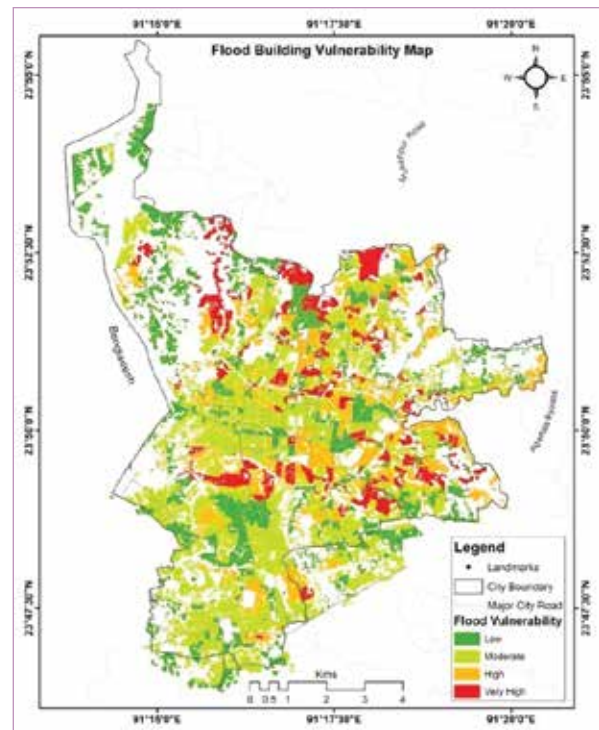
RS-GIS Inputs for Hazard, Vulnerability, and Risk Assessment in Eight Urban Centres of Tripura

The Hazard Vulnerability and Risk Assessment (HVRA) project, sponsored by the North Eastern Council (NEC) under the PoA Projects, aims to

assess and mitigate hazards such as landslides, floods, and lightning by analyzing both social and physical vulnerabilities. The assessment is carried out at a detailed local scale of 1:4000, using specialized methods tailored to each hazard.

A key outcome of the project is the development of vulnerability maps that integrate demographic data to evaluate population exposure in the targeted towns. Community engagement is also emphasized, capturing local insights on risk perception and resilience. The final risk assessment combines hazard evaluations and vulnerability analyses to offer a comprehensive picture of potential risks.

Notably, the flood vulnerability map for Agartala categorizes risk levels from low to very high, and its accuracy was validated by the State Disaster Management Authority, Tripura, after the flood event on August 21, 2024.



A flood building vulnerability map displaying different levels of flood risk across the Agartala Town. The map uses color coding to indicate flood vulnerability levels: green for low, yellow for moderate, orange for high, and red for very high.

HYDROLOGY & WATER RESOURCES

The Water Resources Division (WRD) provides geospatial support for water resources and hydrological disaster management in the Northeast (NE) region. Major activities of the division include operating Flood Early Warning Systems (FLEWS) for Assam and pilot systems for other North Eastern states identifying vulnerable areas due to riverbank erosion, development of water resources system and preparing river atlases for the NE region. The division also conducts studies on flood scenario generation and discharge based downstream impact assessments for the Ranganadi hydropower project in Arunachal Pradesh, the Doyang hydropower project in Nagaland, and the Kurichhu hydropower project in Bhutan. Dedicated to applying space technologies, the division addresses other challenging hydrological issues in the NE region of India. A summary of the major works carried out are provided below.

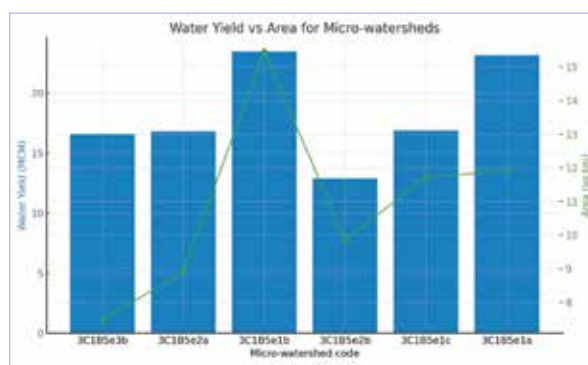
Master Plan for Potential Small Multipurpose Reservoirs and Water Harvesting Sites in Meghalaya

The study included crucial variables for creating a soil erosion susceptibility map and analyzing the feasibility of a location for constructing water harvesting systems. In the case of soil erosion vulnerability mapping, the vulnerability was classified into five classes ranging from very low to very high. From the MCDA-AHP analysis, it is observed that 0.05%, 6.83%, 38.56%, 51.98% and 2.58% of the geographical area of the state are very high, high, moderate, low and very low susceptible to soil erosion respectively at 80% accuracy. A total of 1828 sites were proposed for the construction of water harvesting structures in the state. The proposed sites are feasibly located and will yield multiple benefits, such as silt reduction, water for agriculture, drinking water, etc. The catchment areas of the selected suitable

sites range from a few hectares up to 22179.1 Ha. The final technical report was submitted successfully to the user. Based on the requirement of the user, The estimation of the average potential water yield for the whole state of Meghalaya at micro-watershed level is under progress. From figure below, the average potential water yield for some of the micro-watersheds in the East Khasi Hills District, Meghalaya, ranges from 12.88 MCM to 23.46 MCM.



Micro-watersheds in Meghalaya



Potential water yield vs Area for Micro-watersheds

Flood Early Warning Systems (FLEWS) for Assam

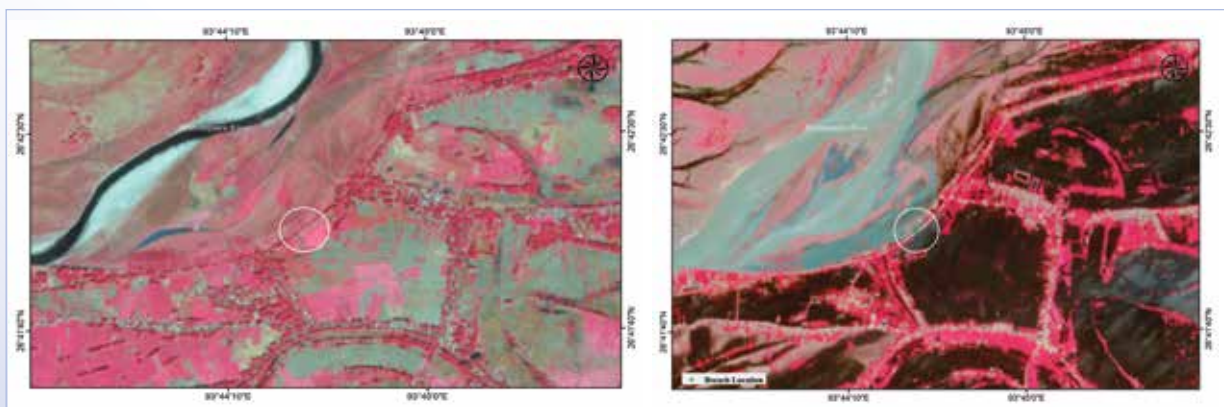
The Flood Early Warning System (FLEWS) for Assam was initiated in the year 2009 on a pilot basis and became fully operational for all districts of Assam in a phased manner from 2012 to 2023. Today, the project covers all flood prone districts of Assam with the issue of actionable flood alerts



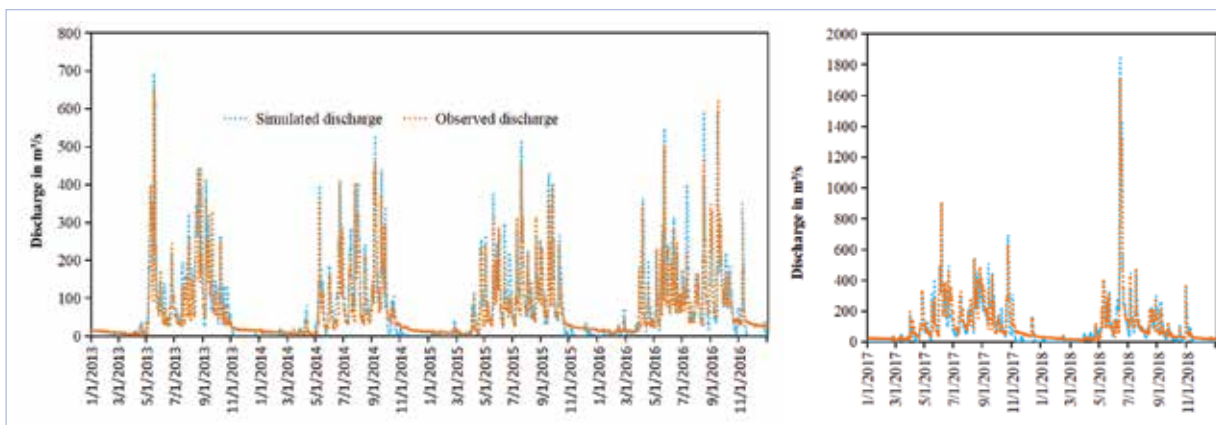
at the revenue circle level. Since the inception of FLEWS, an average year-to-year alert success score of 80 to 85 % and an average alert to alert lead time ranging from 12 to 36 hours has been maintained. On the successful completion of the first (2012-14), second (2015-17), third (2018-20), fourth (2021-23) operational periods, the Assam State Disaster Management Authority (ASDMA), Government of Assam, has requested NESAC to continue for the fifth operational period from 2024-26 which is currently ongoing. During the monsoon season of the year 2024, 55 flood alerts have been issued to the flood prone districts of Assam at district level. As part of the FLEWS objective, NESAC identified 7 embankment breach locations for the year 2024 using high resolution LISS IV, and Sentinel 1 & 2 satellite images. The districts affected due to embankment breach were Dibrugarh, Golaghat, Majuli, Nagaon, Karimganj, Cachar, and Hailakandi. The analysis was performed and report was generated to provide the Water Resources Department, a key stakeholder, an input to carry out the routine embankment plugging and repair before the onset of the 2025 monsoon. Further, the parameters and variables of the FLEWS flood models/hydrological models, responsible for generation of flood discharge at multiple outlets of the river, were updated successfully prior to the monsoon. Currently, two flood advisories in the month of May were issued to 2 districts of Assam.

Flood Early Warning Systems (FLEWS) for NER

As part of the study, 36 semi-distributed hydrological models were developed for predicting flood hydrographs for flood-prone rivers in the Northeastern (NE) states. These include 12 models in Meghalaya, 3 in Nagaland, 2 in Mizoram, 9 in Arunachal Pradesh, 2 in Sikkim, and 8 in Tripura. Calibration and validation of these hydrological models were completed for river basins wherever observed discharge data were available. During the 2024 monsoon season, a total of 40 experimental flood alerts were issued to the State Disaster Management Authorities (SDMAs) of Meghalaya (10 alerts), Tripura (19 alerts), Arunachal Pradesh (10 alerts), and Mizoram (1 alert). The success rate of these alerts was approximately 70% to 80%, as validated through user feedback and other sources. Furthermore, event-based calibration and validation of the flood models were carried out for eight river basins in Tripura using observed discharge data provided by the Central Water Commission (CWC). Currently, seven state-of-the-art discharge sensors (RLS & SVR) are proposed to be installed in 2025 in major flood-prone rivers—one in each of the Northeastern states (excluding Assam)—as a pilot implementation for end-to-end calibration and validation of flood forecasts in upcoming monsoon seasons. In addition, the MCDA-AHP-based Flood Hazard Categorization project has been completed for Assam by the Water Resources Division, NESAC, and guidance has been provided to the Arunachal Pradesh Space



FCC of (a) pre-breach and (b) post-breach along Brahmaputra Dyke in Golaghat District



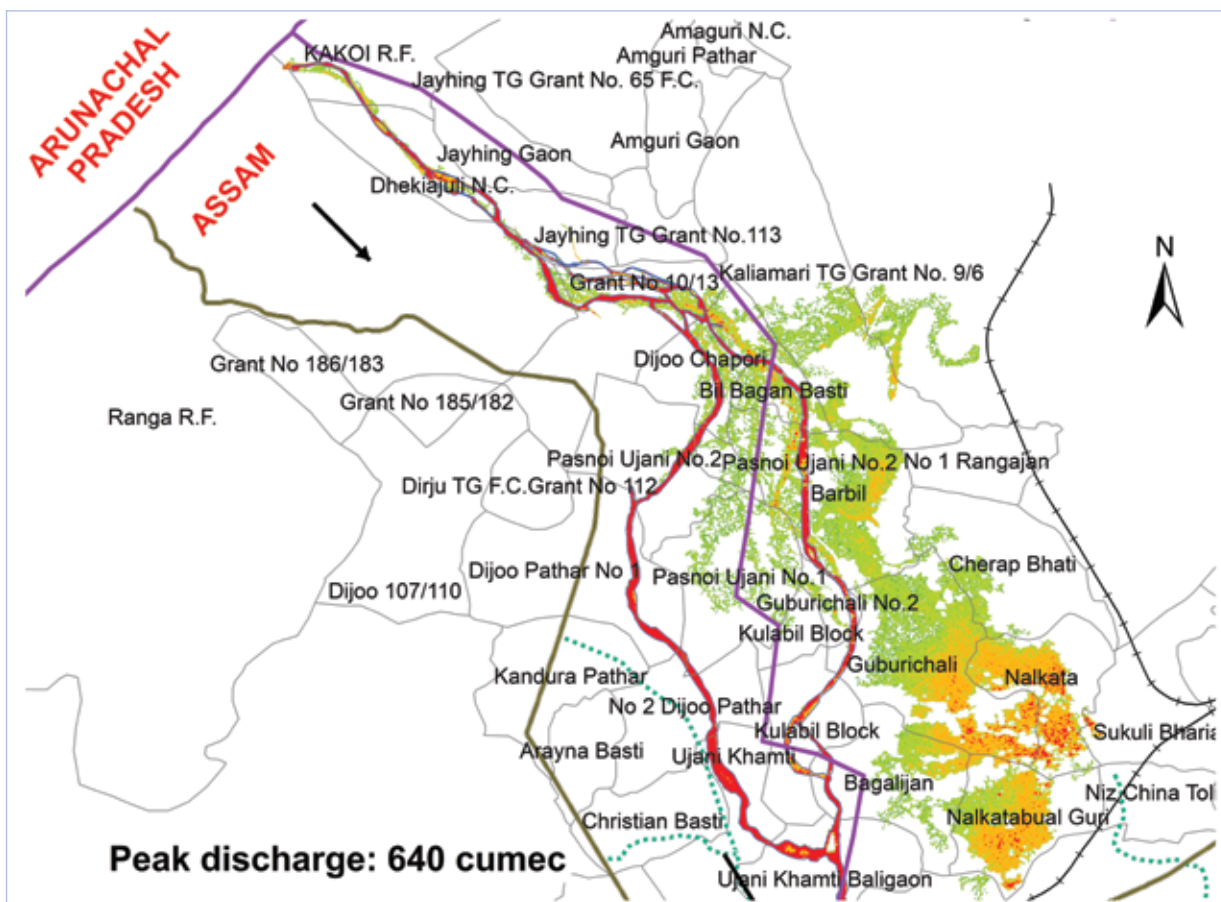
Calibration and validation for Manu River basin in Tripura

Applications Centre (APSAC) to undertake similar work for Arunachal Pradesh.

Flood Scenario Generation and Downstream Impact Assessment for Ranganadi, Doyang & Kurichhu Hydropower Projects in Assam

NESAC has taken up this study based on the request from the Assam State Disaster Management Authority (ASDMA). The main

goal of the study is to enable the user to be aware of the possible affected locations and villages beyond the river banks and its periphery downstream of these major hydro-electric power dams due to high dam flow release during monsoon seasons. The 2D hydro-dynamic simulations based on the past measured dam release discharge and the hypothetical possible high dam flow release hydrographs have been completed for downstream of Ranganadi HEP,



Flood inundation scenario for Ranganadi HEP



Doyang HEP and Kurichhu HEP. Generation of statistics related to the percentage of affected villages and locations for all 3 HEPs has been completed with respect to different dam flow release scenarios. In the case of dam flow release from Ranganadi HEP, the downstream river overflows and starts to inundate a total of 103 ha with a peak flow value of 264 m³/s. At a peak flow release of 760 m³/s, there was a total inundation of 1391 ha. Validation of the flood inundations is in progress based on the data received recently from the user. Currently, preparation of the final project report has been completed.

Development of Sikkim Water Resources Atlas

NESAC has taken up this study for the Sikkim Water Resources Department, Government of Sikkim. As a part of this project, the rivers of Sikkim have been mapped at a scale of 1:5000 along with important features such as river banks, sand deposits, embankments, hydro-meteorological observatories, snow pillows, major locations,

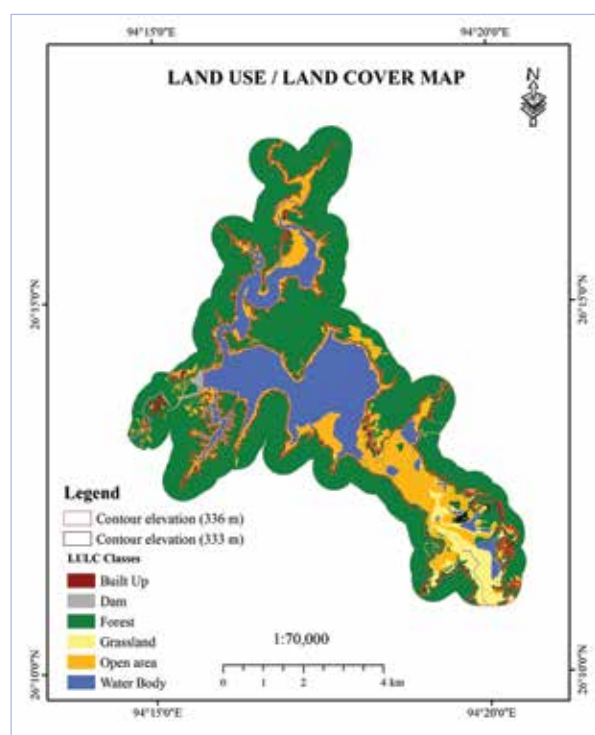
roads, snow/glaciers, and glacial lakes, administrative boundaries, etc. Further, district-wise, as per the six administrative district boundaries shared by the Government of Sikkim, river system maps, elevation maps, LULC maps with the latest satellite imagery of 2023–24 at a scale of 1:10,000, and major river catchment maps have been prepared. Moreover, authentication of the names of all rivers and sub-tributaries has been completed with assistance from the Sikkim Water Resources Department and Forest Department. A comprehensive mapping and categorization of glacial lakes has also been done. Also, a technical review of the project status was conducted and discussed in the presence of the Secretary, Sikkim WRD, in the month of September 2024. Similarly, a meeting was held at NESAC along with officials from the Sikkim Water Resources Department related to the progress of the project in February 2025. At present, all the layers, maps, shapefiles, and the final technical report generated under the study have been shared with the user.



River catchment map for Sikkim

Topography, bathymetry Survey & Capacity estimation of Doyang HEP Reservoir, Nagaland

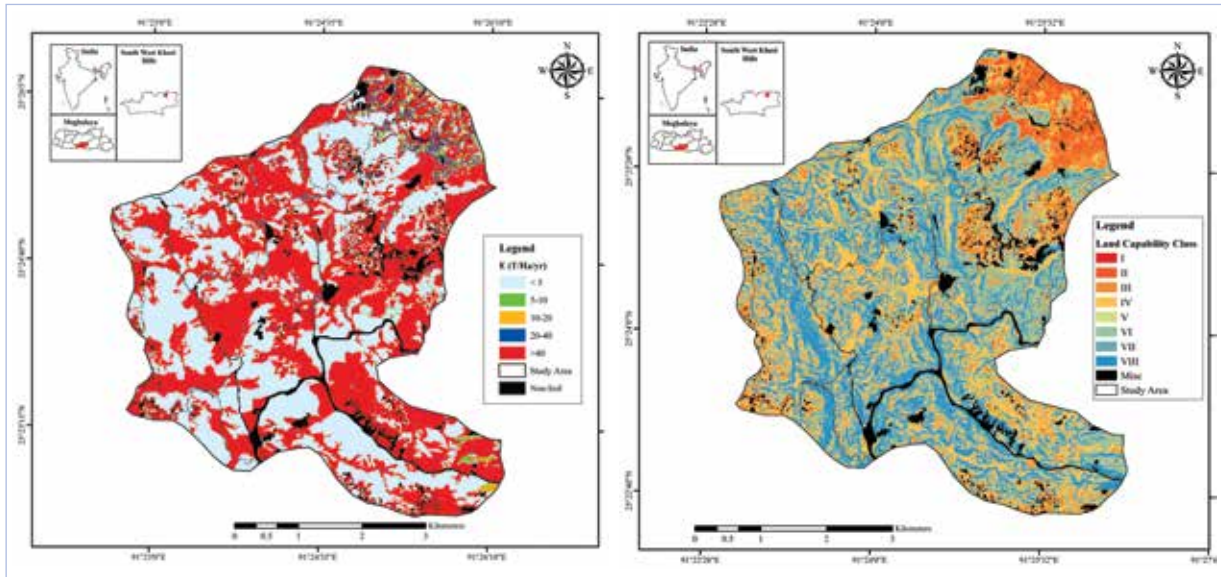
The objective of this study is to accurately estimate the storage capacity of the Doyang Reservoir in Nagaland using a dual-method approach. Firstly, an Unmanned Aerial Vehicle (UAV) was used to obtain topographic information for the dam's periphery. Secondly, the subsurface topographic variation of the reservoir was obtained using the dual-frequency echo-sounder. Integrating these two datasets using remote sensing technique, surface and subsurface elevation variations were obtained, and used for estimation of the new Area-Elevation-Capacity of the Doyang reservoir. Comparing the original capacity estimated during the year 2000 and the new capacity in the year 2023, there was a significant loss of 23.74 MCM and 20.19 MCM at Full Reservoir Level (FRL) and Maximum Water Level (MWL), respectively. Hence, this method provides elaborate and reliable information for dam maintenance and planning. Also, as per the user requirement and request, NESAC completed the derivation of Land Use Land Cover (LULC) map using the the ortho-mosaic image acquired from UAV over the Doyang Reservoir. The broad classes



include Built-up, forest, open area, waterbody, grassland and dam. Further, the corresponding LULC between the contour elevations from 324 m (operating reservoir level) to 336 m (Maximum Water Level) was calculated in significance with the requirement from the user. The updated final project report along with the important derived layers and LULC have been submitted successfully to the user.

Land Resources Inventory Mapping, Meghalaya

This study generates a comprehensive geospatial database of land resources across three watersheds located in West Garo Hills, South West Khasi Hills and West Jaintia Hills districts. The study involved the preparation of thematic maps such as Land Use and Land Cover (LULC), physiography, slope, drainage, annual average rainfall, soil classification, soil erosion, and land capability at a large scale using geospatial technology. The land capability map was derived from the soil map prepared with collaboration of the user department. Apart from high resolution satellite imagery, CartoDEM and extensive field data was utilized for generation of the thematic maps. LULC analysis revealed significant variability in land use patterns, with forested areas dominating all three watersheds. Physiographic mapping identified plateaus and subdued hills as the major landforms, while slope analysis highlighted the presence of extensive moderately to steeply sloping terrain, particularly in the South West Khasi Hills. Soil mapping showed that Inceptisols and Entisols are the dominant soil orders, and most soils are acidic with varying nutrient status. The revised Morgan–Morgan–Finney (rMMF) model was applied to estimate soil loss, with results indicating severe erosion risks in parts of South West Khasi Hills and West Garo Hills due to steep slopes and inadequate vegetation cover. The land capability assessment classified a significant portion of the terrain as having severe limitations for agriculture, with only a small fraction suitable for crop production. The spatial



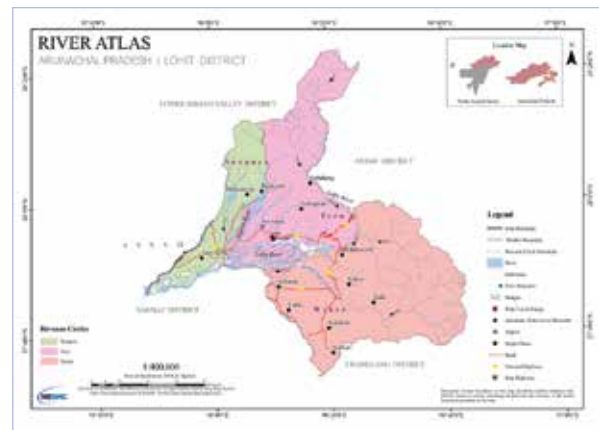
(a) Average Annual Soil Loss map of WDC-3, South West Khasi Hills
 (b) Land Capability Classification map of WDC-3, South West Khasi Hills

outputs of this study provide critical inputs for land use planning, watershed development, and implementation of soil and water conservation measures in Meghalaya's diverse and fragile hill ecosystems.

River Atlas NER (except Assam)

With the good credibility of the project River Atlas Assam, NESAC has taken up the project for preparation of the River Atlas for other NE states with funding from the North East Council (NEC), Government of India. The project deals with high scale (1:5000) mapping of the river networks, river banks (right and left), sediments, hydro-meteorological networks (e.g., Water level recorder, AWS, Snow pillows, etc) embankments, bridges, roads, dams/hydropower reservoirs, etc. It involves generation of maps showing river networks at block levels for each district, LULC maps and a river atlas map with elevation (DEM) in the background, along with the map of major river catchments for the entire state. The composition of all maps were completed. Currently, all the maps of various districts prepared under the atlas have been shared with the stakeholder department (mainly Water Resources Department) of each of the seven states, to carry out the authentication, correction and provide suggestions on various layers

especially the correctness of local river names and their sources of origin. An example of the river atlas map with revenue circles or blocks in the background is shown in the figure.



River Atlas map for Lohit, Arunachal Pradesh

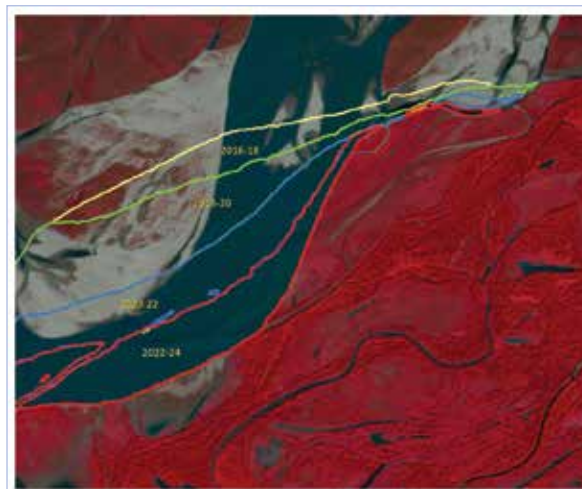


River catchment map for Nagaland

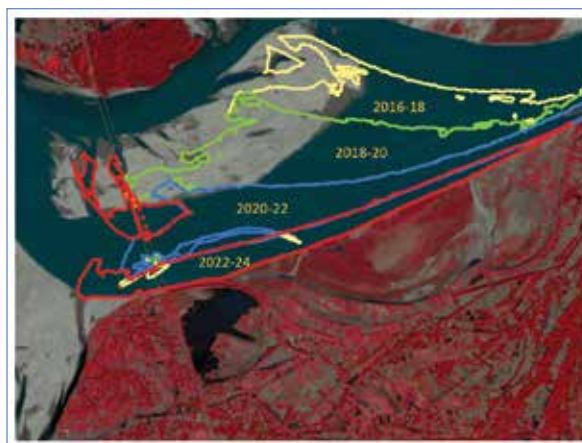
Bankline Migration Studies of the Brahmaputra, Barak, and Selected Tributaries

The Brahmaputra River, which passes through the state of Assam, is highly dynamic experiencing continuous bank erosion. The impact of this erosion, along with that of its major tributaries and sub tributaries, has significant environmental and socio-economic implications for the region. This study examines the migration of bank lines for the river Brahmaputra, Barak, and selected tributaries during 2016 to 2022. The bank line shifting rate is also assessed within this time-frame (2016-2018, 2018-2020, 2020-2022, and overall 2016-2022). Sentinel-2 satellite data is utilized to map year wise river bank lines using Normalized Difference Water Index (NDWI) which were analyzed in GIS platform to estimate erosion and deposition occurred during this period. The Digital Shoreline Analysis System (DSAS) is employed to assess the bank line migration rate for the Brahmaputra, Barak, and nine selected tributaries. The study shows that Laharighat block in Morigaon, Guijan block in Dibrugarh and Golaghat West and Bokakhat block in Golaghat suffers higher rate of bank shifting (more than 300m/year). Among the tributaries, the Subansiri river experiences the highest levels of erosion and deposition followed by Beki, Manas, Lohit, and Jia Bharali. DSAS analysis shows that the bank line shifting rate for the Brahmaputra river is highest during 2018-2020 on both the banks. Among 9 tributaries, Subansiri shows the highest bank-line shift followed by Beki and Manas. An effort has been carried out to identify potential sites for river training works based on visual interpretation of satellite imageries based on the river configuration in the year 2022. A total of 286 potential sites for different river training works were identified along the Brahmaputra River and its selected tributaries. Currently, a similar activity is under progress using the latest

satellite images for the year 2024. In this regard, analysis for the main Brahmaputra and Barak river was completed.



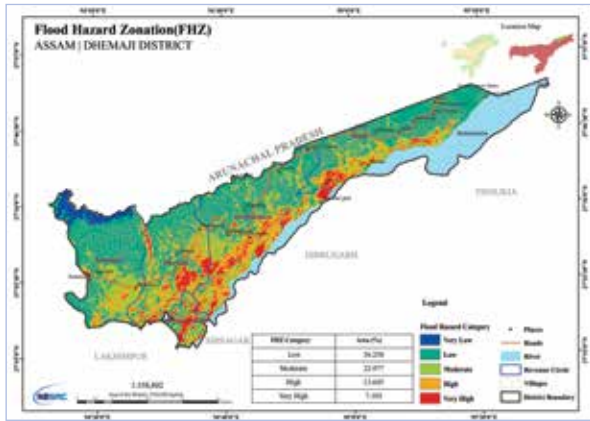
Erosion along Brahmaputra river, Golaghat District



Erosion along Brahmaputra river, Sonitpur District

MCDA-AHP based Flood Hazard Categorization of Assam

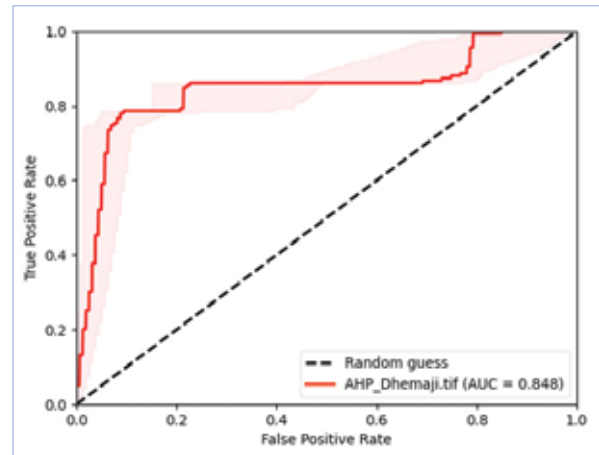
This study was taken up by NESAC to generate the flood hazard maps for Assam using the Multi-Criteria Decision Analysis - Analytical Heirarchical Process approach. This study was funded by the North East Council (NEC), Govt. Of India. Altogether, seven Geo-spatial layers were used, such as NDVI, NDMI, NDWI, historical embankment breach, River Confluences, Elevation and slope. In this study, all the flood hazard maps for 33 districts have been generated and the corresponding villages under different categories (Very low, low, moderate, high and very high) are also listed. In addition, the hazard



Flood Hazard map for Dhemaji

map generated was validated and compared with the flood inundation map derived from satellite images of 15 years by the National Remote Sensing Centre, ISRO, using the Receiver Operating Characteristics - Area Under Curve

(ROC-AUC) approach, an AUC value greater than 0.5 is considered satisfactory. At present, the preparation and finalization of the final project report has been completed.



ROC-AUC for Dhemaji

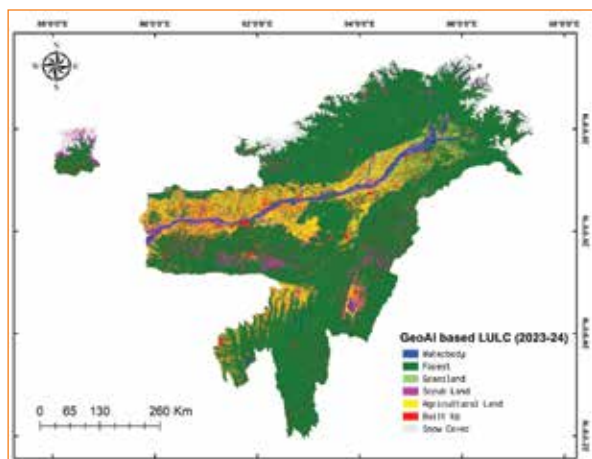


GEOINFORMATICS AND IT

The Geoinformatics and IT Division (GID) specializes in crafting advanced technological frameworks to integrate space technology for developmental support in the NE region. By developing web, mobile, and dashboard applications, GID enhances governance activities across government departments. The division also leads numerous R&D initiatives, utilizing cutting-edge techniques like AI, photogrammetry, and computer vision to deliver innovative solutions.

North Eastern Spatial Data Repository (NeSDR)

The North Eastern Spatial Data Repository (NeSDR) serves as a central hub for spatial data, promoting data sharing, collaboration, and informed decision-making across various sectors, including disaster management, infrastructure planning, natural resource management, and environmental monitoring.



Land Use Land Cover (LULC) 2023-24 map generated using AI based Deep Learning is made available at NeSDR portal

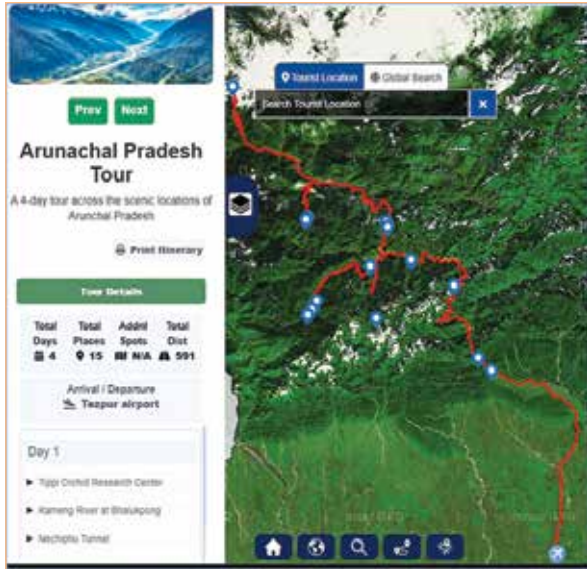
To enhance efficiency, the NeSDR software platform has been augmented with a micro-service-based framework, ensuring improved performance and scalability.

The repository has grown significantly, now cataloguing 1,430 vector datasets across

diverse thematic categories. Additionally, it is enriched with AI-powered thematic products, such as the 2024 Land Use Land Cover (LULC) map of the NE region, further expanding its analytical capabilities. More than 137 specific user departments and PSUs have benefited from NeSDR's data services and applications. To ensure maximum utilization of space-based products, a range of outreach and capacity-building initiatives, including three state-level workshops (two in Arunachal Pradesh and one in Assam) and several on-site training programs tailored for different developmental sectors have been organized. The growing popularity of NeSDR is evident in its extensive user engagement, with total number of visits to the portal surpassing 6.2 million (62,08,356). This significant level of adoption highlights its importance as a vital geospatial resource for the region.

GeoTourism Dashboard Application for NE Tourism Management

This is one of the important project in the Tourism Sector to empower tourism activity in the region using geospatial technology. It aligns seamlessly with the Vision Document 2030 of North Eastern Council, Government of India reflecting a forward-thinking approach to regional development. Under this project, a GeoTourism dashboard application has been developed as a comprehensive platform to promote tourism using advanced geospatial technology. It integrates and visualizes key tourism-related data, offering a seamless and interactive experience for travellers, tourism departments, and stakeholders. The application now catalogues 1,245 tourism sites, including heritage locations, cultural landmarks, and nature-based destinations. It also maps over



Geospatial Travel Itinerary for one tourist circuit of Arunachal Pradesh

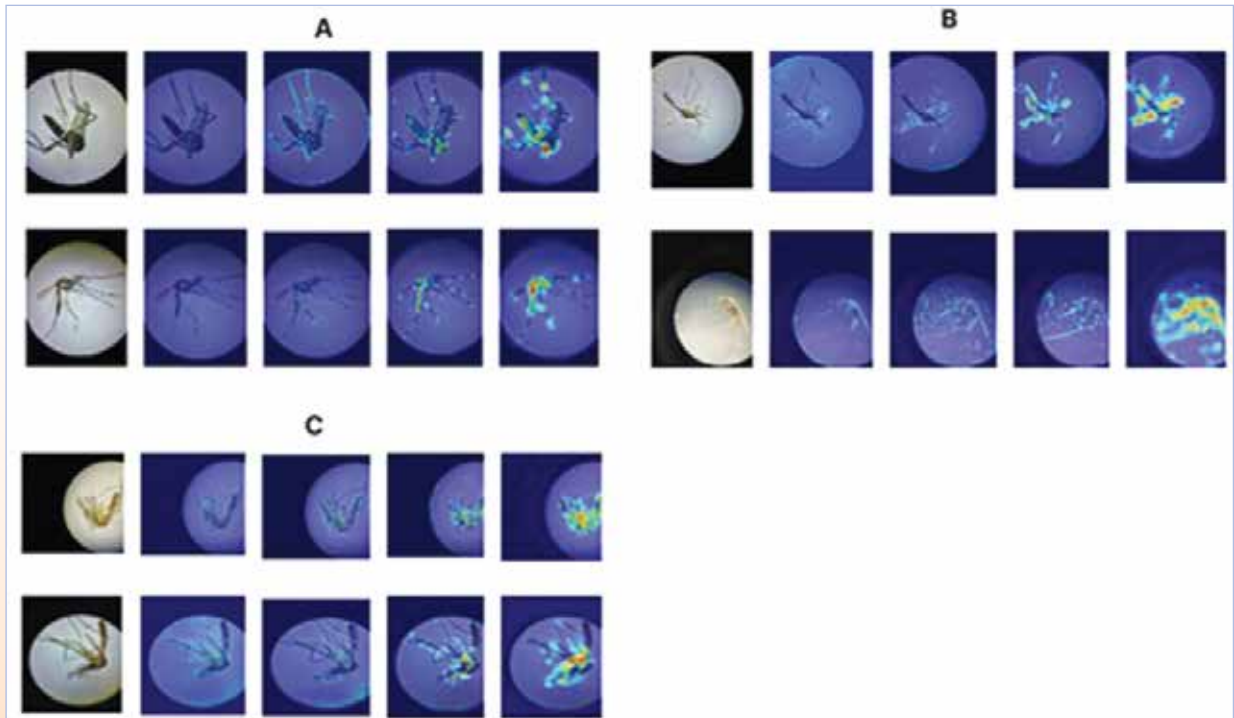
21,000 utility points such as accommodations, restaurants, fuel stations, medical facilities, and transportation hubs to assist tourists in planning their travel itinerary. Additionally, it features 47 curated tourist circuits and 30 trekking trails, providing detailed route information, difficulty levels, and scenic highlights. The key deliverables include the development of a Tourism Potential

Index, a Tourism Comfort Index, and an AI-powered travel itinerary generator, ensuring a seamless and personalized travel experience.

Beyond enhancing visitor experiences, the platform can also serve as a vital tool for policymakers, offering insights into visitor trends, infrastructure needs, and sustainable tourism planning. Adventure tourism is also a key focus, with mapped rivers for water sports and trekking trails catering to outdoor enthusiasts. Additionally, the platform highlights the region's vibrant cultural festivals, ensuring travellers can fully immerse themselves in its rich traditions. A brainstorming workshop was organized on 3rd March, 2025, bringing together over 41 participants from tourism departments, NGOs, and other stakeholders across the Northeast states to foster innovative ideas and collaborative solutions.

Integrated surveillance system for early diagnosis & treatment of Malaria for ICMR

This is another important project of NESAC in



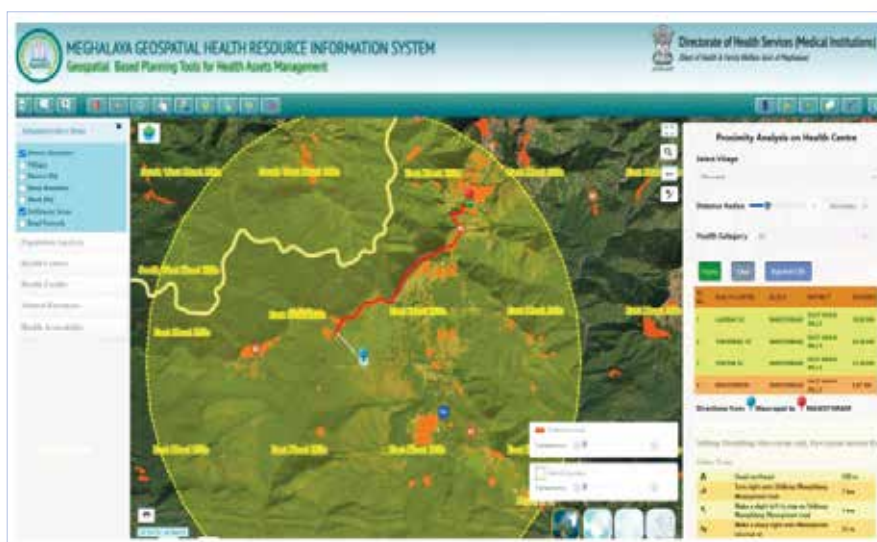
The Vision Transformer (ViT) model has been utilized to accurately identify mosquito species, specifically A) Aedes, B) Anopheles, and C) Culex, demonstrating its capability to revolutionize mosquito surveillance and management

Health Sector taken up in collaboration with Regional Medical Research Council (RMRC) ICMR, Gol with an aim to develop an integrated surveillance system for Malaria. The Phase-I work pertaining to Tripura has been completed successfully and Mizoram, Meghalaya, Arunachal, West Bengal have been covered under Phase-II (ongoing). The integrated surveillance system is comprised of a smart mobile app named as “Fever Tracker” (multi-lingual) and Malaria Dashboard application. The Fever Tracker app facilitates the survey of malaria cases, sample data collection for early diagnosis & treatment and follow-up module for positive cases in spatial domain. Malaria Dashboard Application provides interactive visualization of malaria incidents, mosquito samples, and hot-spot analysis over the Bhuvan base map. It integrates key environmental data like forest cover, weather conditions, infrastructure, roads, and settlements, offering a comprehensive decision-support system for health experts. Recently, AI-based models have been developed to automatically detect mosquito species and generate a Malaria Hazard Map, further strengthening predictive analytics and proactive intervention strategies. This initiative marks a significant step toward leveraging technology for improved public health surveillance and malaria control in the region.

This application focuses on creating a user-friendly web portal that harnesses the power of geographic information systems (GIS) to enhance the visibility, coordination, and accessibility of health centres. It is designed to cater to the needs of Directorate of Health Services(MI), Govt. of Meghalaya and the healthcare providers. The application offers tools to visualize and analyze health centre locations, population density, and generate report, among other vital geospatial data. This enables healthcare professionals to make data-driven decisions regarding resource allocation, planning, and identifying areas with specific healthcare needs. The development of the Geo Web Portal involves several key stages, including data collection; GIS database creation, web application development, and user interface design. Spatial data from various sources, such as government health departments, satellite imagery, and population census data, are integrated to build a robust GIS database. The web application is developed using modern technologies to ensure scalability, responsiveness, and security. The implementation of this portal has the potential to enhance healthcare decision-making, increase community engagement, and ultimately contribute to better health outcomes for individuals and populations. To enhance accessibility and conduct gap analysis, a unified decision support tool was developed, incorporating features such as Proximity Analysis,

Integrated Spatial Decision Support System for Health Asset Management in Meghalaya

Geo Web Portal for Health Centres is aimed at improving access to healthcare services and facilitating efficient healthcare management through the use of geospatial technologies.



Graphical view of Proximity Analysis on Health

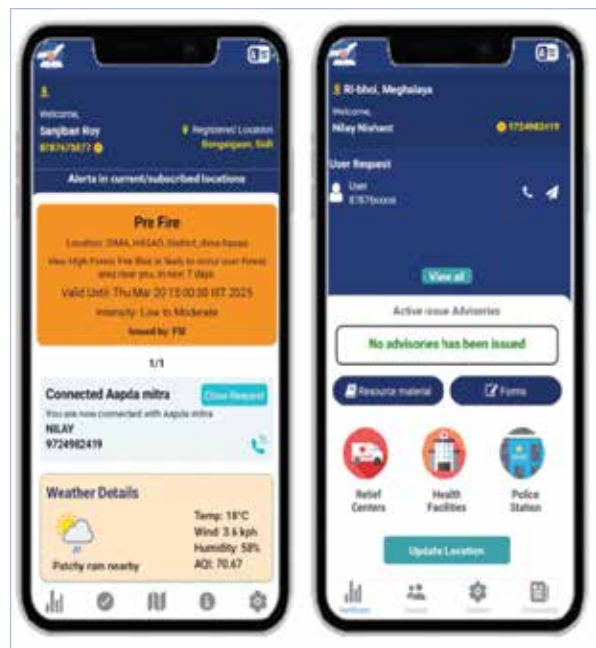


Accessibility Assessment based on health-centre-wise population, network distance/time, and road conditions, Route Finder with direction maps, Service Area Computation, Evaluation of Health Centres and Manpower Resources vis-à-vis Population, and Ambulance Availability Status.

Integrated WebGIS for Real-Time Early Warning and Disaster Monitoring

This is one of the crucial project in disaster management support domain taken up at the request of Assam State Disaster Management Authority (ASDMA) with an objective to develop a single-window integrated WebGIS platform for the near-real-time dissemination of disaster alerts and warnings issued by agencies such as IMD, CWC, IITM, FSI, NCS, and NESAC. The SMART AXOM Dashboard application is the core of the entire WebGIS platform which consumes alerts/warnings from various sources in near-real time mode and disseminates via SMART AXOM app and SMS gateway. It has more than 30 disaster relevant geospatial products, visualization of latest freely available satellite data from Bhoonidhi & other resources to enable damage assessment and provision for site suitability analysis for setting-up temporary relief camps etc. The SMART AXOM mobile app for citizens is designed to receive all the alerts/warnings and location-based advisories in geo-fencing based mode. It has a smart map module to visualize the detailed attributes and information of an incident along with surrounding infrastructures, health, police, and utility connectivity on the Bhuvan base map or any other freely available high resolution satellite data via APIs. User can also fetch the live locations of Aapda-mitra volunteers in case of any emergency situation. The SMART AXOM app for Aapda-mitra allows the registration of volunteers and activates the volunteers for any kind of alerts/warnings or incidents reported by

the citizens in their proximity. In 2024, it played a critical role by issuing over 45,000 early warnings and alerts to ASDMA officials, enhancing disaster preparedness. SMART AXOM integrates CAP-enabled alerts from NDMA SACHEF and issued over 45,000 early warnings in 2024, significantly enhancing disaster preparedness. Advanced LLM-based RAG pipelines enable faster geospatial data retrieval, improving decision-making and emergency response. It stands as a milestone in disaster resilience, ensuring proactive risk mitigation and real-time response.



Beta version of SMART AXOM Mobile App and SMART AXOM Volunteer app for dissemination of alerts

Integration of UAV and IIDS for Crop Health Monitoring and Agro-Advisory in NE India

This research project was initiated in August 2020, jointly in collaboration with the digital India Corporation (DIC), New Delhi; the College of Post-Graduate Studies in Agricultural Sciences (CPGS-AS), Umiam; and NESAC, with financial support from DIC, New Delhi. The project aims to provide Evidence-Based Agro-Advisory Services (EBAAS) using UAV-derived data to enhance farm productivity. It focuses on six crops, namely paddy, ginger, turmeric, pineapple,



cabbage, and cauliflower for health assessment and monitoring, in Ri Bhoi and East Khasi Hills districts of Meghalaya. A total of 83 aerial surveys have been conducted using multi-rotor UAVs equipped with RGB and multispectral sensors/cameras for regular crop health assessment. Between April 2024 and March 2025, 29 additional surveys were carried out. The collected UAV data have been processed to generate 3D textured models, Digital Surface/Terrain Models (DSM/DTM), high-resolution georeferenced orthomosaics, and vegetation indices such as NDVI, GNDVI, and NDRE. These datasets have been shared with partner institutions for further analysis, facilitating the development of evidence-based agro-advisories for registered farmers. Additionally, NESAC and CPGS-AS have developed cadastral maps by integrating mosaic ortho-images and field-based information. To enhance accessibility and dissemination of agro-advisories, the DHaBRt-Geoportal has been designed and developed. This platform provides near real-time insights on crop stress, nutrient deficiencies, disease management, and yield forecasting at the plot level, ensuring farmers receive timely and precise recommendations. Various training programs, awareness sessions, and field demonstrations have been conducted for farmers. A Stakeholder Consultation Meeting and Field Visit was jointly organized with the partner institutes on January 9-10, 2025. The meeting featured technical presentations and demonstrations, highlighting the role of UAVs and digital platforms in modernizing agriculture and improving rural livelihoods. The Project Review Steering Group (PRSG) members and experts discussed strategies for scaling up UAV applications, integrating AI and blockchain technologies, and strengthening institutional collaborations for long-term sustainability. A field visit to project sites in Meghalaya provided firsthand insights into the implementation and impact of these technologies, allowing

stakeholders to interact with farmers and assess on-ground progress.



DHaBRt Geo-Portal

GeoTagging and Monitoring of NEC funded Projects/schemes in NE region using Geospatial Technology and Tool

This flagship project is a key initiative for geotagging and monitoring developmental projects funded by NEC/MDoNER across the Northeast region. Covering 637 projects across 1,728 sites, it employs a technology-driven approach to ensure efficient and transparent project tracking. Project progress is monitored through three advanced modes – i) Site Surveys via Mobile App – Using NavIC-enabled smartphones, the mobile app ensures high positional accuracy for on-ground data collection, ii) Satellite Imagery Analysis – Platforms like Bhuvan, Bhoonidhi, and other open-source datasets provide broad-scale project tracking and 3) Drone-Based Monitoring – Deployed selectively based on demand, high-resolution drone imagery enhances tracking for specific project sites. To further optimize monitoring, AI-driven progress assessment using satellite and drone images has been conducted for select locations as case studies, showcasing the potential of automated analytics. The application is being handed over to NEC for their operational activity with regard to the geotagging and monitoring of project sites. Encouraged by its success, this approach has been formally adopted by Meghalaya (98 projects), Sikkim (113 projects), and Tripura (45 projects), following requests from their respective state governments.



Mobile app for geotagging and monitoring of projects funded by state governments of Meghalaya, Sikkim and Tripura

Geospatial Decision Support System for Monitoring Transboundary Animal Diseases

The project aims to develop a Decision Support System (DSS) that integrates geospatial technology for the effective monitoring and control of major Transboundary Animal Diseases (TADs). Currently, validation and refinement of village and veterinary center data, particularly focusing on newly generated spatial layers for veterinary infrastructure such as markets, feed mills, and farms is in progress. Efforts are also underway to incorporate data from the ongoing 20th National Livestock Census, which will further enrich the existing dataset for improved decision-making. To enhance its analytical capabilities, the system is being enhanced with livestock disease forecasting models, transmission dynamics studies of TADs, and a Natural Language Query Interface that enables intuitive question-answering within the application. Additionally,

Assamese language support is being integrated into the mobile app, ensuring ease of access for the general public. The application is also being bolstered with the inclusion of reserve forest areas as a critical dataset, recognizing their role in the transmission of diseases from wildlife to domestic animals. By leveraging advanced geospatial techniques and AI-driven analytics, this initiative aims to establish a comprehensive disease surveillance and management system for effective livestock health monitoring in the region.

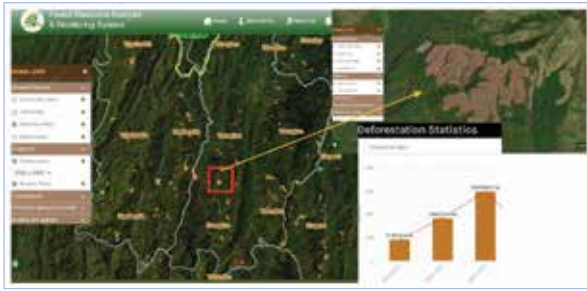
Forest Resource Analysis and Monitoring System (FRAMS) for Manipur

NESAC has developed a mobile application and dashboard to disseminate deforestation alerts to forest department officials. This system leverages AI and Information and Communication Technology (ICT) tools to provide near real-time insights into vegetation cover dynamics

based on satellite observations. The application includes a comprehensive forest resource database on yearly forest deforestation, land use and supports near real-time data analytics, report generation at district wise or reserve forest level, and alert notifications to App. It



Few african swine fever (ASF) case clusters spanning 2021-2024 in Assam demarcated using the application



FRAMS map visualization interface for analysis of deforestation statistics in spatial domain



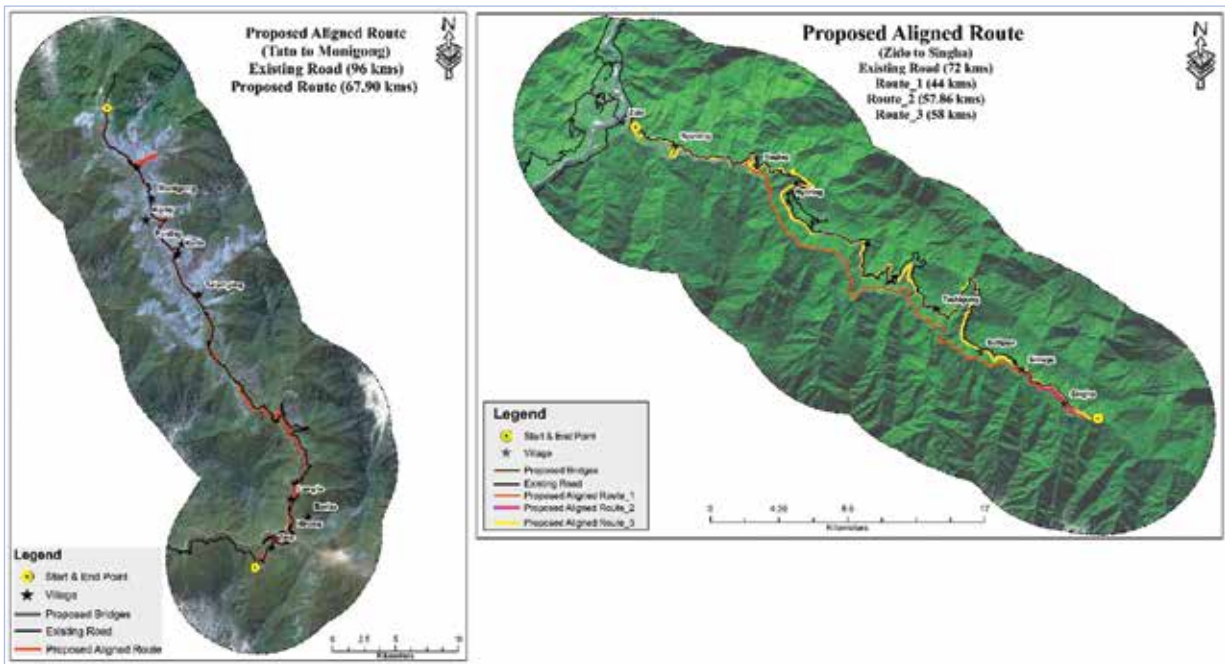
FRAMS analytics module for analysis of time series historical data

features interactive data visualization, enabling officials to monitor and analyze deforestation trends effectively. Dynamic AOI based analysis (circle/rectangle/polygon) for deforestation statistics and Zonal statistics calculation and filter-based display on NDVI MODIS 250 m 15 days composite for 24 years has been included as part of vegetation analytics. Additionally, the

system integrates time-series satellite data from Cartosat and LISS-IV series at multiple resolutions (1m, 2.5m, and 5.8m), facilitating detailed forest cover monitoring and change detection across the state. CNN based model has been trained on LISS-IV and Sentinel-2 series of satellites to detect change in the forest cover based on time series satellite image on monthly basis.

RS-GIS Support for Highway Alignment Planning in Arunachal Pradesh

This project was initiated under the Plan of Actions (PoA) projects with funding from ISRO/DOS. Significant progress has been made, particularly in generating Landslide Susceptibility Maps (LSM) at a 1:25,000 scale and assessing landslide-prone areas using DEM-based gradient criteria for route alignment and realignment. The study focused on two sites in Arunachal Pradesh: (1) Tato–Monigong in Shi-Yomi district and (2) Zido–Singha in Upper Siang district. Additionally, suitable locations for construction materials have been identified along the proposed alignments. The study utilized multiple datasets, including LISS-IV-MX (13 Feb 2022), Sentinel-2A (14 Mar 2022), ALOS PALSAR DEM (12.5m), CartoDEM V3.0 (10m), and collateral data from GSI, literature, and a



Proposed alignment routes for the study areas



limited field survey. Based on the analysis, three best-suited routes were identified between Zido and Singha, measuring 44 km, 57.86 km, and 58 km, along with one optimal route between Tato and Monigong (67.90 km). About 19% of the approved funds have been utilized, with the project successfully integrating multi-source remote sensing datasets to enhance feasibility analysis. The report has been submitted to NHIDCL, Regional Office, Itanagar, and further work will be undertaken as per requirement.

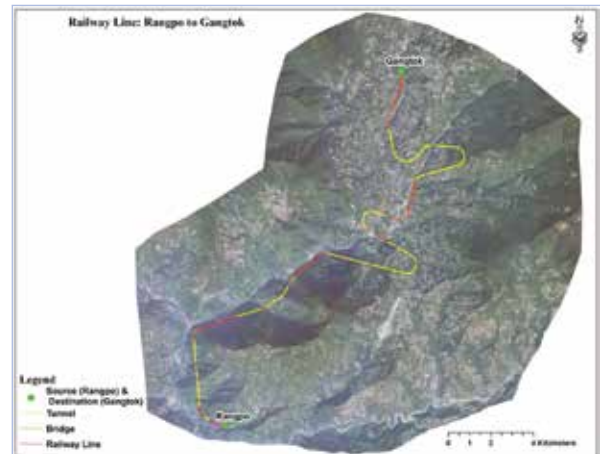
Space based Inputs for New Railway Line Alignment from Rangpo to Gangtok, Sikkim

As requested by North East Frontier Railways (Cons), Maligaon, Guwahati, this study was conducted to assess the feasibility of the proposed railway alignment using space-based technologies. The analysis focused on overburden conditions, land use/land cover (LULC), proximity to settlements, and the presence of water bodies to support the planning of key structural components, including tunnels, bridges, and surface segments.

The assessment covered a 35.55 km railway alignment, comprising 11 tunnels (22.46 km total), 32 bridges (4.75 km total), and 44 surface segments (8.34 km total). The elevation along the alignment ranges from 400 m to 1650 m. A detailed study of Tunnel-3 revealed a length of 1.53 km, an elevation difference of 20 m, and an overburden height of 800 m at 780 m from the starting point. The land use distribution within the tunnel area consists of 80.69% forest, 16.63% agricultural land, and 2.67% built-up area, with no wastelands or water bodies. The landslide susceptibility analysis indicates 51.23% low susceptibility, 48.77% moderate, and 0% high susceptibility.

This study has provided valuable insights into the structural feasibility of the railway alignment,

and a detailed observation report has been submitted to North East Frontier Railways.



Proposed alignment routes for railway network

Capacity Building activity under Plan of Action projects for Arunachal Pradesh, Mizoram, Nagaland and Sikkim

As part of the Plan of Action (PoA) projects, four capacity-building initiatives were undertaken in Arunachal Pradesh, Mizoram, Nagaland, and Sikkim to enhance the utilization of geospatial technology for sustainable development and informed decision-making. In Arunachal Pradesh, training programs were conducted by APSAC in collaboration with NESAC for government officials at state and district levels, equipping 245 government officials across Namsai, Dirang, and Itanagar with skills in geospatial data utilization via the NeSDR portal. Mizoram's initiative, led by the Mizoram Remote Sensing Application Center in collaboration with NESAC, focused on training line department officials and academia in GIS applications, facilitating three training programs that trained 45 participants and established a geospatial training lab at MIRSAC.

Nagaland's capacity-building efforts, spearheaded by the Nagaland GIS & Remote Sensing Center (NGISRSC) in collaboration with NESAC, aimed to bridge the gap between theory and practice through workshops, collaborative networks, and resource-sharing mechanisms, fostering grassroots-level geospatial awareness. 50 government officials were trained, 108 data layers were shared across to government



departments and more than 200 students were exposed to space technology. In Sikkim, the Sikkim State Council of Science & Technology (SSCS&T) conducted training programs for line department officials and college students, covering remote sensing principles, satellite imagery interpretation, and hands-on training with Google Earth and ArcGIS. Here, 30 government officials were trained and 175 students were trained across Gangtok, Pakyong, Gyalshing and Namchi districts of Sikkim. These initiatives collectively contributed to strengthening geospatial capabilities, promoting efficient resource management, and fostering

Snow). LULC outputs are published as a web map service using the NeSDR portal and can be utilized for R&D purposes and quick visualization for regions where recent LULC maps are not available. The developed models are validated on a random sample of 6,000 points over NER and achieved ~76% accuracy.

Development of deep learning based image synthesis system for cloud removal and semantic change detection using remotely sensed data

This work aims to develop deep learning based models (TMLNet and CRNet) for automated cloud removal and semantic change detection



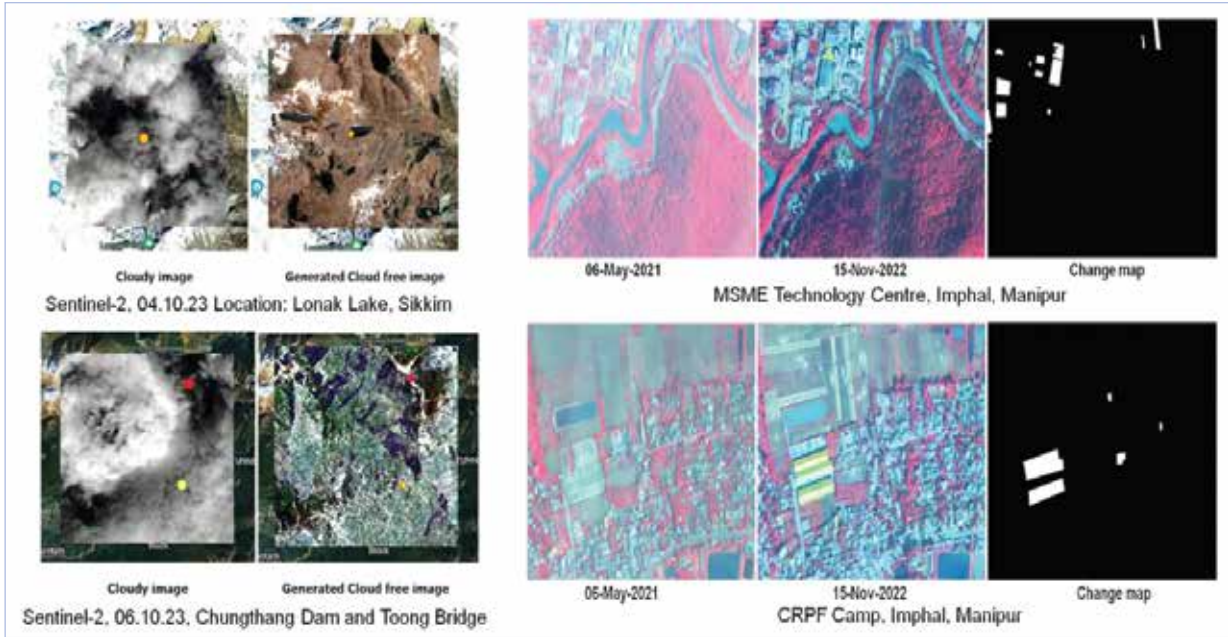
Mosaic of photographs of training programs at Arunachal Pradesh, Mizoram, Nagaland and Sikkim

a culture of technology-driven planning and decision-making across the four states.

GeoAI-based LULC level-1 product generation

This study focuses on developing GeoAI models for automated Land Use Land Cover (LULC) level-1 maps for the entire NER at periodic intervals. NESAC has developed models (ACNet and HybridNet) for segmentation using Sentinel-2 images, which generate level-1 LULC outputs at 10m resolution with seven classes (Water body, Forest, Scrub, Grassland, Agriculture, Built-up,

in satellite images. The number of days with persistent cloud cover is high in India's northeastern region, which affects optical sensors' ability to acquire images. NESAC has developed data-driven models to overcome this challenge by producing synthetic images for cloudy data and identifying built-up changes. The cloud removal model utilizes Sentinel-2 and Sentinel-1 images to generate cloud-free output. The cloud removal model is validated on Sikkim images of 2023 with heavy cloud cover. The change detection model is validated on Cartosat-3 data for automatic built-in change detection of built-up. The results for both models



Outputs of cloud removal model

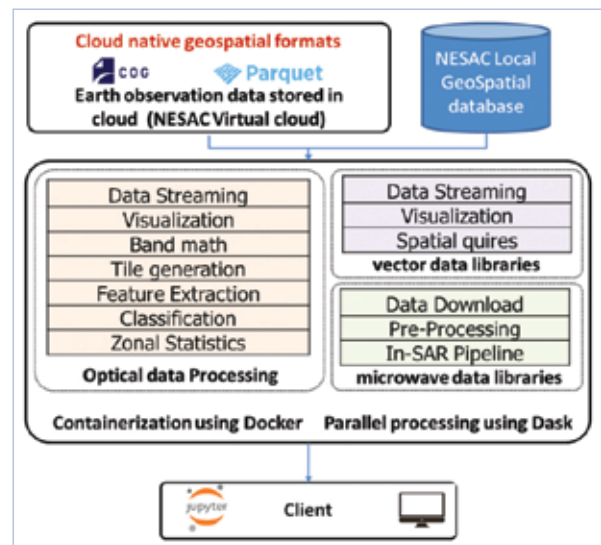
Outputs of change detection model

are shown in the following figures.

A novel cloud-native geo-processing framework for effective analysis on distributed earth observation data cubes

The exponential growth of Earth Observation (EO) data necessitates scalable, efficient, and cost-effective storage and processing solutions. Cloud-Native Geospatial Formats, particularly Cloud-Optimized GeoTIFF (COG) and SpatioTemporal Asset Catalog (STAC), enable seamless integration of EO data with cloud environments, optimizing accessibility and computational efficiency. NESAC has developed a cloud-native geospatial framework that leverages these formats to store, index, and process large-scale EO datasets efficiently. COG facilitates on-the-fly access to geospatial data without requiring full downloads, while STAC enables structured metadata management, supporting discovery and interoperability across diverse datasets. Efficient querying and analytics are enabled through distributed processing engines like Dask, Apache Spark, and RasterIO, allowing parallelized computations over large raster datasets. Furthermore, Web Map Services

(WMS) and APIs provide real-time access and visualization capabilities.



High level architecture diagram of the framework to process distributed cloud native geospatial formats

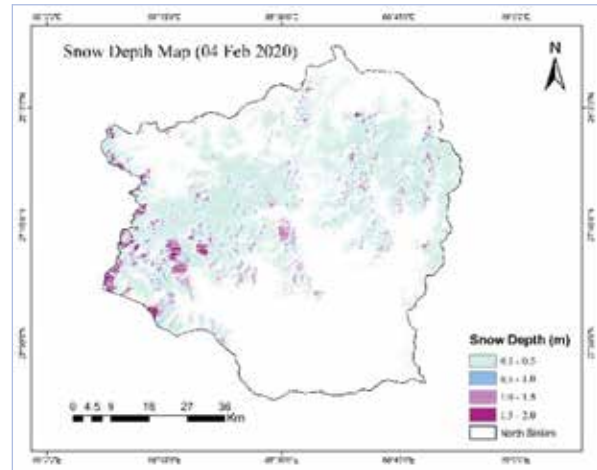
Snowmelt Estimation Using Machine learning with a hybrid optical-SAR approach

Accurate snowmelt estimation is crucial for understanding and managing water resources, predicting hydrological changes, and assessing climate impacts. We have approached estimation of snowmelt using time series of SAR and optical imagery where snow cover area and associated snow depth is used to estimate a time series



of snow characteristics. A monthly difference is then applied to estimate changes in snow mass over a period of time. Thus, we develop a monthly snowmelt product at 100m resolution. The study integrates multispectral Sentinel-2 and SAR Sentinel-1 images, leveraging their complementary strengths to enhance the reliability and accuracy of snowmelt estimates. Data collection was performed using Google Earth Engine, focusing on images with minimal cloud interference. The Normalized Difference Snow Index (NDSI) and machine learning methods were employed to map snow cover effectively. In-situ snow depth measurements from ground measurements across the ICIMOD snow observation stations were crucial not only for validating but also for training the snow depth estimation models. Different types of machine learning algorithms were assessed for their performance to predict snow depth accurately, including Linear Regression, Random Forest, Gradient Boosting Regression, XGBoost, Support Vector Machine (SVM), and Multilayer Perceptron (MLP). The Gradient Boosting Regression model, identified through rigorous performance

evaluations, demonstrated superior predictive capabilities. Key parameters used in the modeling include the Snow Index (SI), backscatter values at VH and VV polarization from Sentinel-1, and Normalized Difference Vegetation Index (NDVI) from Sentinel-2.



Snowdepth maps generated using GBR regression for February 2020 for North Sikkim



SPACE AND ATMOSPHERIC SCIENCE DIVISION

The Space and Atmospheric Science Division (SASD) of NESAC has been working to understand and characterize the major drivers for weather and climate variability, through the collection and analysis of in-situ data, satellite-based data and products, and numerical modeling. The group also conducts research to improve short and medium range weather forecast, particularly the severe weather forecasts over the region. In addition, the group provides support and critical input in the management of major disasters like floods, severe storms, lightning, etc. using data from the S-band polarimetric radar, automatic weather stations, satellites, numerical models, etc. The major activities and achievements of this group are described below:

Aerosol vertical profile over Umiam

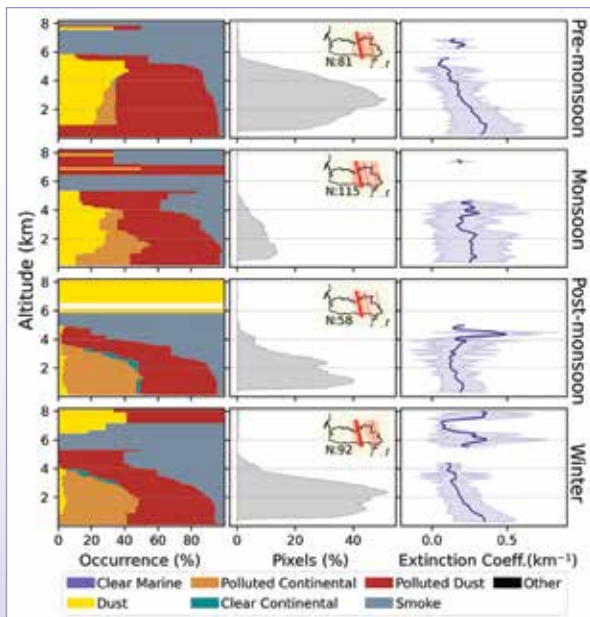
Information on the vertical profile of aerosol is important for the better estimation of aerosol radiative forcing and its climatological impact. CALIPSO satellite observations from 2006 to 2023 provide valuable insights into the vertical profiles of aerosols. The study over Umiam (25.67°N, 91.90°E) reveals distinct seasonal variations and vertical heterogeneity in aerosol

subtypes, including clear marine, dust, polluted continental, clear continental, polluted dust, smoke, and others.

During the pre-monsoon season, aerosol observations (high pixel %) remain substantial even at altitudes exceeding 4 km, with dust aerosols being the predominant component. This is likely attributed to the combined influence of an elevated planetary boundary layer, driven by intense solar heating across India, and the long-range transport of dust aerosols from the western regions, which contribute the most to the overall aerosol load. The monsoon season shows the least accounts of aerosols (low pixel %) suggesting effective wet scavenging process. Polluted continental aerosols which mainly originate from biomass burning and fossil fuel combustion show the highest contribution within 4km primarily in the post-monsoon and winter seasons. The extinction coefficient profiles exhibit a noticeable decrease with altitude during the pre-monsoon and winter seasons, whereas during the monsoon and post-monsoon periods, the profiles appear more uniform yet exhibit greater variability. This pattern may be attributed to effective convective mixing prevalent during the monsoon and post-monsoon seasons over the region which allows for vertical redistribution of aerosol particles.

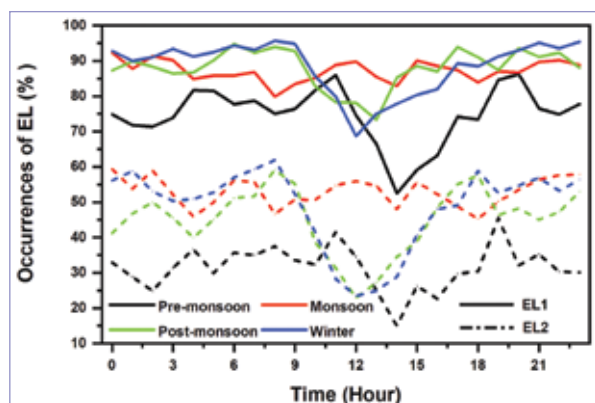
Investigation of elevated aerosol layer over a remote hilly station in Meghalaya

Elevated aerosol layers (EL) play a crucial role in aerosol dynamics and their potential implications for regional air quality and climate. Continuous monitoring of EL height is being conducted over Umiam using a LIDAR Ceilometer in a joint effort by the Physical Research Laboratory (PRL), Ahmedabad and NESAC. While ceilometers are primarily used to determine atmospheric boundary layer height, they also provide valuable information on elevated aerosol layers.



Aerosol vertical profile over Umiam showing various aerosol occurrence percentage in left column, percentage of pixels showing presence of aerosol in middle column, and vertical profile of total extinction coefficient in right column.

The diurnal variation in EL occurrences relative to the boundary layer is shown in figure. A distinct seasonal pattern is observed, with frequent and persistent occurrences of the first elevated layer (EL1) across all seasons, indicating complex atmospheric boundary layer (ABL) structures. These structures are often characterized by multiple stable residual layers (RL), which contain aerosols either retained from the previous day's convective boundary layer (CBL) after sunset or transported from distant sources by winds. Although EL occurrences exhibit strong diurnal variability, their frequency is generally higher during morning and nighttime periods. This suggests the presence of temperature inversion layers formed due to the collapse of the convective boundary layer after sunset. Interestingly, in the monsoon season, EL occurrences remain fairly uniform throughout the day. However, in the post-monsoon and winter seasons, a significant reduction in EL occurrences, approximately 25%–30% for EL1 and close to 40% for EL2 was observed between 8 AM and 12 PM, indicating the dissipation of these layers.



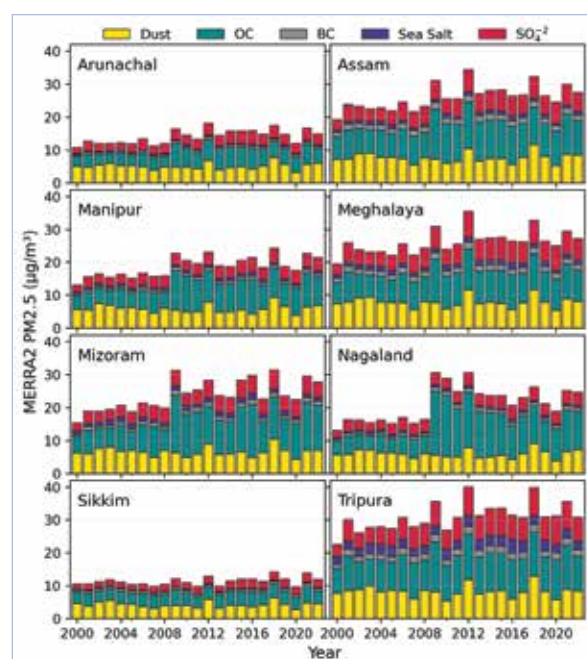
Diurnal variations of occurrence of elevated layers (EL) as a percentage of the BLH occurrence. The first (EL1) and the second EL (EL2) are shown in solid and dashed line respectively.

A concurrent early morning peak in surface black carbon (BC) levels, measured using an Aethalometer (Make: MAGEE SCIENTIFIC, Model: AE33, Wavelength used: 880 nm), was observed during the same seasons. Further analysis, integrating backscatter profiles with surface BC data, revealed a strong potential for top-down mixing of aerosols from elevated layers into the developing boundary layer. This vertical transfer

of pollutants suggests that elevated aerosol layers can significantly influence near-surface air quality by injecting aged aerosol particles into the mixed layer.

Long term changes in particular matter over different NER States

The mean particulate matter (PM_{2.5}) concentrations over the NER of India, derived from MERRA-2 reanalysis datasets of aerosol species (Dust (PM_{2.5}), Black Carbon (BC), Organic Carbon (OC), Sea Salt (PM_{2.5}), and Sulfate (SO₄²⁻), exhibit an overall increase over the past two decades (2000–2022). Organic carbon, primarily formed through decomposition of organic materials through combustion of fossil fuels and biomass burning show prominence over all the states. Dust aerosols, mostly transported from the western deserts of India and beyond through long-range transport mechanisms also show significant contributions to PM_{2.5} levels in all states. Sulfate (SO₄²⁻) aerosols over the NER are primarily formed through the secondary transformation of gaseous SO₂, a by-product of fossil fuel combustion. Their concentrations are notably higher over Tripura, Assam, and Meghalaya, which are in close proximity to the Indo-Gangetic Plain (IGP), a major emission



PM_{2.5} concentration over NER States for the period from 2000–2022



hotspot with coal-fired power plants, vehicular exhaust, and industrial activities. The PM2.5 concentrations exhibit a sudden increase in 2009 and 2012, primarily driven by higher OC contributions. This rise may be linked to previous records of high fire count intensities potentially linked with large-scale oscillations such as ENSO (El-Nino Southern Oscillation), creating conditions that could have contributed to increased forest fire activity. Ensuring the accuracy of these trends requires additional in-situ observations. Given the rising PM2.5 levels and their harmful effects on air quality and human health, it is essential to implement stronger mitigation measures to reduce emissions, particularly from anthropogenic sources.

Generative AOD Adversarial Neural Network for INSAT 3DR Aerosol Optical Depth Retrieval

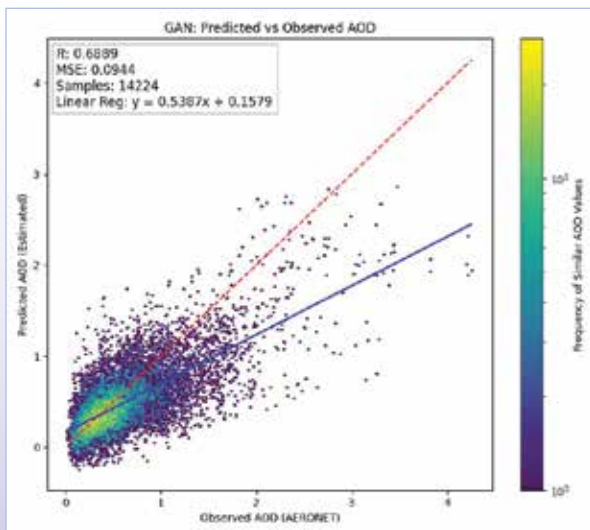
Aerosol Optical Depth (AOD) retrieval is crucial for monitoring atmospheric aerosols and their impact on climate and air quality. Traditional methods rely on Top-of-Atmosphere (TOA) reflectance data, but uncertainties in radiative transfer calculations and surface reflectance variations can introduce errors. To address these challenges, we explored an advanced AOD retrieval algorithm utilizing a Generative Adversarial Neural Network (GAN) model, specifically designed to enhance quantitative

aerosol retrievals over India using INSAT-3DR TOA reflectance data and AERONET ground-based observations for validation. A comprehensive dataset was created by spatially and temporally collocating INSAT-3DR TOA reflectance with AERONET AOD measurements over different surface types across India from 2023 to 2024 along with elevation data.

A total of 14,224 training samples were used to develop the model, ensuring robustness across diverse aerosol conditions. K-fold cross-validation demonstrated that the GAN model significantly improves retrieval accuracy compared to conventional approaches. Independent validation using 2024 data confirmed its superior performance, achieving a high correlation (R=0.68). Despite its strong performance, sensitivity analysis revealed that GAN exhibits limitations in areas with high aerosol loading and spatial heterogeneity, where retrieval uncertainties are relatively higher. Nevertheless, this deep learning-driven approach offers a significant advancement in AOD retrieval using INSAT-3DR, providing more accurate and frequent aerosol monitoring over India for air quality assessment and climate studies.

Ensemble based rainfall forecast for NER: Comparison between HYBRID and HYBRID-DUAL method

Data Assimilation (DA) methods play a crucial role in enhancing Numerical Weather Prediction (NWP) model forecasts by producing optimal analysis fields through the integration of observational data with model short-range forecasts. To achieve this, DA schemes require accurate error information from both observations and model forecasts, collectively known as the Background Error Covariance (BEC) matrix. While observational errors are generally provided by data providers, the BEC matrix must be derived either from model forecasts or based on climatological data. Depending on the type of BEC used, DA methods are broadly categorized into variational methods (e.g., 3DVAR, 4DVAR)



Predicted and observed AOD over the Indian region based on the training results

and Ensemble Kalman Filter (EnKF) methods. However, implementing pure ensemble method on operational basis is computationally expensive. To address this challenge, a HYBRID approach has been developed by researchers, which effectively utilizes flow-dependent information from ensembles in a computationally efficient manner.

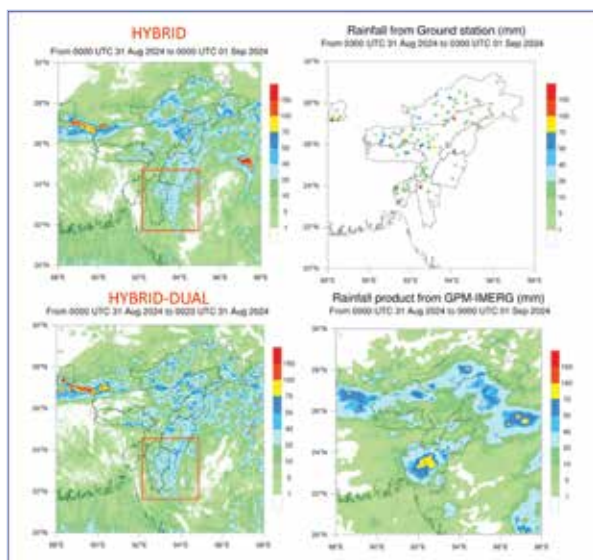


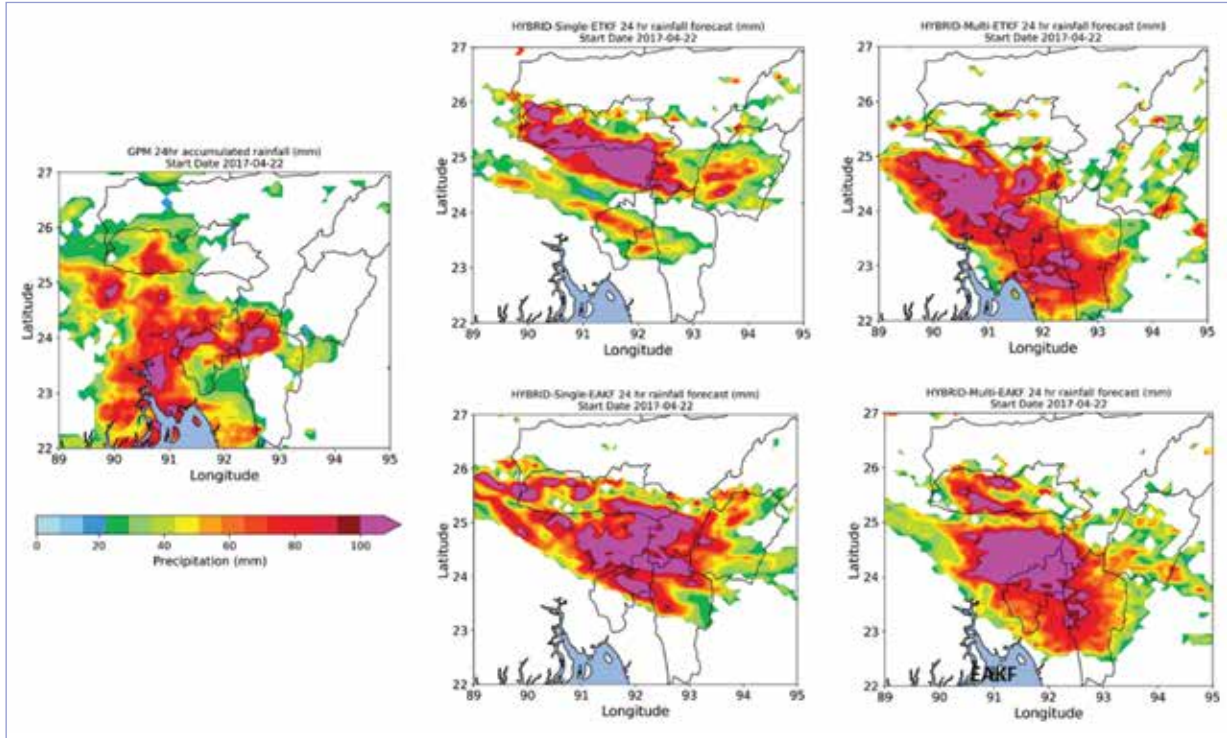
Figure: Rainfall simulation with (a) HYBRID-DUAL, (c) HYBRID method and (b) observed rainfall data from IMD AWS stations and (d) GPM-IMERG rainfall estimates

In this study the HYBRID (WRF-ETKF) method with 50 member ensembles has been used for simulation of heavy rainfall during 2024 monsoon season. Here, the model outer domain cover the monsoon prevailing region of India and the inner domain covers the NER of India. The model forecast results indicate that, although the HYBRID method significantly improves rainfall predictions across most of the NER region compared to 3DVAR, it fails to enhance rainfall forecasts over the southern part of NER. It is observed that, in most of the cases the rainfall over Tripura and Mizoram was shifted more towards north and northeastern side. To address the issue, another method has been used which is called as HYBRID-DUAL method. The HYBRID-DUAL method offers a computationally efficient alternative by modifying how flow-dependent error covariance information is used. Unlike the HYBRID configuration used here, which only

performs ensemble simulations for the coarser (outer) domain and uses its initial conditions for forecasting both outer and inner domains to get rid of computational demands, the HYBRID-DUAL method separately generates initial conditions for the inner domain based on the ensemble members of the outer domain. This approach avoids the need to generate independent ensemble members for the inner domain, significantly reducing computational costs while effectively utilizing ensemble information. The results also demonstrate that the HYBRID-DUAL method provides improved rainfall forecasts over the southern part of NER compared to the standard HYBRID method.

Performance of various ensemble methods for simulation of heavy rainfall over NER

Ensemble-based data assimilation methods, such as the Ensemble Kalman Filter (EnKF) and hybrid ensemble-variational methods (eg: WRF-ETKF, WRF-EAKF), address the limitations of variational methods (eg: 3DVAR, 4DVAR) by incorporating flow-dependent Background Error Covariance (BEC) information by estimating the BEC dynamically using an ensemble of forecasts. This ensemble represents a range of possible atmospheric states, allowing the BEC to vary according to the evolving flow and capturing error structures that adapt to changing weather patterns. However, the performance of the hybrid DA method also depends on the ensemble configuration methods such as ensemble generation methods, ensemble update methods, etc. Two ensemble update methods: EAKF (Ensemble Adjustment Kalman Filter (EAKF) and the Ensemble Transform Kalman Filter (ETKF) were employed. While ETKF is already integrated with the WRF model, EAKF is implemented using the Data Assimilation Research Test bed (DART) software package. Both the methods use the traditional Kalman filter update equation to adjust the ensemble mean while ensuring that the updated ensemble covariance remains consistent with



GPM observed rainfall and model simulated 24 hr rainfall forecast valid for April 22, 2017 from the experiments: b) HYBRID-Single-ETKF, c) HYBRID-Multi-ETKF, c) HYBRID-Single-EAKF, d) HYBRID-Multi-EAKF

theoretical expectations. The primary difference lies in their algorithmic approach to updating the ensemble perturbations. Furthermore, 30 member ensembles are generated based on initial condition perturbation (named as HYBRID-Single) and combinations of Multi-Parameterization schemes (named as HYBRID-Multi).

Among the data assimilation experiments, HYBRID-Multi-EAKF demonstrates the highest agreement with GPM observations, effectively capturing both the spatial extent and intensity of rainfall. In contrast, HYBRID-Single-EAKF and HYBRID-Single-ETKF exhibit a northward displacement of rainfall maxima, while HYBRID-Multi-ETKF tends to shift the maxima southward over Mizoram, deviating from observed patterns. This superior performance highlights the importance of multiphysics-ensemble data assimilation techniques in improving short-term heavy rainfall forecasts. Given the complex terrain of the NER, where orographic effects and mesoscale convection strongly influence

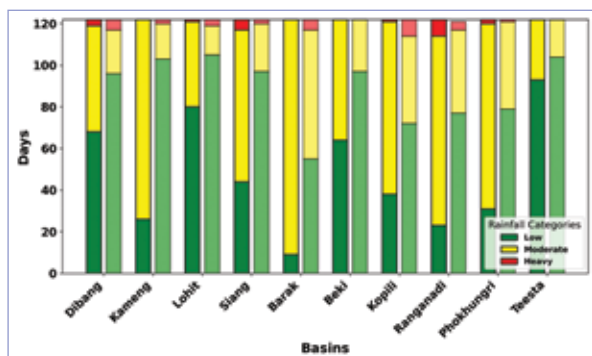
precipitation patterns, advanced assimilation approaches such as HYBRID-Multi-EAKF provide a clear advantage in enhancing predictive skill.

Performance of rainfall forecast over major river basins of NER of India

Predicting rainfall over complex topography like the NER of India remains a significant challenge. However, continuous evaluation of model performance helps identify and address shortcomings. NESAC provides rainfall forecast using the WRF (Weather Research and Forecasting) model for the NER of India, which is used for the Flood Early Warning System (FLEWS) project. The rainfall forecast was evaluated against multi-satellite precipitation estimates from the Integrated Multi-satellite Retrievals for GPM (IMERG) over 67 river basins and watersheds in Northeast India for the 2024 monsoon season.

Rainfall events were categorized as low (<10 mm/day), moderate (10–50 mm/day), and heavy (>50 mm/day), and the number of occurrences in each category was compared

between model simulations and observations. The model underestimated the number of low-rainfall days while tending to overestimate light rainfall, often classifying it as moderate rainfall. The number of heavy rainfall days was generally lower across all basins, but significant uncertainties were observed over the Barak, Kopili, and Kameng basins for heavy rainfall occurrences.

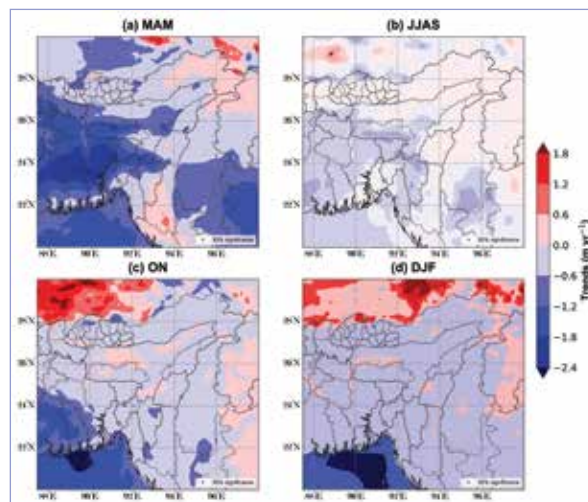


Comparison of the number of days with low, moderate, and high rainfall events as represented by the model and observations for the monsoon season of 2024 over each basin. For each basin, the first column represents the model, while the second column represents the observations.

Climatology of atmospheric boundary layer height over NER of India

Atmospheric boundary layer height (ABLH) was studied over the NER of India for the period from 1979 to 2020 using IMDAA gridded regional reanalysis product. The analysis was conducted both annually and seasonally for ABLH trends to assess changes in mean ABLH in the past four decades across the region bounded by 20°N to 30°N latitude and 85°E to 100°E longitude. Some regions showed increasing ABLH trends especially during monsoon season (JJAS) at rates up to 0.6 meter per year, but a widespread significant decreasing trend in ABLH was observed, especially over western and south-western region of the study domain. During the pre-monsoon (MAM) season, relatively greater magnitude of downward ABLH trend was observed in areas like Bangladesh, Myanmar and Indian states of West-Bengal, Meghalaya and some parts of Assam, Northern Tripura and Mizoram (-1 to -2.5 meter per year), followed by West-Bengal (-1.5 to -2.5 meter per year)

during post-monsoon season (Oct-Nov). The winter season (Dec-Jan-Feb) was characterized with relatively greater decline in ABLH over nearby Bay of Bengal (< -2.4 meter per year). The predominant declining ABLH patterns over land areas over this region can impact regional air quality and therefore may significantly impact regional weather and human comfort.



Trends in seasonal mean atmospheric boundary layer height (ABLH) over NER of India and adjoining areas

Surface and Atmospheric Controls on PBLH over Northeast India

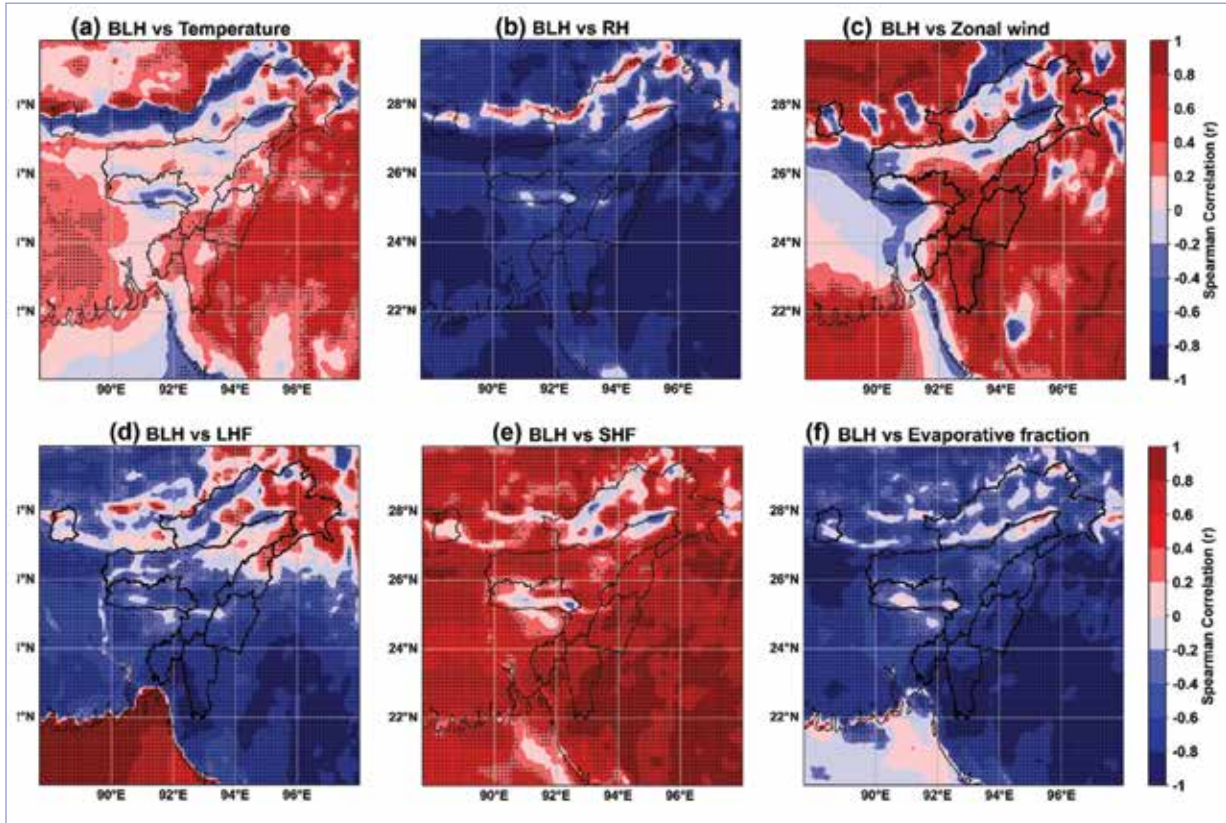
The planetary boundary layer height (PBLH) plays a vital role in surface-atmosphere interactions and is influenced by various meteorological and surface parameters. Using the IMDAA reanalysis dataset (1980–2020), we examined annual correlations between PBLH and six variables over Northeast India (NEI) and nearby regions: temperature (T), relative humidity (RH), surface zonal wind (SZW), latent heat flux (LHF), sensible heat flux (SHF), and evaporative fraction (EF = LHF / (LHF + SHF)). Spearman correlation analysis (figure) shows that PBLH is positively correlated with T, SZW, and SHF, and negatively correlated with RH, LHF, and EF. Stippled regions in the figure indicate statistically significant correlations at the 5% level. RH showed the strongest negative correlation, suggesting that increased moisture inhibits vertical mixing and suppresses PBLH growth. While rising surface temperatures generally promote boundary layer



expansion, our results show a decreasing PBLH trend despite warming in NEI, indicating other dominant controls such as increased RH or altered wind dynamics. SZW showed a strong positive correlation ($r > 0.5$), implying that declining wind speeds may reduce turbulence and contribute to shallower boundary layers. These findings

by making the system live under the NER-DRR portal.

The tracking system utilizes the data from the Indian Lightning Location Network installed by the Indian Institute of Tropical Meteorology (IITM), Pune in near real-time by converting the



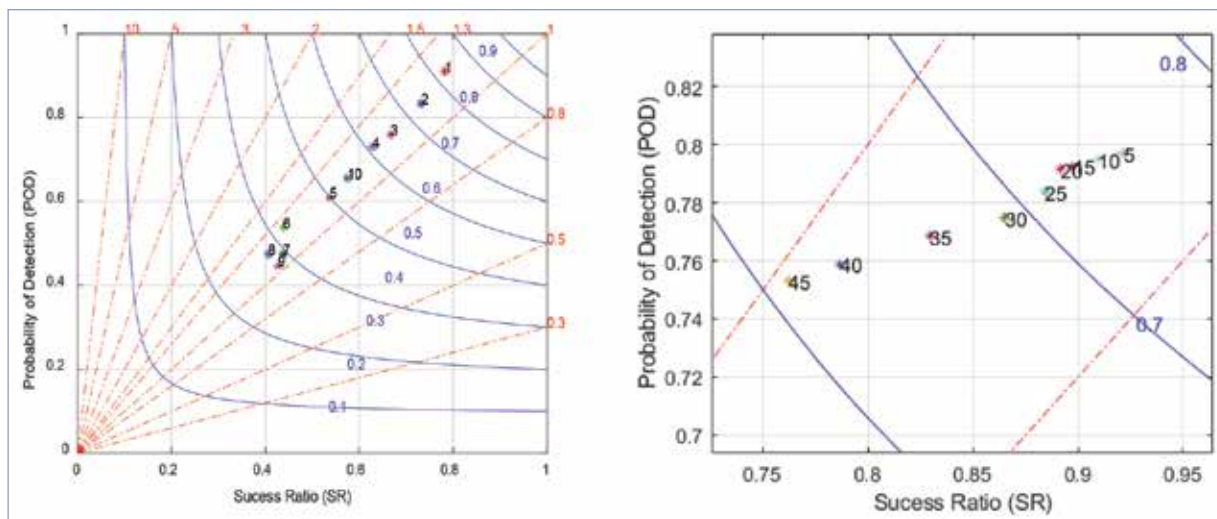
Correlation of atmospheric boundary layer height (BLH) with surface layer and meteorological parameters

emphasize the critical roles of surface heating, wind, and moisture in modulating PBLH, with implications for regional weather, air quality, and climate variability.

Development of Location Based lightning nowcasting system for NE region of India

The NER of India is severely affected by lightning, leading to significant loss of life and property. NESAC has developed a lightning nowcasting system using the WRF-ELEC model-based forecasting and near real-time thunderstorm tracking using ground based lightning detector data. This system was demonstrated during 2024

data into a density map as an initial condition. These density maps are further used to identify active storm cells, track their movement, and interpolate data for lightning nowcasting. Simultaneously, the WRF-ELEC model is employed for lightning forecasting, with GFS data serving as the initial condition. Lightning density maps are assimilated into the model to enhance forecasting accuracy. A detailed validation of the beta version of the system has been conducted using data from various sources like LDSN, INSAT, and DWR data. The results indicate that the model's forecast accuracy and the tracking system's nowcasting accuracy exceed 75% for three-hour forecasts and 45 minute lead times, respectively. Additionally, to test the reliability



Solid blue lines represent critical success index, and red dotted lines represent bias. Left panel shows performance of E-WRF model up to nine hours lead time marked as 1 to 9 and number 10 marked for average performance. Right Panel shows performance of Thunderstorm tracking for different lead times.

of the system, based on the request from the Assam State Disaster Management Authority (ASDMA), SMS based alerts were delivered to the authorized personnel of ASDMA. This demonstrated that the developed system can be effectively implemented to reduce lightning-related losses.

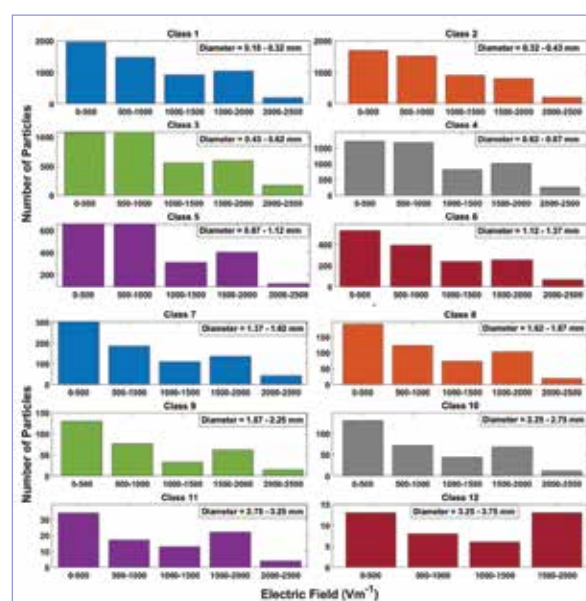
To further improve accuracy, NESAC has installed three new sensors in the NER integrating them into the national grid of IITM to improve the data quality of the lightning location system to enhance accuracy. Additionally, a network of electric field meters is being installed to assist in lightning warning efforts.

Investigating the impact of atmospheric electric fields on rain drop size distribution

The atmospheric electric field and its dynamics could impact the micro-physical properties of hydro-meteors in a convective system including modification of hydrometeor size and number density. An analysis of raindrop size distribution was conducted using data from the Laser Precipitation Monitor (LPM) and compared with atmospheric electric field measurements. A specific thunderstorm case was identified to examine the relationship between drop size and electric field variations. The study revealed that as

the electric field increased, both the rainfall rate and the frequency of precipitation intensified. Notably, smaller raindrops were predominant at lower electric field strengths, while larger raindrops became more dominant at higher electric field strengths. This indicates a direct correlation between electric field variations and the onset of precipitation, prompting further investigation.

Additionally, an analysis was performed to explore the role of strong electric fields in enhancing raindrop coalescence process, leading



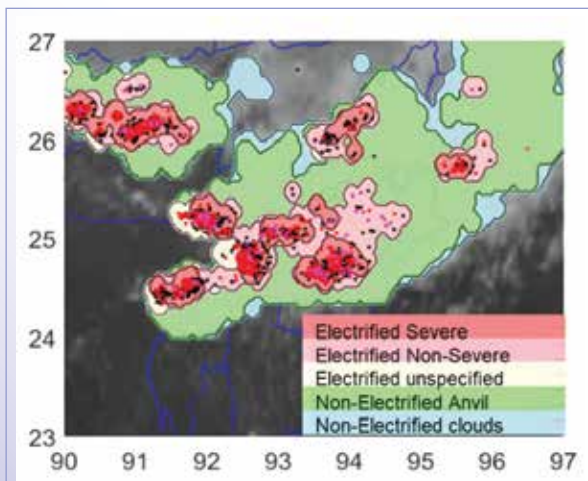
Distribution of raindrops of different diameter class in different bin of electric field



to the formation of larger drops and increased rainfall intensity. The findings suggest that higher electric field strengths reduce the overall number of raindrops across all size ranges, with a more pronounced effect on smaller droplets. This is likely due to the increased force exerted by the electric field, which causes smaller droplets to either disperse or merge into larger drops. In contrast, for larger raindrops, the electric field enhances coalescence, resulting in fewer but bigger droplets under stronger electric field conditions. Specifically, smaller raindrops are most abundant in areas with weak electric fields (0–500 V/m), whereas larger raindrops become more prominent under stronger electric fields (1000–2000 V/m).

Estimations of electrified clouds using satellite and lightning data

An algorithm has been developed to estimate electrified and non-electrified clouds along with their severity levels using INSAT-3D/3DR/3DS and lightning data. The algorithm also identifies severely electrified regions that are potential areas for severe thunderstorms and hailstorms. Electrification primarily occurs in the mixed-phase region (0°C to -20°C) in the presence of graupel and ice crystals, which are the main contributors to lightning activity. The INSAT-3D/3DR/3DS water vapor (WV) band (6.50 - 7.00 μm) helps detect the presence of these hydrometeors, providing additional

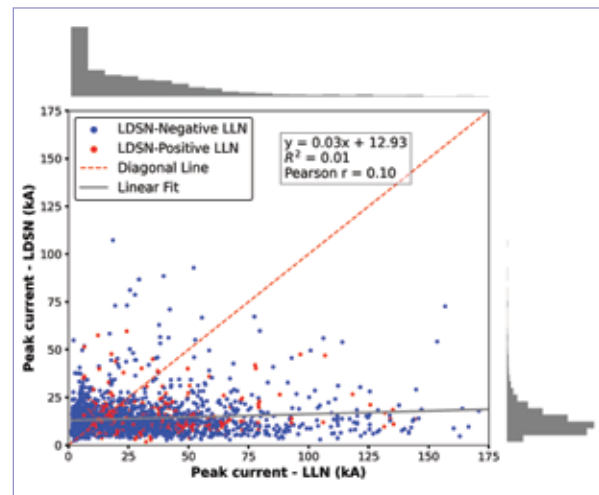


Retrieved electrified and non-electrified region in a cloud using INSAT-3D/3DR/3DS and ground based lightning data.

information for identifying electrified, lightning-producing clouds. The electrified region is much smaller than the entire cumulonimbus (Cb) cloud, including its convective and anvil regions. Within the electrified region itself, there are localized areas with intense lightning activity, indicating the potential for severe weather. Additionally, some electrified regions exhibit lightning activity without being associated with other impacts of severe weather. A case study was conducted to identify hailstorm-prone areas within electrified clouds. The algorithm successfully distinguished severe regions, and hailstorms were reported in the identified areas.

Inter-comparison study of two regional Lightning Location Network

A study has been taken up to compare the performance of two different regional lightning location networks (LLN) over India: IITM-LLN and NRSC-LDSN. The study involved inter-comparison of their stroke density, ability to capture lightning hotspots; ability in representing the peak current associated with lightning and obtained relative location, time and current accuracies for shared events between the networks. Both the network showed similarities in capturing spatial pattern of lightning occurrences, but they differed in terms of stroke densities.



Current difference of shared events of NRSC-LDSN with respect to IITM-LLN over Indian region during Oct 09 and Dec 08 2024, histograms on each axis shows stroke densities.

To obtain relative location, time and current estimation accuracy of both the LLNs, shared

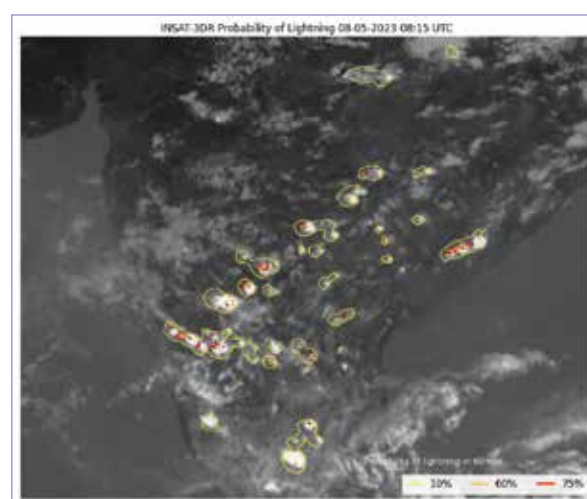
events between the two networks were determined. The thresholds used for matching criteria were time difference and spatial separation of 100 ms and 30 km respectively. A key finding is that LDSN significantly underestimates peak current compared to LLN, with both networks showing poor correlation in current estimates. A comparison shows that the underestimation by LDSN is equally true for both positive and negative current cases of LLN. However, the discrepancy may stem from LLN overestimation rather than LDSN underestimation, as neither network directly measures current, and both estimate it using empirical formulas influenced by sensor distribution and atmospheric attenuation. LDSN's lower sensor density over the study domain may contribute to current underestimation. Typically, estimated currents are validated using ground-truth methods such as rocket-triggered lightning or instrumented towers, which are currently unavailable in India. This highlights the need to establish such validation facilities for improving lightning current estimates.

Deep Learning based Lightning Nowcasting using INSAT-3D/3DR Data for Indian Region

Building on the innovative approach of ProbSevere LightningCast, a deep-learning model is being developed to enhance lightning nowcasting capabilities using purely satellite imagery from INSAT-3D and INSAT-3DR datasets as inputs. This model aims to leverage high-temporal-resolution geostationary satellite data in conjunction with ground-based lightning detection data from the Indian Institute of Tropical Meteorology (IITM) to improve short-term lightning forecasts. At its core, the model is designed to process and analyze vast amounts of satellite imagery and meteorological data in real time. Using convolutional neural networks (CNNs), the model identifies spatial and temporal patterns that indicate favorable conditions for lightning formation. INSAT-3D and INSAT-3DR, with their frequent updates and multispectral observations, provide an ideal data source for

capturing cloud-top properties, convective growth, and atmospheric instability over the Indian subcontinent and surrounding regions.

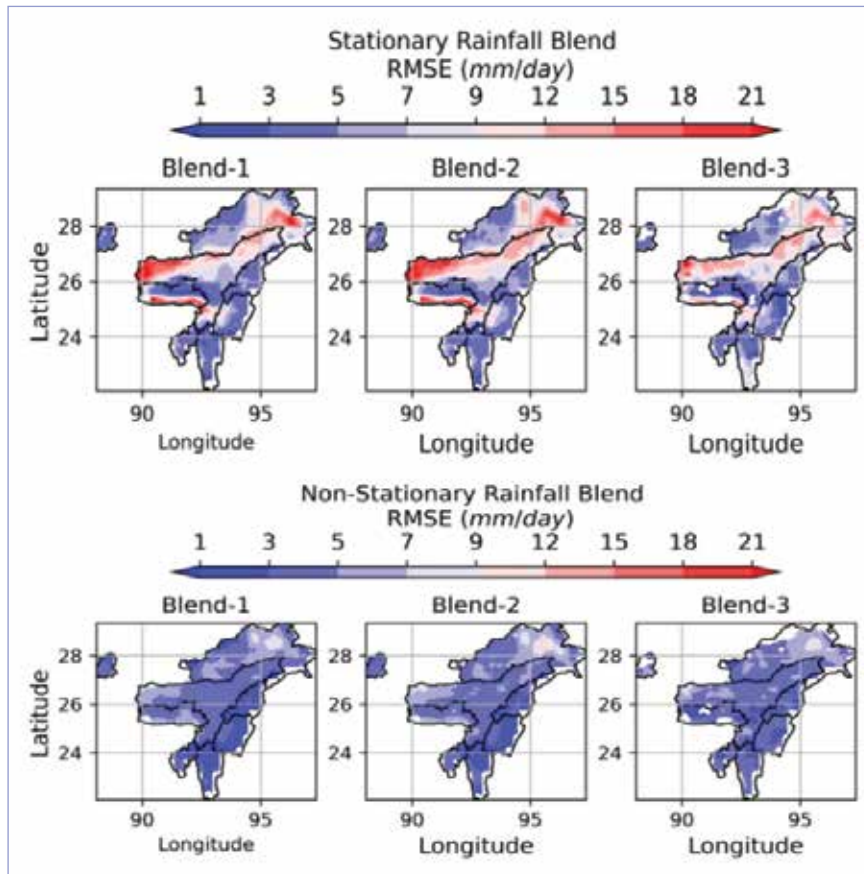
This high-temporal-resolution data enhances the model's ability to detect convective initiation and forecast lightning activity up to 60 minutes in advance. A key aspect of this model is its planned integration with IITM's ground-based lightning detection network, which serves as a critical validation source. The ground-based lightning data will provide an extensive record of lightning occurrences, ensuring that the model's predictions are continuously refined for improved accuracy and reliability. The model is currently in the validation phase, with ongoing efforts focused on optimizing deep learning architectures, and fine-tuning model performance. Once validated, this lightning nowcasting system can be made operational to provide timely warnings for lightning-prone regions.



Overlaid results of IITM data and Lightningcast prediction over INSAT3DR TIR1 Channel

Examining the efficacy of a non-stationary blending scheme in reducing the uncertainty in long-term rainfall product

Assessing the long-term characteristics of rainfall is important for understanding the effect of global warming on precipitation patterns. Currently, these long-term characteristics of rainfall are being examined either by analyzing



The uncertainty of the merged rainfall products from the stationary merging scheme and non-stationary merging scheme. The uncertainties are represented in terms of RMSE here which are estimated using the Triple Collocation Approach.

reanalysis rainfall product or satellite-based, as these two provide a spatiotemporally consistent rainfall field for long time periods. However, there are some inherent uncertainties in these products. Studies have shown that merging different rainfall products is an efficient way for generating a spatiotemporally consistent rainfall product with lower uncertainty compared to its parent rainfall products. Traditionally, the merging schemes used for this purpose used a stationary approach. A stationary merging scheme used weights that are invariant in time, thereby missing the temporal variability of uncertainty. This can lead to merged products with inflated uncertainties. Considering this, a non-stationary merging scheme was developed and examined for rainfall products over the NER of India.

The merging weights are estimated from the inherent uncertainties of the parent rainfall products using a novel uncertainty estimation

approach called Triple Collocation Analysis (TCA). This study uses seven rainfall products from different sources, namely, IMDAA, SM2RAIN, IMERG, CHIRPS, INSAT-3D IMSRA (IMR), and GSMaP. The efficacy of the stationary and the non-stationary merging schemes are tested for four sets of combination of rainfall products, namely, Blend-1 (IMDAA, SM2RAIN, IMERG), Blend-2 (IMDAA, SM2RAIN, CHIRPS), Blend-3 (IMDAA, SM2RAIN, IMR) and Blend-4 (IMDAA, SM2RAIN, GSMaP). The uncertainty quantification analysis revealed GSMaP to be the most reliable rainfall product out of all. The examination of the uncertainty of the merged

rainfall product showed the lower uncertainty levels the merged products compared to their parent product, irrespective of stationary or non-stationary merging scheme. This examination also revealed the non-stationary merging scheme's effectiveness in reducing the uncertainty of the parent rainfall compared to that from the stationary scheme. The inter-comparison between the stationary and non-stationary scheme also revealed that the effectiveness of the non-stationary scheme is highest when the parent rainfall products show strong spatiotemporal variability.

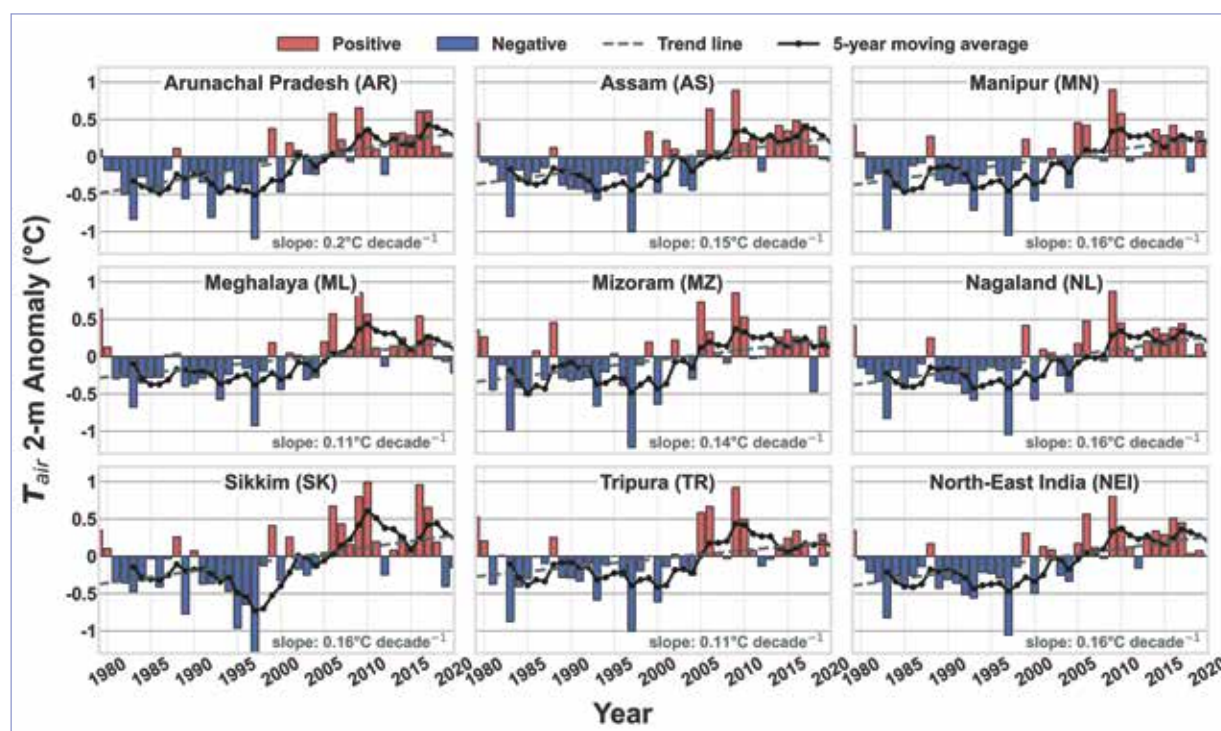
Climatology of ambient temperature and its anomaly over NER of India

Surface temperature trends over NER of India were assessed during the period 1979 to 2020 using the regional reanalysis dataset named Indian Monsoon Data Assimilation and Analysis (IMDAA) and a global dataset known as European

Centre for Medium Range Weather Forecasts (ECMWF) Reanalysis, Version 5-Land component (ERA5-Land). Non-parametric statistical methods, such as Mann-Kendall and its various modified versions were employed to investigate climatic changes in terms of mean temperature across the region. Significant upward (increasing) trends were observed over a large portion of the area across both the datasets. The rising trends were more prevalent over regions with relatively higher elevations such as Arunachal Pradesh and Sikkim ($0.03\text{--}0.04^\circ\text{C}$ per year) indicating a possible occurrence of Elevation Dependent Warming (EDW) over NER that needs further investigation. The analysis further revealed significant increasing trends during all seasons except pre-monsoon (Mar-Apr-May) with highest rate of change during the post-monsoon season (0.22°C per decade; Oct-Nov). This poses significant risk to the human and natural ecosystems of the area as the signatures of climate change observed in the study, could lead to rise in extreme weather events over NER, therefore affecting lives and livelihood in this rain-fed agricultural dependent area.

identifying changing climatic patterns over an area when studied in terms of meteorological variables. We investigated anomaly of annual surface temperature over NER of India and its constituting states to examine deviation of mean annual temperature with respect to a long-term (1979-2020) average value using high-resolution IMDAA datasets. A clear shift from negative (blue) to positive (red) anomaly estimates were observed over NER and its eight states marking a significant temperature regime shift around the beginning of 21st century. Simple regression analysis revealed increasing trends in mean temperature anomaly with rates varying between $0.1\text{--}0.2^\circ\text{C}$ per decade. The maximum rate of change in anomaly was observed in Arunachal Pradesh (0.2°C per decade) followed by Manipur, Nagaland, Sikkim and Assam ($0.15\text{--}0.16^\circ\text{C}$ per decade). The 5-year running mean also revealed an evident rising pattern from negative to positive values around 2005 indicating a possible abrupt climatic shift. This accelerated rise in warming scenario over NER can be linked to increased anthropogenic intervention during recent times that can potentially impact regional climate dynamics thus affecting agriculture, water resources, and associated ecosystems.

Anomaly analysis provides crucial insights in



Anomaly in mean surface temperature over NER of India and its constituting states during the 1979 to 2020 period.

SATCOM & UAV DIVISION

The Satcom & UAV Division (SUD) at NESAC continues to strengthen connectivity, technological advancement, and disaster management in the North Eastern Region.

SUD has submitted proposals for setting up of internet based Tele-Education & Telemedicine projects for NE states which are under administrative consideration. The division has been also entrusted with responsibilities for local coordination for many ISRO projects/facilities like, operational management of High Throughput Satellite (HTS) GSAT-29 Ground Station at Guwahati, the establishment of Radar under NETRA Project, local coordination for operation of Ground Station under MCF, Hassan and NavIC Earth station of ISTRAC at NESAC. NESAC has also completed its part in Ka-band propagation experiment jointly conducted by ISRO and ONERA-CNES.

Upgradation and Expansion of Tele education project of Tripura (Phase I)

Under this project it has been planned to upgrade the existing SATCOM-based Tele-Education network in Tripura to internet based one with expansion to cover additional schools across the state. It has been funded by Govt. of Tripura under Plane of Action (PoA) project. The nodal agency is SCERT, Tripura and the duration of the project is three years. NESAC has prepared the project proposal, which has been approved by SCERT, and implementation is currently underway in line with the approved plan.

Operational Support to GSAT-29 Ground station cum HUB

The GSAT-29 HUB is fully operational at Guwahati, Assam on 24x7 basis. This HUB has been planned to be used to provide VSAT based internet in Ku

and Ka-Band. At present, the Ku band spectrum is being used to provide internet connectivity on commercial terms. More than 3000 nodes have been established. NESAC oversees the operation and management of the HUB and provides technical and logistical support as required.

NETRA project of ISRO

NESAC is providing necessary coordination and support for the establishment of the radar system under the Network for Space Objects Tracking and Analysis (NETRA) project of ISRO. Developmental work has been initiated on a plot of land measuring 67 acres acquired from APGCL, Government of Assam.



Plot of NETRA land Chandrapur, Assam

NavIC Ground Station at NESAC

The NavIC ground station with 11 m parabolic antenna system is fully operational at NESAC. All necessary support is being provided by NESAC for smooth running of the station.



MATRIS Station (of MCF) at NESAC

MCF Station at NESAC

The MATRIS (MCF Augmented Telemetry & Ranging Infrastructure Shillong) Station with 7.5 m antenna system is fully operational at NESAC for providing telemetry and ranging support to MCF ISRO. NESAC is providing all necessary support for the smooth operation of the station. A joint survey was also conducted recently with the MCF team for the augmentation of the MATRIS station with two (02) new antenna systems.

Electronics & Instrumentation Lab at NESAC

An Electronics and Instrumentation lab has been set up to support R&D activities of the centre. The lab currently has facilities for various mechatronics projects, prototype development and testing, Internet-of-Things (IoT) & Wireless Sensor Network (WSN) based technology development. It has High End systems for running various Electronic Computer Aided Design (ECAD) Software & other Mathematical Software. Six students have worked in the lab in 2024 for their various project work related to IoT & WSN technology development.

UAV Activities

NESAC has been actively involved in UAV technology development and its applications. The centre is well equipped with different types of UAVs (copter and VTOL Fixed wing) and sensors (RGB/Multi-spectral/Thermal/Hyperspectral/Lidar) for mapping and payload delivery activities. It is providing UAV remote sensing services on operational basis to different user groups across the NER and has completed 23 UAV surveys in the year 2024-2025.

Major UAV Applications at NESAC

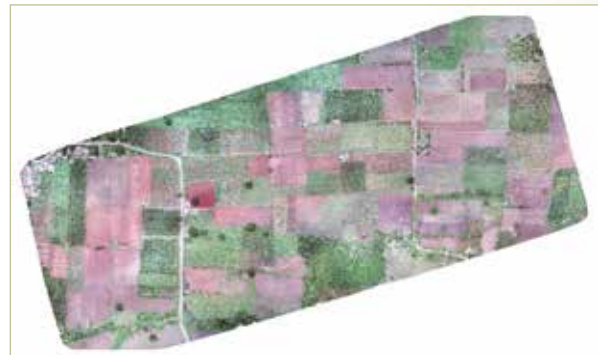
NESAC has completed 23 UAV surveys during the year. Some of the results from the above surveys are given below:



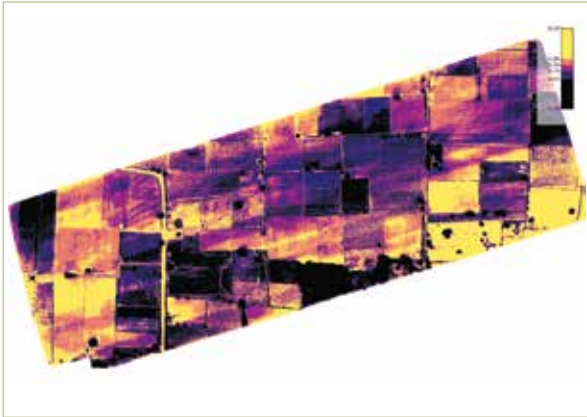
Orthomosaic RGB Data of Wah Umiam (PSP) Stage III HEP Site for NEEPCO



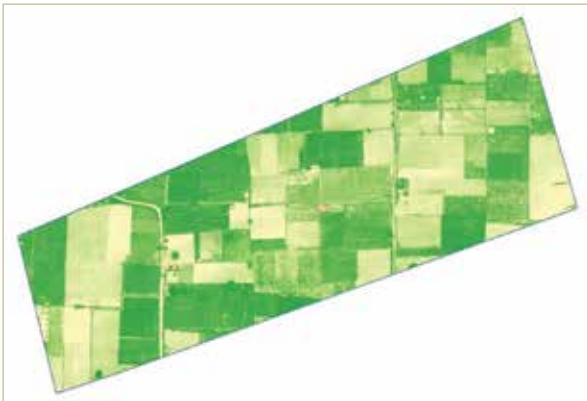
Lidar point cloud Colorized with RGB Data of Wah Umiam (PSP) Stage III HEP Site for NEEPCO



RGB Orthomosaic Image of Berambadi at Mysore for TRISHNA Mission



Thermal Image of Berambadi at Mysore for TRISHNA Mission



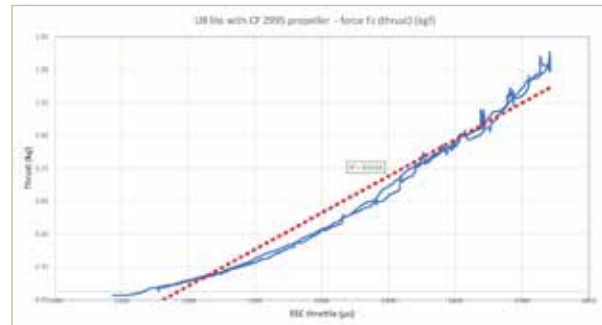
Multispectral Image (NDVI) of Berambadi at Mysore for TRISHNA Mission



RGB Orthomosaic Image of Nengmandalgre East Garo Hills for Directorate of Agriculture

Study of Electric Propulsion Systems for Small UAVs (<25 kg)

A comprehensive study of the electric propulsion system (motor-propeller) for small-category (<25 kg) Unmanned Aerial Vehicles (UAVs) was carried out, where the Thrust Stand 15 Pro was used to test ten sets of propellers ranging from 6-inch to 29-inch diameters. The test yielded data on thrust, torque, voltage, current, RPM, and ESC and motor temperature. The test results were analyzed to determine the thrust linearizing coefficient (R^2), a critical parameter for drone control and stability. The coefficient was found to be 0.97 for the U8Lite motor paired with the CF 2995 propeller and 0.92 for the MN 5212 motor paired with the CF 1851 propeller. CFD analysis of some propellers have been done in ANSYS Discovery and a detailed analysis in ANSYS Fluent is under progress.

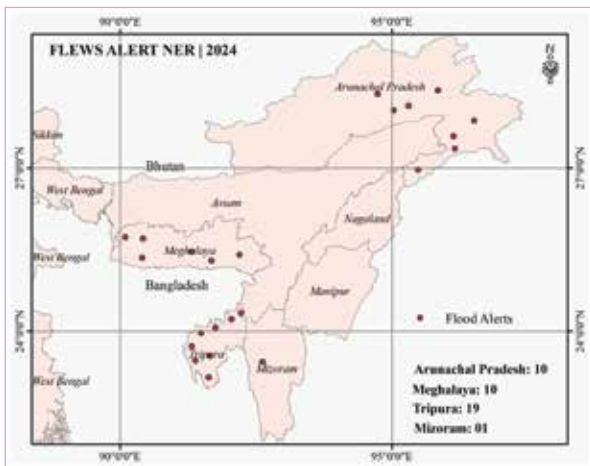


Thrust (kgf) vs ESC throttle (μ s) curve for U8 lite with CF 2995 propeller

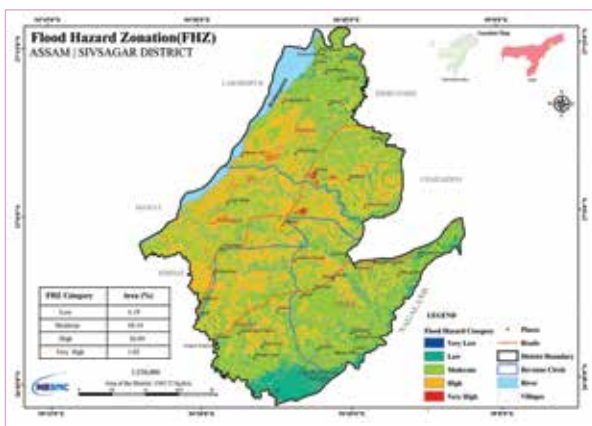


DISASTER MANAGEMENT SUPPORT ACTIVITIES (NER-DRR)

The North Eastern Regional Node for Disaster Risk Reduction (NER-DRR) at NESAC has been set up to enhance disaster management efforts in India's northeastern states, leveraging the power of geospatial technology. The NER-DRR node plays a crucial role in developing a detailed geospatial database designed to meet the unique disaster management needs of the region. To encourage greater involvement and ensure a collaborative approach, regular training sessions are held, equipping stakeholders with the skills to effectively use the geospatial data services and applications created under the NER-DRR initiative for disaster risk mitigation. NER-DRR has been actively engaged in a variety of disaster-related initiatives, which are outlined below:



Flood Alert (Pilot alerts) Location Map for NER

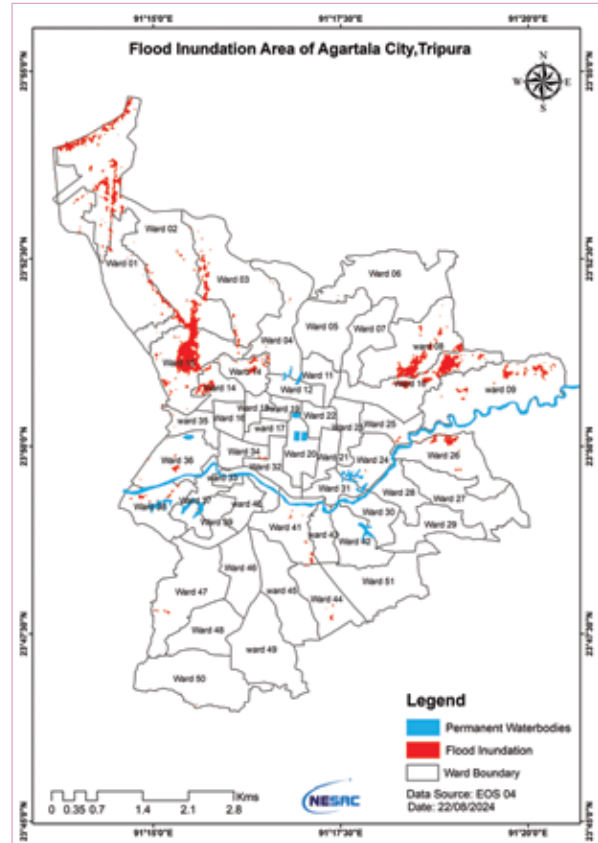


Flood Hazard Zonation Map for Sivsagar District, Assam

Space Based Emergency Support during Floods in Guwahati and Tripura

On August 05, 2024, a large part of Guwahati city was submerged in urban floods due to continuous heavy rain, resulting in the disruption of the normal life of the people. Accumulation of water was reported from almost all peripheral roads in the city, with people stranded in their vehicles for hours amid heavy traffic.

A report on flood inundation mapping of Guwahati Urban Area on August 5, 2024 using EOS 04 SAR satellite data has been submitted to Assam State Space Application Centre (ASSAC). In addition, a report on rainfall activity over Guwahati city and surrounding area for August 5, 2024 and land use changes in the catchment area has been submitted to assist in the evaluation of the urban flooding event which occurred over the Guwahati city.



Flood Inundation Map of Guwahati and its surrounding area (August 5, 2024)



Similarly, an initial report on flood inundation mapping of Tripura on August 21, 2024 has been submitted to Tripura Space Applications Centre and SDMA, Tripura. On further request from SDMA, Tripura, separate inundation maps were prepared for Gomati, Sepahijala, South Tripura, West Tripura districts along with Agartala for August 21 and August 22, 2024 respectively and submitted to the concerned authority. Based on the availability of satellite data, flood inundation maps were prepared till August 28, 2024 and submitted to the concerned department. In addition, daily weather monitoring report for Tripura during August 22-26, 2024 has also been submitted to SDMA, Tripura.

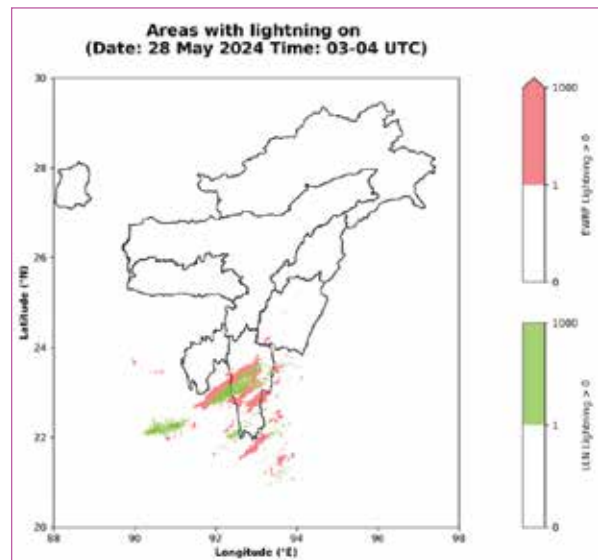
River Bank Erosion & Embankment breaches

Continuous river bank erosion in dynamic rivers like the Brahmaputra and many of its tributaries has a significant environmental and socio-economic impact on the region. Studies have been taken up to assess and estimate the river bank erosion and identify the patches vulnerable to continuous erosion. Satellite data are utilized to map year wise river bankline using Normalized Difference Water Index (NDWI) in GIS environment. In addition, change detection analysis was done in GIS platform for identifying banklines subjected to Erosion and Deposition. A study was carried out to estimate the river bank erosion in Assam during 2022 to 2024 and found 21832.72 ha of land was eroded by River Brahmaputra and other major tributaries where 19240.56 ha of land are eroded by Brahmaputra River. With correspondence to similar study carried out previously, 44 patches of bankline of Brahmaputra River experiencing continuous erosion since 2016 to 2024 has been identified. Further, Pre- and post-flood satellite images of 2024 were used to identify the embankment breach locations due to the floods that occurred in the year 2024. With both datasets, 7 breach locations were identified in 7 districts of Assam. The tabular details are given below: It is to be mentioned here that, some breaches might not be visible due to the limited spatial resolution

of open datasets, the absence of data during the event, and a lack of information on embankments.

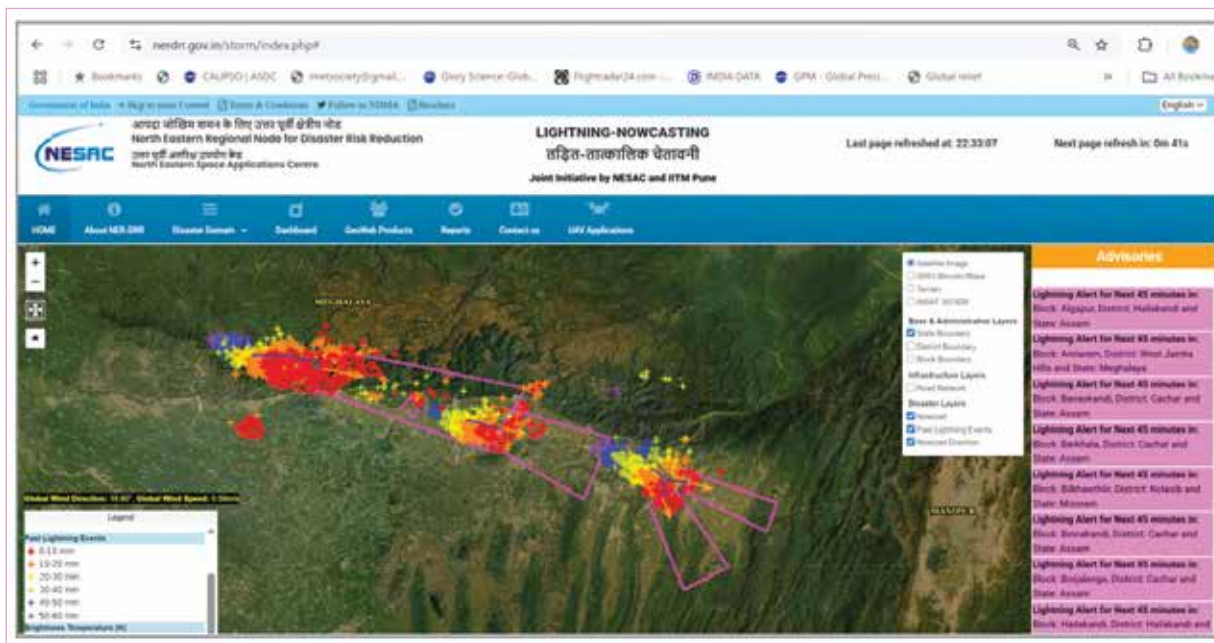
Lightning Early Warning System for NER

NESAC has developed a two-layer thunderstorm and lightning warning system. One of them is a tracking system that exploits the early lightning data from the convective clouds, that are detected by a ground based lightning detector network (established by Indian Institute of Tropical Meteorology (IITM), Pune). The tracking system is capable of providing village-level lightning early warning with a lead time of up to 45 minutes. The other is a numerical model based system, wherein the data from the above mentioned ground network is assimilated in the WRF-Elec (Weather Research and Forecasting - Elec) model, that offers an overall assessment of thunderstorms and lightning across the NER with a lead time of up to six hours.

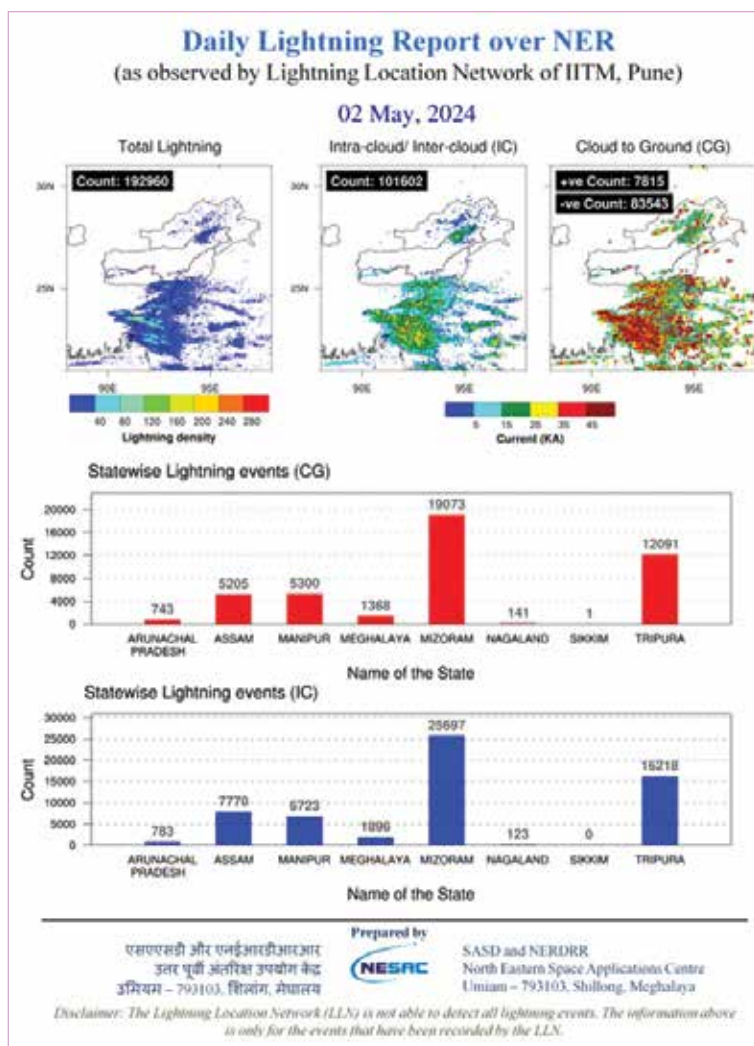


Comparison of WRF-ELEC model-based forecast (red) and IITM-ILLN based observation (Green)

During the pre-monsoon and monsoon season of 2024, both the model and tracking system were operationalised under the NER-DRR, delivering seamless forecasts. After the completion of both the pre-monsoon (March 2024 – October 2024), performance validation of the nowcasting services were conducted at various levels. Figure presents a case where the WRF-Elec model successfully forecasted lightning at the correct location with a lead time of three hours.



Demonstration of thunderstorm tracking and generated alert in NER-DRR portal



Lightning activity over NER of India on 2nd May, 2024

The tracking system showing the areas that are likely to be impacted by lightning with a lead time of 45 minutes is also shown in the figure. It was observed that the performance of the WRF-Elec model tended to saturate in severe cases, whereas the tracking system remained proactive during intense thunderstorms. Validation was carried out using reported fatalities and damages across the NER, revealing that the tracking system was able to generate alert in most of the cases with 79% accuracy for forecasts with a 45 minute lead time. The services were effectively used by the State Disaster Management Authorities of Assam, Meghalaya, and Tripura. The Assam State Disaster Management Authority used the alerts to send SMSs to the concerned officials at revenue circle level, for further necessary action down the line.

In addition, a daily lightning report is prepared for the NER region, providing information on spatial distribution of lightning, lightning



density, peak current, polarity of the lightning, and statewide lightning events (separately for the cloud to ground and inter-cloud lightning). The report is prepared using the data from the national network of lightning detectors operated by IITM, Pune. It has been observed that the highest lightning activity was recorded on May 2, 2024 in Mizoram and Tripura and on June 7 in Meghalaya and Assam. The adjacent figure illustrates the lightning activity across the NER region for 2nd May, 2024. The reports along with the archived data are available at www.nerdr.gov.in.

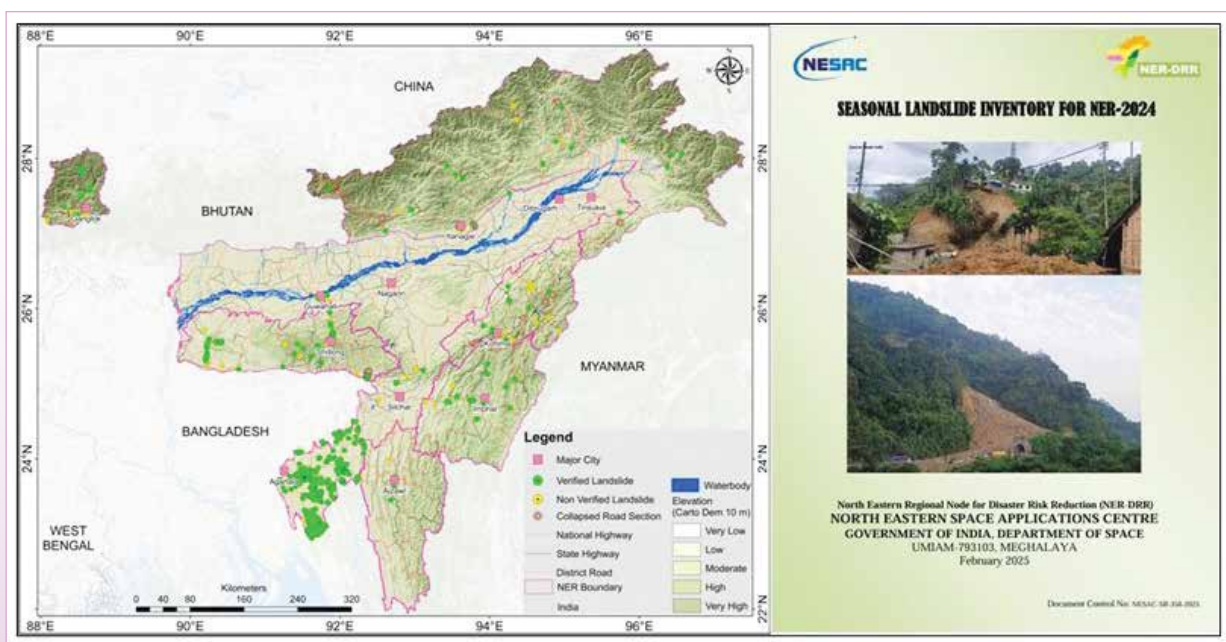
Seasonal Landslide Hazard Studies in the North Eastern Region (NER)

Seasonal Landslide Inventory, 2024: The landslide inventory under the NER-DRR program of NESAC is a dynamic and evolving effort, meticulously compiled and updated each year to document reported landslide occurrences across the North Eastern Region (NER) of India. Sourced primarily from newspapers and online media reports, this inventory is further validated through periodic field visits, and interpreting postdated satellite image to ensure accuracy. In 2024 alone, 1137 rainfall-triggered landslide incidents are mapped across various states, leading to significant disruptions to transportation, collapse

of roads, houses and tragic loss of life. A total of 98 casualties were reported, with Arunachal Pradesh accounting for 1, 10 from Assam, 5 from Manipur, 13 from Meghalaya, 38 from Mizoram, 7 from Nagaland, 13 from Sikkim and 11 from Tripura. However, this compilation may not encompass all landslides that occurred during the year. Both the documented landslide locations and the comprehensive report are accessible at <https://www.nerdr.gov.in/>.

Landslide Inventory along National Highways in NER:

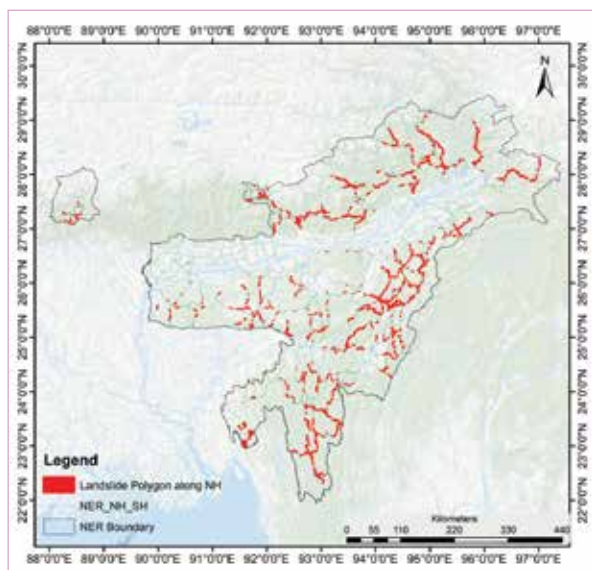
Temporal mapping of historical landslides along the National Highways of the NER was carried out using freely available optical images, such as Resourcesat-2 LISS IV MX and images available on the Google Earth platform, etc. High-resolution satellite imagery was utilized to delineate landslide-affected areas over a period of five years. The combined approach enabled the identification of persistent landslide-prone zones along critical highway corridors. The mapping effort offers valuable insights into the frequency, spatial distribution, and evolution of landslides in the region, aiding in the identification of vulnerable road sections. The compiled inventory will be an essential input for hazard assessment, infrastructure planning, and mitigation strategies



Seasonal Landslide Inventory for 2024



to reduce landslide risks along the major transportation routes in the NER.

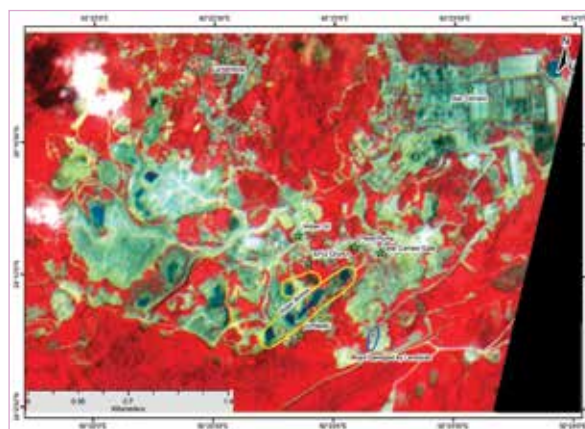


Landslide inventory along National Highways

Emergency Services for Landslide mitigation

During monsoon season, event-based support is provided as and when requested by concerned line departments of NER States. Some of the major events are as follows,

1. On June 15, 2024, a disastrous landslide struck, completely obliterating a section of the road along NH-6 near Lumshnong village in East Jaintia Hills, Meghalaya. It was a debris flow, and authorities informed that due to continuous water flow, traffic movement came to a complete halt for more than 24 hours. A thorough mapping exercise was conducted to evaluate the extent of damage and to identify potential sources of water. The analysis was conducted using cloud-free LISS-4 data of May 16, 2024, to assess the terrain conditions prior to the event. Since the adjacent area is limestone quarry so it may exhibit Karst Topography developed due to the chemical weathering of limestone coming in contact with water. The information, including affected road section and suspected sources of water, are shared with the Office of the District Commissioner, East Jaintia Hills, as an aid to response and mitigation efforts.

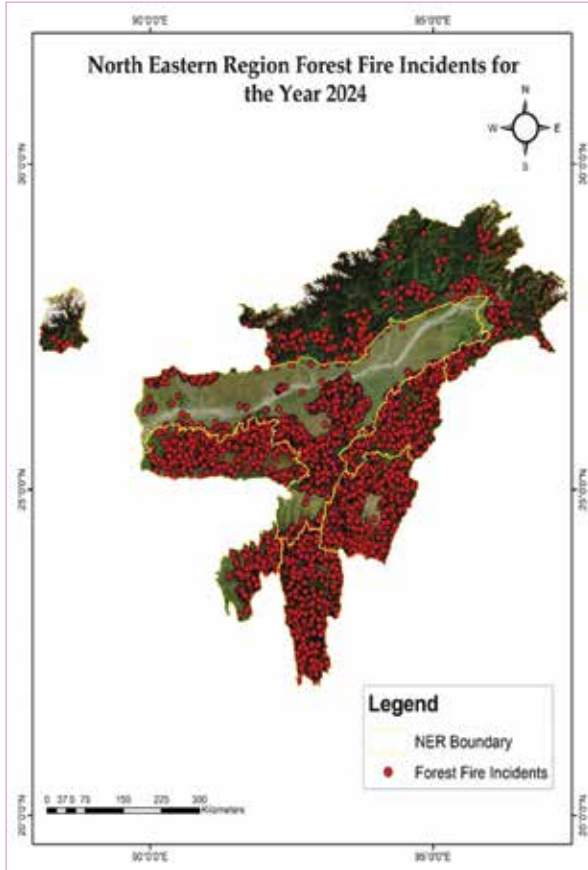


Landslide affected area near Lumshnong village
(background LISS IV MX image)

2. A landslide event took place near Kuliang Village, in East Jaintia Hills, Meghalaya on August 6th, 2024 and affected the traffic movement along NH 6. Due to unavailability of cloud free optical data immediately following the event Sentinel 1, GRD and SLC data are used to locate and derive information on affected areas to provide immediate information to the concerned line department. Sentinel 1 data of June 19th and August 6th 2024 are used for analysis.
3. For the extreme event in Tripura, which occurred between August 19-24, 2024 and resulted in both floods and landslides, almost throughout the entire state, Sentinel-1 SAR data was analyzed to detect changes in phase, coherence, and intensity, aiding in potential landslide identification. The study aimed to assess the impact of heavy rainfall on slope stability and detect possible landslides triggered by the event. In addition, where cloud-free conditions permitted, pre- and post-event optical imagery from LISS-4 and Sentinel-2 was processed to enhance landslide detection efforts. This multi-sensor approach provided a comprehensive assessment of the probable affected areas and the result is validated with ground data shared by SDMA, Tripura.

Forest Fire Assessments for North Eastern States of India

A total of 38,649 forest fire incidents were recorded in Northeast India for the year 2024. The spatial distribution of these incidents across the region is shown in the figure below.



Forest Fire Incidents over North Eastern States for the year 2024

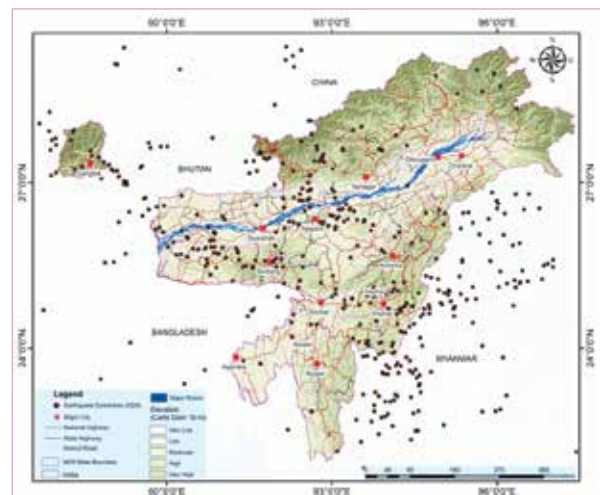
Forest fire burned area analysis is being carried out to understand the extent of damage. In Meghalaya, 2,264.88 sq. km of forest was affected by fire in 2024, which accounts to 13% of the state's total forest cover.

This assessment was carried out using Google Earth Engine, a cloud-based geospatial analysis platform, enabling a comprehensive evaluation of burnt areas for informed decision-making and proactive forest fire management.

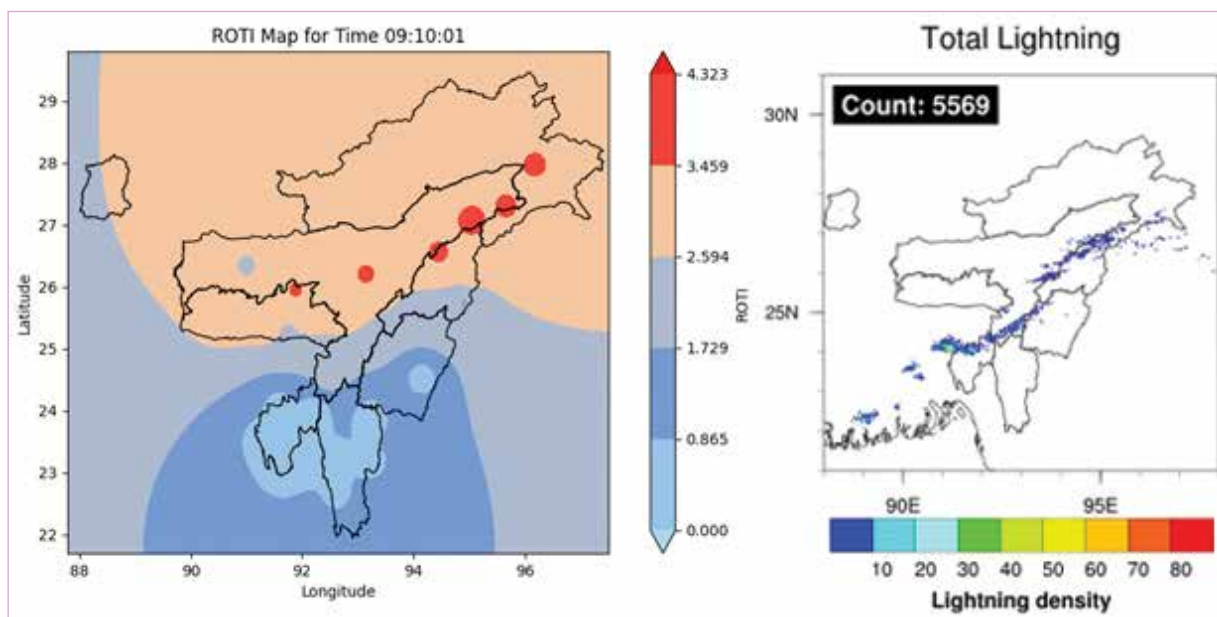
Earthquake Cataloguing for NER

As part of the NER-DRR activities, an earthquake catalogue for 2024 has been compiled,

documenting 428 earthquake events within the NER and its vicinity (87°-98°E, 21°-30°N), sourced from the National Center for Seismology (NCS), United States Geological Survey (USGS), and local reports. No major damage or casualties were reported. The state-wise distribution includes 35 earthquakes in Arunachal Pradesh, 78 in Assam, 45 in Manipur, 47 in Meghalaya, 2 in Mizoram, 10 in Nagaland, 9 in Sikkim, 3 in Tripura, and 199 in the NER-adjacent region. By magnitude, 144 events were below Mw 3, 244 were between Mw 3-4, 37 were between Mw 4-5, and 3 were between Mw 5-6, all of which occurred in the Myanmar region bordering the NER. The catalogue includes details on the date, time, location, depth, and magnitude of each earthquake. The distributions of earthquakes occurred in NER during 2024 are shown in the below figure. An earthquake of magnitude 5.0 occurred at 02:25:40 Hr IST in the Assam's Morigaon district, India, with epicentre at Lat: 26.28°N, Long: 92.24°E and shallow focal depth of 16 km. Preliminary investigation of ionosphere variation before the earthquake suggests Total Electron Content anomaly on February 18, 2025 from time series Global Positioning System (GPS) data at Udalgudi, Assam. It was seen that a considerable amount of lightning has also occurred on the same day. We collected lightning locations and investigated TEC Rate of change Index (ROTI) to see if lightning locations match with the anomalous zone. The left figure below shows the TEC ROTI map at 09:10:01 UTC and right image shows lightning locations on February 18,



Earthquakes in NER India and adjoining area (2024)



TTEC ROTI Variations and lightning locations(left): ROTI variations on 18-02-2025 at 09:10:10 UTC, (Right): Total Lightning locations on 18-02-2025(Source : IITM Network)

2025.The analysis suggested TEC anomaly due to earthquake and lightning event on the same day.

NER-DRR Decision Support System for Disaster and Emergency Management in NER

The NER-DRR Geoportal is a unified web based platform designed and developed to support disaster management across the NER. It serves as a comprehensive repository of multi-scale geospatial data tailored for disaster risk reduction, integrating advanced decision support systems. With real-time data updates and powerful geospatial analytical tools, the geoportal helps disaster management officials with critical insights for effective emergency response and preparedness. Now accessible at <https://www.nerdr.gov.in>, the NER-DRR geoportal acts as a one-stop gateway for accessing disaster-specific geospatial data, analytical tools, and application services, strengthening resilience and proactive disaster mitigation efforts in the region. The geoportal now has nine independent sub-portals under four major operational services, such as Hydrological Services, Meteorological Services, Geological Services, Forest Fire Services. All the portals have dynamic geospatial datasets which are fed during its respective seasons. Hydrological Services include flood inundation monitoring

and early warning systems, helping predict and manage flood risks. Meteorological Services offer Numerical Weather Prediction based weather forecasting, thunderstorm/lightning nowcasting, providing real-time updates for weather related hazards. Furthermore, custom APIs have been developed to provide real-time ground data based lightning alerts at the block level, enhancing disaster preparedness through precise, location-specific notifications. Additionally, a dedicated webpage has been designed to provide real-time lightning tracking and visualizations, aiding in thunderstorm monitoring and analysis. Geological Services cover earthquake and landslide information, assisting in preparedness and

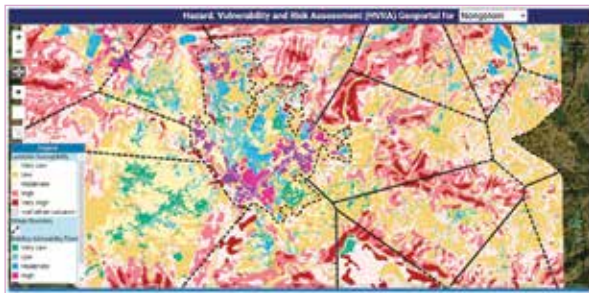


NER-DRR Geoportal showing major DRR services including events and alerts



response to these events for systematic inventory and its analysis. Furthermore, an interactive web platform has been integrated to visualize ionospheric Total Electron Content (TEC) data, along with its metadata, offering researchers and stakeholders' easy access to visualize TEC changes over NER. Forest-Fire Services monitor Forest fires, offering early detection to mitigate fire risks by providing various value-added services.

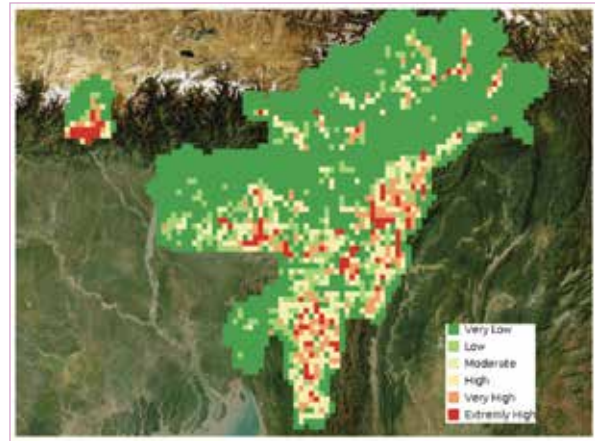
All these disaster related alerts for floods and lightning as well as value-added alerts for forest fire are disseminated in operational mode, while the current and historical occurrences of landslides, earthquakes, embankment breach locations and forest fires are systematically categorized within the NER-DRR portal. Together, all these modules enable comprehensive disaster monitoring, supporting timely alerts and informed decision-making for the region.



HRVA Geoportal for Nongstoin Town showing Landslide Susceptibility

For disaster risk reduction, specialized interactive web portals and geo-spatial tools have been developed for Hazard, Vulnerability, and Risk Assessment (HVRA) in selected urban areas of NER, focusing on landslides, floods, and lightning/thunderstorms. These platforms enable spatial analysis and data-driven decision-making for disaster management. Advanced Decision Support Systems (DSS) have been implemented for landslide risk assessment, offering proximity-based analysis and visualization tools.

Additionally, efforts are underway to develop real-time landslide prediction models, integrating continuous monitoring capabilities. A dedicated DSS system has been launched to provide timely, location-specific landslide alerts.

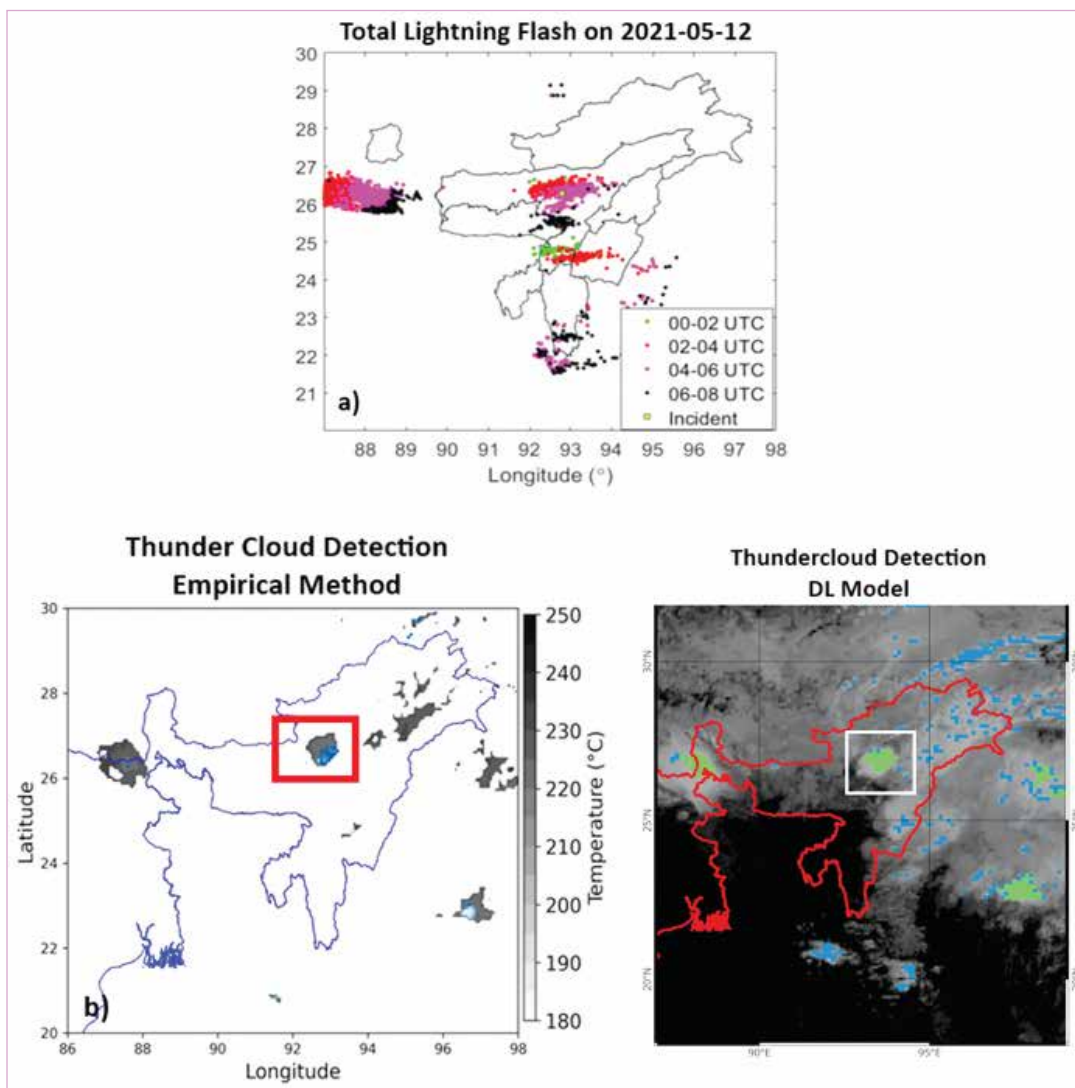


Predicted Landslide Grids

Comparing Deep Learning and Empirical Approaches for INSAT-3D/3DR Thunderstorm Detection:

The NER of India faces the wrath of thunderstorms every year mostly during the pre-monsoon season. NESAC has been working on thunderstorm early detection since 2014 under the NER-DRR project using methods combining the strength of both NWP models as well as conventional observations from satellite and radar. However, it is observed that although NWP models play an important role in the early warning of weather events, due to spin-up issues during the first 0–6 hours of forecast, the model cannot predict events that occur during these early hours. Once the storm initiates, tracking and monitoring its features within the initial 0-6 hours is crucial to minimize the related damage via increasing warning lead times. In this study, two methods have been used to identify thunderstorm potential areas using INSAT data. Algorithms using spectral band differences (TIR, MIR, WV) from INSAT-3D/3DR have been employed to identify rapidly developing convective clouds, indicating potential thunderstorms and two deep learning (DL) models, U-Net and Mask R-CNN, have been configured with INSAT-3D/3DR data for detecting convective clouds. Both the methods show significant potential to detect unstable convective zones. But the strength of DL models is found more important for isolated thunderstorm event.

The figure above presents a comparison of the



Lightning Flash during May 12, 2021 between 00 UTC to 08 UTC (a); Convective cloud detection using Empirical Method (b) and DL (MaskRCNN) model (c)

two methods based on their performance during a lightning event that occurred on May 12, 2021, between 0300 and 0400 UTC, resulting in the death of 18 elephants in Nagaon District, Assam. The empirical method successfully identified the convection zone as represented by a red box in the above figure but also overestimated certain areas in eastern Assam. In contrast, the DL model accurately detected the region by effectively eliminating the false alarms produced by the empirical method and it may be attributed to the fact that Deep learning models effectively learn subtle variations in brightness temperature (BT) that reflect cloud morphology and dynamics more accurately.

Preliminary Analysis of Category-B Risk Glacial Lake in Arunachal Pradesh, India

When a glacial lake breaches, it releases a massive volume of water, causing devastating downstream flooding that can claim lives, destroy infrastructure, and displace communities. Understanding which lakes pose the greatest threat to nearby settlements is crucial for effective disaster preparedness. Recognizing this urgency, the NDMA, in collaboration with technical and research institutions under the Government of India, has identified 188 high-risk glacial lakes in the Indian Himalayan Region (IHR). Of these, 141 have been categorized into three risk levels A, B, C and uncategorized based on assessments by



various institutions. Notably, 27 of these high-risk lakes are located in Arunachal Pradesh, posing a significant threat of Glacial Lake Outburst Floods (GLOFs).

This initiative focuses on creating an inventory of nine high-risk glacial lakes in Arunachal Pradesh using remote sensing and GIS. The lake boundary is an important parameter for monitoring the glacial lakes. This parameter indicates the extent of the water spread area. Thus, prior to monitoring

of the glacial lakes, the delineation of the lake's boundary is a crucial step. In this exercise, the boundary of the glacial lakes was delineated by visual image interpretation. Through satellite imagery from Sentinel-2A/2B and building footprints from Microsoft, built-up areas downstream are identified by analyzing spectral signatures. GIS tools are then used to measure the distances between these settlements and the glacial lakes, providing valuable insights into potential threats.

| SI No. | Temporary ID | District | Area (Ha) | Approximate Distance to the Nearest Settlement Downstream (km) |
|--------|--------------|---------------|-----------|--|
| 1 | NDMA-040 | Tawang | 88.23 | 35 |
| 2 | NDMA-490 | Tawang | 4.1 | 10 |
| 3 | NDMA-107 | Tawang | 13.37 | 7.1 |
| 4 | NDMA-054 | Anjaw | 63.75 | 16 |
| 5 | NDMA-055 | Anjaw | 52.7 | 35 |
| 6 | NDMA042 | KurungKumey | 55 | 75 |
| 7 | NDMA-111 | Upper Siang | 48.5 | 45 |
| 8 | NDMA-049 | Dibang Valley | 56.54 | 45 |
| 9 | NDMA-051 | Dibang Valley | 70.04 | 35 |



OUTREACH & CAPACITY BUILDING

Training and workshop

NESAC has organised several outreach and capacity building programs to maximise the use of geospatial information for planning and developmental activities in the North Eastern Region. The Basics of Remote Sensing, Advances in UAV Technology, and Geospatial Applications in all the thematic areas, including Agriculture & Soil, Forestry & Ecology, Water Resources, Geosciences and Urban and Regional Planning, are covered in seven regular two-week courses. In 2024–2025, NESAC hosted 23 training sessions, including both regular and customised courses. These programs ranged in duration from one to two weeks to one to four days. There were 671 attendees in all, 370 of whom enrolled in the short courses and 301 in the longer ones. Of the 23 programs, 16 were specially designed courses for specific user departments, while 7 were regular courses spanning a variety of thematic areas.

NESAC conducts 5th edition of Two Week short course on “ Applications of RS & GIS in Agriculture and Allied Areas”

NESAC successfully conducted the fifth edition of the two-week short course on “Applications of Remote Sensing & GIS in Agriculture and Allied Areas” during August 19–30, 2024. The course was attended by 28 participants, which included officials from state agriculture, horticulture and fishery departments, faculty members from colleges and universities, scientists, subject matter specialists, research scholars and private startups. During the period of the course participants engaged in 15 hours of theory classes and 25 hours of practical sessions and 16 hours for project work. Facility visits were arranged to ISTRAC Facility, UAV lab and Doppler Weather Radar station, Sohra as part of the course. The participants were divided into seven groups, each assigned a distinct mini-project focusing on key application areas of agriculture and allied sectors using geospatial technology.



Two weeks course on “Remote Sensing and GIS Applications in Forestry and Ecology”

Two weeks short course on “Remote Sensing and GIS Applications in Forestry and Ecology” was conducted by the Forestry and Ecology Division (FED), NESAC during December 02-13, 2024 at NESAC Outreach Facility. A total of 27 participants attended the course which included officials from Forest departments of NER, faculties from government institutes, professionals from private companies and research scholars. The course curriculum included fundamental concepts of remote sensing and GIS, GPS and hands-on training with remote sensing data and relevant software. The specific topics covered in the course were forest cover and density mapping, growing stock and biomass assessment, wildlife habitat evaluation, species distribution modelling, forest fire monitoring and burnt area assessment. A brief introduction to advance remote sensing applications such as UAV, hyperspectral and microwave remote sensing were imparted to the participants during the training. To provide practical exposure on familiarization of the satellite images and their real-world applications, a field visit to Sohra was conducted on December 7, 2024. Six mini



projects (group-wise) were carried out by the participants.

Two-weeks course on “Applications of Remote Sensing and GIS in Water Resources and Flood Management

NESAC successfully conducted a two-weeks training on “Applications of Remote Sensing and GIS in Water Resources and Flood Management” during November 18-29, 2024 at the NESAC Outreach Facility. In total, 18 participants from government departments and academia from different parts of India attended the course. The course included 14 theory classes and 10 practical sessions, covering topics from basic to advanced levels such as basic of remote sensing and GIS, hydrological modeling, hydrodynamic modeling, dam break modeling, Watershed prioritization and basics of soil erosion estimation, Flood Early Warning System, climate change and its impact, LiDAR and microwave remote sensing. The use of HEC-HMS, QGIS, HEC-RAS, SNAP and GEE was also introduced in the practical sessions.



Two-week course on UAV Remote Sensing: Technological Advances and Applications

A two-week course on “UAV Remote Sensing Technological Advances and Applications” was conducted as part of its capacity-building and outreach initiative. There were 16 participants in the course, who registered through the online portal. Jointly organized by the Geoinformatics and IT Division (GID) and the SATCOM and UAV Division (SUD), the course aimed to deepen understanding of UAV principles, components,

and their applications in remote sensing. The curriculum was comprehensive, covering the principles and components of UAVs, the various remote sensors used, and effective flight planning for data acquisition tailored to a range of remote sensing applications. Participants learned about different data processing techniques that enable the creation of high-resolution data products.



NESAC conducts two weeks training under AMRUT 2.0

North Eastern Space Applications Centre (NESAC), in collaboration with the Town and Country Planning Organisation (TCPO), Ministry of Housing and Urban Affairs (MOHUA), Government of India, successfully conducted a two-weeks training on “Formulation of GIS Based Master Plans (Tier-II) under AMRUT 2.0 Capacity Building sub-scheme Initiation” for Middle-Level Officials at the NESAC Outreach Facility during September 17-27, 2024. The training covered a wide array of topics, including an overview of government initiatives in geospatial technology-based planning, fundamentals of remote sensing and geographical information system, satellite image interpretation and procurement, survey techniques and navigation systems, mobile applications, GIS analysis, and advanced technologies such as UAVs; urban sprawl, growth modelling, creation of Geodatabase, and preparation of GIS Based Master Plans, followed by practical sessions on each topic. A total of 28 officials from six states, namely Mizoram, Manipur, Himachal Pradesh, Andhra Pradesh, Tamil Nadu, and Kerala participated in the training.



One-week course on “Basics of Geo Web Services & Spatial Data Analytics Platform using open-source tools”

NESAC successfully conducted one-week training on “Basics of Geo Web Services & Spatial Data Analytics Platform using open-source tools” during January 20-24, 2025 at the NESAC Outreach Facility. In total, 18 participants from government departments, academia and industries from different parts of India attended the course. The course comprised 11 hours of theoretical sessions and 13 hours of practical sessions. It covered foundational concepts in remote sensing and GIS, introduced the open-source technology stack for web GIS and mobile application development, and focused on utilizing open-source tools to create dashboards and mobile applications. The course concluded with an overview of advanced topics on artificial intelligence and cloud computing.



NESAC Conducts One Week Online Course on SATCOM & SATNAV

The fourth edition of the online Course on Satellite Communication & Satellite Navigation:

Technologies & Applications was conducted at NESAC during September 23rd-27th, 2024. A total of 135 participants registered for the course mainly from NITs and other Engineering Colleges. A total of 13 lectures were delivered by Scientists of SUD, NESAC as well as thematic experts from Space Applications Centre (SAC), Ahmedabad, Satcom Program Office (SATCOM PO), ISRO HQ & MCF, ISRO. 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.



One Day Training on Utilization of North Eastern Spatial Data Repository (NeSDR) Platform for Meghalaya Basin Development Authority

A one day training programme on the Utilization of North Eastern Spatial Data Repository (NeSDR) Platform was organized for the Meghalaya Basin Development Authority (MBDA), Shillong on 6th May, 2024. It covered lectures and hands-on exercises on the NeSDR and Bhoonidhi portals followed by a special session on code walkthrough. Officials attended the training programme held at NESAC Outreach facility.





Training Program for Women in geospatial Technology, "Satellite in Your Hand"

NESAC conducted a two-day Capacity-Building Training Program for Women in geospatial Technology, "Satellite in Your Hand," during May 30-31, 2024, in collaboration with RambhauMhalgiPrabodhini, and Earth Sight Foundation and the initiative supported by the National Commission for Women. Seventy two women working in government offices in various departments, such as Agriculture, Fishery, Soil water conservation, Water resources, Forestry, Urban development and also working in NGOs that deal with the environment, disaster management, etc. participated in the program. Smt. Delina Khongdup, Member, National Commission for Women graced the occasion as the Chief Guest. The program was conducted via hands-on mode on how to use the many available online platforms such as SchoolGIS and Gram Manchitra. ISRO/DoS portals including Bhoonidhi, Bhuvan and NeSDR were also demonstrated.



NESAC conducts a two weeks training course on 'Applications of Remote Sensing and GIS in Sericulture' for CSB Scientists

NESAC successfully conducted a two-week training on 'Applications of Remote Sensing and GIS in Sericulture' for Central Silk Board (CSB) scientists from June 24th to July 5th, 2024. A total of 28 Scientists from various CSB organizations from all over the country participated in the CSB sponsored training. The program featured lectures, practical sessions, and field visits. The course included 13 theory classes and 14 practical sessions, covering topics from basic to advanced levels covering multispectral, microwave, hyperspectral and UAV Remote Sensing. They

were also assigned six Mini projects related to sericulture, which they completed within the course duration.



Basic course on Remote Sensing & GIS Technologies and Applications conducted for CAPF & IB Officials

A one week Basic course on Remote Sensing & GIS Technologies and Applications for Central Armed Police force (CAPF) & Intelligence Bureau (IB) officials sponsored by Initiatives Identification and Execution Cell (NIIE), Force Head Quarters, Border Security Force (FHQ BSF) was organised during 22nd to 26th July 2024. The programme was attended by one Commandant & four Assistant Commandants from Central Reserve police Force (CRPF) and five Constables from Indo-Tibetan Border Police (ITBP). Basic theory on the principles of remote sensing and GIS, GPS, satellite data downloading, image processing and various applications were covered in the course with hands on practice session for the benefit of the trainee officers.



One day training program on "Forest Fire Prevention and Mitigation Strategies" for NDRF

One day orientation program was held at NESAC on 17th March 2025 for a group of 50

NDRF personnel on Forest fire prevention and mitigation as part of the training program at CASFOS, Byrnihat, Meghalaya. During the program a facility visit was arranged at NESAC with special focus on IRNSS NavIC, drone-based monitoring and NERDRR facility. Dr Kasturi Chakraborty, Head FED, NESAC and Project Manager on Forest fire under NERDRR gave a detailed presentation on Remote sensing-based Forest fire monitoring.



NESAC hosted the 4th edition of the YUVIKA Program

NESAC hosted the fourth edition of the YUva VigyaniKaryakram (YUVIKA) or the Young Scientist Program of ISRO during 13th-24th May, 2024 along with six other major centres of ISRO. Ten students of class IX and X standards from each State and Union Territory (UT) were selected for the programme based on a well defined criteria. NESAC hosted the program for the 44 students from Arunachal Pradesh, Manipur, Meghalaya, Mizoram, and Nagaland. The program was inaugurated virtually from URSC, Bengaluru by Shri S Somanath, Chairman ISRO on 13th May, 2024. Chairman, ISRO also interacted with the students across all ISRO centres hosting the YUVIKA program. The program had lectures, hands on sessions, visits to facilities and other places of interest, project work, etc. Yoga sessions and indoor sports were also arranged for the students. The program covered many interesting activities like Model Rocket making and launching, Telescope assembly, robotics and robot assembly, interactive games, etc. in addition to lectures on different interesting topics covering Astronomy, Astrophysics, Cosmology, Chandrayaan, Mangalyaan, Gaganyaan, different Space Applications, etc. In addition, live

demonstrations on sounding rocket launching, live session from Antarctica were arranged to make the program a memorable one for the young scientists. The major attraction of the program was an online interactive session with the selected Indian Astronauts. NESAC also arranged a live lecture cum demonstration on UAV technology and demonstration. Students were also taken to Regional Science Centre and Planetarium at Guwahati, Eastern Air Command of Indian Air Force in Shillong, Don Bosco Museum, etc.



NESAC conducts two-week basic course on 'Space technology applications to study climate change and its impacts'

NESAC conducted a two-week basic course on 'Space Technology Applications to Study Climate Change and Its Impacts' from 24th February to 7th March 2025 at the NESAC Outreach Facility. Nine participants from across India attended. The course began with an inaugural lecture by Dr. S. P. Aggarwal, Director, NESAC, and other experts covered topics such as regional climate modelling, satellite precipitation retrieval, paleoclimatology, cryospheric studies, and Python-based data analysis.





Basic course on Remote sensing and GIS

Two week course on fundamentals of remote sensing and GIS using open source software was conducted during 10th – 21st February 2025. Course module includes open source geospatial software for mapping, visualization and analysis with introduction to python for geospatial data, demonstration of Geoportals, exposure to advance technique like microwave, UAV and hyperspectral remote sensing.



Workshop/Exhibition/Public Awareness NESAC User Interaction Meet (NeUIM-2024)

The 2nd Edition of the NESAC User Interaction Meet (NEUIM) took place on September 5-6, 2024 via hybrid mode. NeUIM 2024 focused on utilizing Space Science and Technology to boost societal benefits, improve governance, enhance natural resource management, provide disaster management support, and foster outreach and networking with stakeholders, academia, and industry. The inaugural event on 5th Sept, 2024 commenced with a lighting of the lamp followed by a welcome note by Dr. S.P. Aggarwal, Director, NESAC. The inaugural program was chaired by Dr. R. R. Navalgund, former Director of SAC and NRSC as Chief Guest. The event was honored by the presence of Shri Shantanu Bhatawdekar, Scientific Secretary, ISRO, and Dr. Prakash Chauhan, Director, NRSC as the Guest of Honor via virtual mode. At NeUIM-2024, about 170 participants attended in person, while more than 1,000 tuned in virtually through video

conferencing and YouTube streaming. The event featured 38 speakers representing NESAC/ISRO, various state and central departments, academic institutions, and industries, who delivered valuable insights during the two-day program.



Two days workshop on Space Technology in Disaster Risk Management at NESAC

NESAC jointly with National Remote Sensing Centre (NRSC), Hyderabad and National Institute of Disaster Management (NIDM), Delhi organized a two-days workshop on “Space Technology in Disaster Risk Management” at NESAC, Umiyam during 27-28 May, 2024. The inaugural session of the workshop was graced by Dr. Prakash Chauhan, Director, NRSC as the Chief Guest and by Dr. Prabhakar Rai, Secretary cum Director, Sikkim SDMA, and Shri Safi Ahsan Rizvi, Advisor (Mitigation), NDMA as the Guests of Honour. The workshop was organised to create awareness about the role of space technology in disaster risk management and to bring synergy among the decision makers, disaster management officials, stake holders, and researchers in the northeastern and eastern region of India. More than 60 participants from different departments and institutions such as State/District Disaster Management Authority, Water Resource Department, Brahmaputra Board, Geological Survey of India, State Remote Sensing Centres, planning department, IITs, NITs, other state Universities from 8 NE states, West Bengal and Odisha took part in the workshop. The workshop had experts from renowned institutions such as NEIST, NIDM, ISRO, NRSC, IIRS, IIT, CROPC including NESAC offering participants a valuable opportunity to gain insights into the effective utilization of geospatial technology for disaster

risk reduction and develop a comprehensive understanding of this important topic.



Celebration of National Space Day (NSpD)-2024 by NESAC

India had successfully landed its Chandrayaan-3 Vikram lander on the lunar South Polar Region on August 23, 2023. To commemorate this feat, August 23rd has been declared as National Space Day (NSpD) by the Government of India. Department of Space is extensively celebrating the 1st NSpD across the country. The theme selected for NSpD this year is “Touching Lives while Touching the Moon: India’s Space Saga”. North Eastern Space Applications Centre (NESAC) has been identified as the Lead Centre for celebrating NSpD in all the 8 North Eastern States and West Bengal. NSpD was celebrated at Nongpho (Meghalaya), Kohima (Nagaland), Imphal (Manipur), Kolkata (West Bengal), Itanagar (Arunachal Pradesh), Siliguri (West Bengal), Gangtok (Sikkim), Aizawl (Mizoram), Dibrugarh (Assam), Agartala (Tripura) and Silchar (Assam) during 12th July to 12th August 2024. The daylong celebration of NSpD covered a talk on “Indian Space Programmes with special emphasis on Moon Missions”, another talk on “Space applications for Societal Benefit”, exhibition on Indian Space Missions & Space on Wheels Bus and audio visual shows. A quiz competition was also conducted among the participating schools. One day Zonal Event has been organized at Guwahati (Assam) on August 16, 2024. Around 1000 participants representing Scientists from ISRO/Dept. of Space, Head of Premier Academic Institutions of NER, Executives of Industries working in the Space Applications, Start Ups and students has attended the programme.

National Space Day (NSpD) in Meghalaya

NSpD for the state of Meghalaya was celebrated on July 12, 2024 at Nongpoh, Ri Bhoi. The programme was graced by Dr. Joram Beda, Commissioner & Secretary (Planning), Govt. of Meghalaya as the Chief Guest and attended by Deputy Commissioner of Ri Bhoi District, Director, NESAC. Around 475 students representing 14 schools and 2 colleges of Ri Bhoi participated in the programme.



Director, NESAC addressing the students at Nongpoh

National Space Day (NSpD) in Nagaland

NESAC in collaboration with the Nagaland Geographic Information System & Remote Sensing Centre (NGISRSC) celebrated the NSpD at Kohima, Nagaland on July 16, 2024. The event was graced by Principal Secretary and Development Commissioner R. Ramakrishnan, IAS, as the Chief Guest. Around 150 students from various schools of Kohima participated in the event.



Chief Guest along with other delegates at Kohima

National Space Day (NSpD) in Manipur

NSpD for the state of Manipur was celebrated on July 19, 2024 at Imphal in collaboration with the Manipur Science and Technological Council



(MASTEC) and National Institute of Electronics and Information Technology (NIELIT). The event was graced by Th. Biswajit Singh, Minister for Science & Technology, Government of Manipur, as the Chief Guest. Around 220 students representing 54 schools across the state along with faculties of NELIT and students attended the programme.



Chief Guest addressing the students at Imphal

National Space Day (NSpD) in West Bengal (Kolkata)

Regional Remote Sensing Centre- East (RRSC-East), Indian Space Research Organization (ISRO), Kolkata in collaboration with NESAC celebrated NSpD and National Council of Science Museums (NCSM), Ministry of Culture, Govt. of India at Science City, Kolkata, on July 24, 2024. Dr. Sumit Som, Director, Variable Energy Cyclotron Centre, Dept. of Atomic Energy, Govt. of India, Kolkata, was the Chief Guest of the event. More than 300 students representing 10 schools in and around Kolkata and other districts participated in the programme.



Chief Guest along addressing the students at Kolkata

National Space Day (NSpD) in West Bengal (Siliguri)

NSpD was celebrated at Siliguri, West Bengal on July 26, 2024. The event was organized jointly

by Siliguri Institute of Technology (SIT), Siliguri & NESAC with support from RRSC-East and ISRO HQ. Dr. Buddhadev Sau, Former Vice Chancellor of Jadavpur University, Kolkata was the Chief Guest of the programme. More than 200 students from 22 schools in and around Siliguri attended the programme.



Delegates & Students celebrating NSpD at Siliguri

National Space Day (NSpD) in Arunachal Pradesh

NESAC and Arunachal Pradesh Space Application Centre (APSAC) jointly organized NSpD on July 25, 2024 at Itanagar. The programme was graced by Ms. Sumedha Yadav, Secretary (Science & Technology), Govt. of Arunachal Pradesh as the Chief Guest and was attended by around 180 students representing 16 schools of Itanagar Capital Region.



Students celebrating NSpD at Itanagar

National Space Day (NSpD) in Sikkim

NSpD for the state of Sikkim was celebrated on July 29, 2024 at Gangtok. The event was jointly organized by the Sikkim State Council of Science and Technological Council (SSCS&T) and NESAC with support from ISRO HQ. Dr Sandeep Tambe, Secretary (Science & Technology), Government of Sikkim, was the Chief Guest of the event.



Around 129 students representing 20 schools across the state have participated in the event.



Students attending the event at Gangtok

National Space Day (NSpD) in Assam (Dibrugarh)

NSpD at Dibrugarh, Assam was celebrated on August 08, 2024. The event was jointly organized by Dibrugarh Hanumanbax Surajmall Kanoi (DHSK) College and NESAC with support from ISRO HQ. Dr. Jiten Hazarika, Vice Chancellor of Dibrugarh University was the Chief Guest of the event. Around 400 students representing 25 nearby schools/colleges have participated in the event.



Felicitation of the delegates at Dibrugarh

National Space Day (NSpD) in Mizoram

NSpD for the state of Mizoram was celebrated at Aizawl on August 06, 2024. The event was jointly organized by Mizoram remote Sensing Application Centre (MIRSAC) and NESAC with support from ISRO HQ. Dr. Vanlalhlana, Hon'ble Minister of School Education, Govt. of Mizoram was the Chief Guest of the event. Around 150 students representing 25 schools across the state have participated in the event.



Chief Guest along with other delegates at Aizawl

National Space Day (NSpD) in Tripura

Two events were organized at Agartala to celebrate the NSpD for the state of Tripura during August 09-10, 2024. The first event was jointly organized by Tripura Space Application Centre (TSAC) and NESAC on August 09, 2024 with support from ISRO HQ. Shri Animesh Debbarma, Hon'ble Minister of Science, Technology & Environment, Govt. of Tripura was the Chief Guest of the event. Around 230 students representing 11 schools across the state have participated in the event.



Chief Guest along with other delegates at TSAC

The second event in Tripura was organized at National Institute of Technology (NIT) Agartala jointly by NIT-Agartala and NESAC with support from ISRO HQ. Prof Sarat Kumar Patra, Director,



Students interacting with the speaker at NIT Agartala



NIT Agartala was the Chief Guest of the event. Around 190 students representing 16 schools across the state have participated in the event.

Regional level National Space Day-2024 celebration at Srimanta Sankardeva Kalakshetra, Guwahati

The North Eastern Space Applications Centre (NESAC), in collaboration with the Indian Space Research Organization (ISRO) and Department of Science, Technology, and Climate Change, Government of Assam, organized a day long program to celebrate the National Space Day-2024 on 16th August, 2024 at the Srimanta Sankardeva Kalakshetra, Guwahati. This zonal program is the final program of a series of 12 similar events coordinated by NESAC and conducted across the eight NE states and West Bengal since July 12, 2024. A total of around 800 students accompanied by teachers from 28 schools and colleges actively participated in the event. Ms Loya Maduri, Secretary, Dept of S & T and Climate Change, Govt. of Assam and Shri Chanchal Kumar, Secretary, Ministry of DONER were the guest of honour during the inaugural program. The event covered invited lectures on topics related to India's Moon missions, Human space flight program, Space technology to understand the Solar System and Universe, etc. A space exhibition was also organized as part of the program, wherein NESAC and Department of S & T and Environment, Govt. of Assam displayed different models of launch vehicles and satellites as well as put up posters highlighting different components of Indian Space Program. The Space on Wheel from NESAC was also displayed during the program.



Antariksh Maha Yatra has jointly organized by Vijnana Bharati and NESAC/ISRO

The month-long Antariksh Maha Yatra has jointly organized by Vijnana Bharati and NESAC/ISRO covering 21 schools with more than 20,000 students across central Assam, which was inaugurated by Hon'ble Education Minister of Assam. Similarly in West Bengal more than 33000 students from 162 schools have participated in the program.



Exhibition in Vibrant NE 2024 in Guwahati

NESAC represented ISRO/DoS during Vibrant NE 2024 at Kalakhetra on 19th Sept 2024. Hon'ble Governor of Assam Shri L P Achrya inaugurated the program and visited NESAC stall along with Hon'ble Agriculture Minister of Assam Shri Atul Bora. ISRO/DoS stall also received the Best Stall award for empowering communities with information.



Exhibition in India International Science Festival 2024

The 10th India International Science Festival (IISF) 2024, held at IIT Guwahati from November 30th to December 3rd, focused on "Transforming India into an S&T-driven Global Manufacturing Hub," showcasing scientific achievements and fostering collaboration. NESAC has represented



ISRO/DoS. Chairman ISRO visited the stall and interacted with the students. More than 15000 students has attended the program and ISRO/DoS stall has received the best pavilion award.



crucial feedback and suggestions to enhance the GeoTourism platform in line with regional needs. The workshop was participated by 41 officials and stakeholders from different state tourism Directorates, Ministry of Tourism, State Remote Sensing Applications Centres (SRSACs) including NGOs of NE region.

NESAC BOOK EXHIBITION 2025

NESAC Library successfully organized a Book Exhibition on 9th January 2025. Dr. Shyam S Kundu, Sci./Engr 'SG' & Head, SASD, NESAC inaugurated the program.

One day Brainstorming Workshop on GeoTourism Application

A one-day Brainstorming Workshop on "Development of GeoTourism Dashboard Application for Planning, Management, and Monitoring Tourism Activity in the North Eastern Region (NER)" was successfully organized on 3rd March 2025 at the Outreach Building, NESAC. The workshop was a collaborative effort between the North Eastern Space Applications Centre (NESAC) and the North Eastern Council (NEC), aimed at bringing together key stakeholders, user departments, and technical experts to deliberate on strengthening tourism planning and management through innovative geospatial solutions. There were presentations on cutting-edge geospatial technologies for geo-tourism, including climate and comfort indexes, UAV-based 3D visualization, and AI-driven GeoTourism tools. The session focused on the stakeholder interactions, where tourism representatives from Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, and other stakeholders presented



A total of 11 reputed publishers, distributors, and booksellers participated in the exhibition, showcasing the latest editions of textbooks and reference materials relevant to NESAC's fields of research, development, and applications. All NESAC Scientists, members of the Library Advisory Committee (NLAC), Research Scientists, Research Scholars and students participated enthusiastically and visited the exhibition to explore the books related to their research fields.



IMPORTANT EVENTS

AWARDS & RECOGNITIONS

Honour for NESAC for implementing the Official Language Policy of the Union during the Year 2022-2023

Official language conference for East and Northeast region was organized at Mayfair Tea Resort, Siliguri, Assam on 08.03.2024. Hon'ble Union Minister of State, Ministry of Home Affairs and Union Minister of State, Ministry of Youth Affairs and Sports, Shri Nishit Pramanik presided over the conference. The conference was attended by about 650 participants including the Heads of Office and Official Language Representatives of Central Government Offices from East and Northeast region. NESAC Uiam was awarded the third prize for Implementing Official Language Policy of the Union during the year 2022-2023. Administrative Officer, NESAC received the the Official Language Shield and Commendation Certificate from the Hon'ble Minister. Dr. S.P. Aggarwal, Director NESAC acclaimed this great achievement for the Centre and urged all NESAC staff to continue their sincere effort towards OL implementation.



TOLIC Rajbhasha Shield Second Prize conferred to NESAC

NESAC was awarded the Rajbhasha Shield Second Prize by Town Official Language Implementation Committee Shield Scheme for implementation

of official language policy for the year 2023-2024 on 27.06.2024 at TOLIC, Shillong.



Controller of Administration, NESAC receiving the Shield as the Second under TOLIC Shield Scheme, Shillong (Year 2023-2024) (on 27.06.2024)

National Geospatial Enabler Award 2024 conferred to NESAC

The North Eastern Space Application Centre is honoured with the National Geospatial Enabler Award 2024 in recognition for the exceptional services and world-class support provided in the geospatial domain to educational institutions and research organizations across India. National Geospatial Awards is an initiative of the FOSSEE project of IIT Bombay under the aegis of the National Mission on Education through ICT (NMEICT), Ministry of Education, Government of India. Dr S.P Aggarwal received the award on behalf of NESAC during the Open-Source Day & National Geospatial Awards 2024 (Edition 01) event held at IIT Bombay on 15th September, 2024.





NESAC was awarded 3rd prize for outstanding Official Language implementation during 2023–2024

NESAC was awarded the 3rd Prize by the Department of Official Language, Ministry of Home Affairs for outstanding Official Language implementation during the year 2023-24 in the category of Central Government Offices (more than 50 employees) located in 'C' Region during the Joint Regional Official Language Conference held on 5th March, 2025 at Mayfair Spring Valley Resort, Sonapur, Assam. Dr. KK Sarma, Group Head, RSAG NESAC received the award on behalf of the Director, NESAC from Hon'ble Chief Minister of Assam Dr. Himanta Biswa Sarma, who graced the program as the Chief Guest. Hon'ble Union Minister of State for Home Affairs, Shri Nityanand Rai honoured Smt. Namita Rani Paul Mitra, Junior Translation Officer, NESAC a commendation certificate for significant contribution in official language implementation in the Centre.



Dr. K.K.Sarma, Group Head, RSAG, NESAC and Ms. Namita Rani Paul Mitra, Jr. Translation Officer, NESAC receiving the awards from Hon'ble Chief Minister, Assam and Hon'ble Union Minister of State for Home Affairs

OFFICE EVENTS & CELEBRATIONS

- NESAC celebrated its 24th Foundation Day on 05th of September 2024 and entered into 25 years of inception.
- Vigilance Awareness Week - 2024 with the theme **"Culture of Integrity for Nation's Prosperity"**, was observed at NESAC from 28th

October 2024 – 03rd November 2024. Integrity Pledge was administered by Director, NESAC to all permanent staff and CISF Officials on 28.10.2024. Banners and posters, etc were displayed on the Notice Board and in & around the Office/ Outreach and Residential premises. Essay Writing Competition was also conducted for NESAC employees.



Pledge taking ceremony

- 'Rashtriya Ekta Diwas' (National Unity Day) was observed at NESAC. As part of the celebration, the Rashtriya Ekta Diwas pledge was administered by the Director, NESAC to the staff on 01.11.2024.



Pledge taking ceremony

- As part of the "Observation of Samvidhan Diwas (Constitution Day), reading of the Preamble to the Constitution was done by NESAC staff alongwith Dr. K K Sarma, Group Head, RSAG on 26th November 2024 at NESAC Auditorium at 1100 hrs.



Reading of the Preamble to the Constitution

- Swachhta Pakhwada – 2025 was observed in NESAC during the period 31st January – 14th February 2025 at NESAC. The Pakhwada was inaugurated by Director NESAC on the first day of the Pakhwada followed by Pledge taking ceremony & Signature campaign. During the observation, various activities were conducted like Display of Action Plan/ Banners/ Posters in the premise/ notice board /website, Mass cleaning drive in and around NESAC office campus & residential campus, Plogging run from NESAC office to NESAC Residential Campus, etc.



Mass cleaning drive in and around NESAC office campus

Hindi Workshop conducted at NESAC during 2024-2025

As per the Official Language Policy of the Government of India, a Hindi workshop is organized in every quarter. Dr. Sonu Jain, Deputy Director (Official Language), Department of Space, Branch Secretariat, New Delhi, conducted the online workshop on 21.06.2024. The topic of the workshop was "Importance of

Standardized Characters, Spelling, and Syntax in the Implementation of Official Language by the Government of India." The workshop began with a welcome address by the Administrative Officer, who welcomed Dr. Sonu Jain. Dr. Jain then delivered a PPT presentation, making all officers and employees aware of the significance of standardized characters, spelling, and syntax in the effective implementation of the Official Language Policy. Total of 11 officers and employees participated in the session. All participants actively participated by sharing their views and asking questions, making the workshop interesting and informative. The session concluded with a vote of thanks by the Junior Translation Officer, NESAC.



Typing in Unicode and Official Language Implementation Updates

A Hindi Workshop on "Typing in Unicode and Official Language Implementation Updates" was organized on 10.09.2024 at the North Eastern Space Applications Centre (NESAC), Department of Space, Umiam, Meghalaya. A total of 19 officers and 3 employees participated in the workshop. All participants received practical training in Unicode typing on computers during the practice session. The workshop was very interesting and informative. It concluded with a vote of thanks delivered by the Administrative Officer, NESAC.



Official Language Policy Rules and Official Language Implementation in NESAC/ISRO

A workshop on “Official Language Policy Rules and Official Language Implementation in NESAC/ISRO” was organized for Smt. Seena Rajendran, Deputy Director (OL), U.R.Rao Satellite Centre, Government of India, Department of Space, Bengaluru on 13.12.2024 at RS GIS Conference Room, NESAC. A total of 07 officers and 05 employees attended the workshop. The participants shared their views on various aspects of the topic presented.



Compliance (Implementation) of Official Language in scientific and technical works

Shri Rajeev Kumar Nayak, Deputy Director (Implementation), Regional Implementation Office (N.E.R), Guwahati was invited to conduct a workshop on “Compliance (Implementation) of official language – in scientific and technical works”. The programme was conducted on 26.03.2025 at RS-GIS Conference Room. Shri Rajeev Kumar Nayak, took the session in which he made all the participants aware about the various tools of Official language which helps in translation through a PPT presentation. He further gave

a small presentation on various OL tools like-Kanthastha 2.0 etc. A practical training session was also conducted for all the participants. A total of 13 officers and 02 employees attended the workshop.

NESAC celebrates the 78th Independence Day of the Nation

NESAC celebrated the 78th Independence Day of the nation in an eventful manner on 15th August 2024. The National Flag was hoisted by the Director, NESAC, at 09:00 AM at the NESAC office campus, followed by the singing of the National Anthem. The CISF unit at NESAC presented a Guard of Honour to the Director, NESAC, which was followed by the address of Director, NESAC where he highlighted the notable achievements of NESAC during the last year and apprised the NESAC community with the vision of the Hon'ble Prime Minister on the occasion. A demonstration of CISF Weapons Drill was made by the CISF Unit as part of the Independence Day celebration. The program was concluded with distribution of sweets to the individuals who attended the programme.



Hindi Technical Seminar organized at NESAC Umiam

A Hindi technical seminar on “Space Technology Applications in Sustainable Development” was organized at NESAC on 03rd October, 2024. Dr. Vinay Kumar Mishra, Director, Indian Council of Agricultural Research, North Eastern Hill Region (ICAR-NEH), graced the inaugural session of the Seminar.



Administrative Officer, NESAC read out the message of Secretary, Department of Space, Dr. S. Somanath. Dr. S.P. Aggrawal, Director, NESAC in his inaugural address highlighted the importance and timeliness of the theme of the seminar and stated the objective of organizing Hindi technical seminar to promote linguistic inclusiveness in technical communication.



A total of 13 articles were presented in the seminar in two technical sessions. The article titled "Investigation of earth deformation and its impact on seismic potential using radar satellites in Barapani Shear Zone area of Meghalaya" by Dr. Gopal Sharma, Scientist/Engineer-SE, NESAC, Uiam was selected as the best presentation. In the valedictory session, certificates were distributed to all the participants by Director, NESAC.

NESAC Celebrates Hindi Fortnight

NESAC organized Hindi Pakhwada from 17th September to 4th October 2024. It was inaugurated by Dr. K.K. Sarma, Group Head, RSAG, who administered the Hindi Diwas oath to employees. Shri Sharique Alam read the Hon'ble Union Home Minister's message, and Administrative Officer briefed the gathering on the planned competitions.

Competitions like Noting/Drafting, Typing, Translation, Antakshari, Poem Recitation, and Rajbhasha Quiz were held for employees, CISF staff, and families from 19th September.

In the closing ceremony on 4th October, Dr. S.P. Aggrawal, Director, NESAC, emphasized promoting Hindi for wider reach of scientific knowledge and encouraged its daily use. He congratulated everyone and presented certificates and prizes to winners. Shri Kumar Anand concluded the program with a vote of thanks.



Official Language Orientation Program at NESAC

NESAC hosted an Official Language Orientation Program for Senior and Junior Translation Officers of the Department of Space/ISRO centre/units on 4th October 2024. Dr. S.P. Aggrawal, Director, NESAC, and Dr. Shankar Kumar, Joint Director (Official Language), addressed the participants and highlighted the role of the Rajbhasha cadre.



Dr. Rajnarayan Awasthi gave a lecture on "Applied Analysis of Translation and Lexicology," and Mr. Balendu Sharma Dadhich, Microsoft Asia, spoke about using Artificial Intelligence for Official Language implementation. A total of 31 participants from various centres/units of the Department of Space/ISRO and NESAC attended the program.



Celebration of National Voluntary Blood Donation Day

As part of the Celebration of “National Voluntary Blood Donation Day”, NESAC in collaboration with the Regional Blood Centre, Pasteur Institute, Shillong, organized a Voluntary Blood Donation Camp on 18th October 2024 at the Multipurpose Hall, NESAC Residential Complex, Umiam. The Campaign slogan for this year was “Celebrating 20 years of giving: Thank you, blood donors!” blood donors!”. Altogether, 20 (Twenty) volunteers came forward, out of which 12 (twelve) were found fit for blood donation and 08 (eight) were deferred as they were medically unfit.



NESAC celebrates 76th Republic Day of the Nation

The 76th Republic Day of the nation was celebrated at NESAC on 26th January 2025 with a cultural program. Dr. S.P. Aggarwal, Director, NESAC hoisted the tricolor amidst singing of national anthem by the staff of NESAC at



09:00 am. The CISF unit of NESAC presented a guard of honour to Director, NESAC and performed Republic Day parade. Director, NESAC addressed the staff of the Centre with an informative speech, where he highlighted the significance of Republic Day celebration and briefed about the activities and achievements of the Department of Space and NESAC in recent times. Following this, a one minute weapons drill exercise was exhibited by the CISF Unit of NESAC. A cultural program was organized by the NESAC Sports & Recreation Committee at NESAC auditorium.

World Hindi Day Celebration

World Hindi Day was celebrated on 10th January, 2025 at NESAC to promote Official Language in official work among the staff of NESAC. During this period, various competitions were organized like note writing competition, Hindi poem recitation competition in which all the officers and staff of NESAC participated with enthusiasm.



Welcome address by Dr. K.K. Sharma, Group Head, RSAG & Director (in-charge) during World Hindi Day Celebration (10.01.2025)



Welcome address by Shri Sharique Alam, Controller of Administration, NESAC during World Hindi Day Celebration (10.01.2025)



Poem recitation competition organized on World Hindi Day (10.01.2025)



Prize distribution and certificate distribution to the trainees who passed the Hindi language training for the year 2023-2024 during the World Hindi Day (10.01.2025)

Celebration of National Science Day at NESAC

National Science Day 2025 was celebrated with great enthusiasm at the NESAC Outreach Building on 28th February 2025, commemorating Sir C.V. Raman's discovery of the Raman Effect. This year's theme was "Empowering Indian Youth for Global Leadership in Science and Innovation for a Developed India."

The event began with a welcome address by Dr. D. Chutia, Secretary, ISRS Shillong Chapter, followed by an engaging talk by Dr. D. Sinha Roy, Professor and Dean, NIT Meghalaya, on 'Empowering Society Using Artificial Intelligence'. A quiz and a painting competition for school students generated interest in science and technology.

The valedictory session, with Dr. S.P. Aggarwal, President, ISRS and Director, NESAC, as Chief Guest, highlighted the importance of fostering scientific curiosity among youth. Dr. B.K. Handique (ISG Shillong Chapter) and Dr. S.K. Kundu (IMS Shillong Chapter) also spoke

on the contributions of their societies and the value of collaboration.

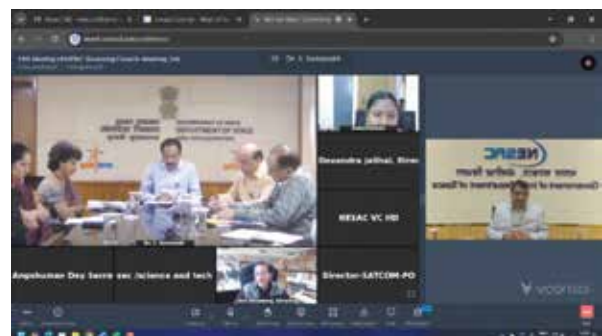


The event was jointly organized by the ISRS Shillong Chapter in collaboration with ISG and IMS Shillong Chapters.

19th Meeting of NESAC Governing Council

The 19th meeting of the NESAC Governing Council (GC) was held online on 17th December 2024, chaired by Dr. S. Somanath, Secretary, Department of Space & Chairman, NESAC-GC. The meeting was attended by Secretaries of Science & Technology from NE states, senior officials from ISRO/DOS, and Directors of NRSC and IIT Guwahati, among others.

The GC approved the minutes of the 18th meeting and reviewed the progress of actions taken. Members appreciated NESAC's significant contributions to space-based developmental planning in the NE region and provided guidance for timely project execution. The Council also approved the Annual Report and audited accounts for FY 2023-24, the budget for 2025-26, and several new MoUs with other institutes and organizations.



12th Meeting of NESAC Society

The 12th Meeting of the NESAC Society, was held on 21st December 2024 at Agartala, Tripura. The meeting was presided over by Hon'ble Union Minister for Home and Cooperation, Shri Amit Shah, and attended by Hon'ble Union Minister of DoNER, Shri Jyotiraditya M. Scindia, Hon'ble Minister of State for DoNER, Dr.

Chairman NESAC Society commended NESAC's vital contributions and encouraged it to expand its activities to address the North Eastern Region's specific needs more effectively. He emphasized broader engagement with Departments, integration of space technology into governance, development of high-resolution DEMs, and



Sukanta Majumdar, Hon'ble Chief Ministers from Arunachal Pradesh, Assam, Manipur, Sikkim, Tripura, senior officials from the Home Ministry, DoS, NEC, and other distinguished members and invitees.

Dr. S. Somanath, Secretary, DoS, Chairman ISRO, Vice-President of the NESAC Society, and Chairman of the NESAC Governing Council, welcomed the dignitaries and assured continued ISRO/DoS support for the region's development. Dr. S.P. Aggarwal, Director, NESAC, presented the Centre's key achievements and activities in the past years.



support for resource exploration and outreach programs for students, women, and tribal communities.

Chief Ministers appreciated NESAC's technical support and shared progress on various projects, while requesting new initiatives in natural resource management, disaster support, infrastructure planning, and other priority areas.

VISIT OF DISTINGUISHED GUESTS

Visit of Prof. Dr. Indra Mani, VNMKV Vice-Chancellor

Prof. Dr. Indra Mani, Honorable Vice-Chancellor of Vasanttrao Naik Marathwada Krishi Vidyapeeth (VNMKV), visited NESAC on 4th June 2024 and delivered a talk on "Digital and Sustainable Agriculture – The Way Forward." He highlighted VNMKV's initiatives in this field and emphasized the need for collaboration with NESAC. Around 70 participants, including scientists and project staff from all NESAC divisions, attended the session.



IMPORTANT VISITOR

| | |
|------------|--|
| 28.10.2024 | Dr. Ricky A J Syngkon, Hon'ble Member of Parliament, Lok Sabha |
|------------|--|

Welfare of SC & ST

i) The welfare of SC & ST is being taken care in this Centre. This Centre has been observing the guidelines for recruitment, promotion and welfare of Scheduled Caste and Scheduled Tribes. Table-11.2 indicates the status of representation of persons belonging to Scheduled Caste and Scheduled Tribe.

Table-11.2

| Sl No | Centre / Unit | Sanctioned strength of employees 2024-2025 | Men-in-position 2024-2025 | Strength of SC employees 2024-2025 | Strength of ST employees 2024-2025 | Strength of PwD employees 2024-2025 |
|-------|---------------|--|---------------------------|------------------------------------|------------------------------------|-------------------------------------|
| 01 | NESAC | 59 | 53 | 01 | 07 | 01 |

| Year | Information | | Replied | | No. of application transferred to other Public Authority | No. of application rejected |
|-----------|-----------------------------|---------------|---------------------------------|----------------------------|--|-----------------------------|
| | No. of application received | No. of appeal | No. of application disposed off | No. of appeal disposed off | | |
| 2024-2025 | 10 | 05 | 10 | 05 | Nil | Nil |

- ii) A Liaison Officer for SCs, STs, OBCs and Minority of this Centre is nominated.
- iii) 16.67% (Approx.) of Group B and 33.3% of Group C employees are from ST community.
- iv) Significant Research personnel are from SC/ ST Community
- v) Many of the outsourced manpower also in Administration, Operation & Maintenance, Gardening, Housekeeping and Canteen belong to SC/ST.
- vi) One post is reserved and filled-up under PwD category.

Right to Information

NESAC is receiving RTI Applications through online and offline mode. The following table shows the number of RTI Applications received and disposed of in FY 2024-2025.



Details of RTI Officials

| Nodal Officer | Name and designation |
|---|---|
| First Appellate Authority (FAA) | Dr K K Sarma, Sci/Engr 'G', NESAC email: kk.sarma@nesac.gov.in |
| Central Public Information Officer (CPIO) | Shri Sharique Alam, Controller of Administration, NESAC email: controller.nesac@nesac.gov.in |
| Assistant Public Information Officer (APIO) | Administrative Officer, NESAC email: ao.nesac@nesac.gov.in |



NESAC PUBLICATIONS (APRIL 2024 TO MARCH 2025)

International Publications

1. Aggarwal, S. P., Kundu, S. S., & Sarma, K. K. (2024). Geospatial Technology for Effective Disaster Risk Reduction: Best practices in capacity building. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, 48, 147-153.
2. Ain, A., Gogoi, M., & Chutia, D. (2025). A new spectral index for vegetation extraction using satellite data. *Journal of Applied and Natural Science*, 17(1), 205.
3. Ain, A., Gogoi, M., & Chutia, D. (2024). Multispectral Satellite Data Classification Using Rank Correlation Similarity Index and Automatic Labeling Technique. *SN Computer Science*, 5(8), 1073.
4. Arun, B. S., Gogoi, M. M., Deshmukh, D. K., Hegde, P., Boreddy, S. K. R., Borgohain, A., & Babu, S. S. (2024). Enhanced light absorption by ambient brown carbon aerosols in the eastern Himalayas. *Environmental Science: Atmospheres*, 4(7), 782-801.
5. Barman, N., Kundu, S. S., & Borgohain, A. (2024). Observation and model simulation of aerosol optical properties and size distribution over the hilly terrain of Northeast India. *Aerosol Science and Engineering*, 8(3), 319-335.
6. Bhat, Y., Nandy, S., Das, K., Tamang, M., Padalia, H., Nath, A. J., ... & Singh, R. P. (2024). Vegetation disturbance and regrowth dynamics in shifting cultivation landscapes. *Scientific Reports*, 14(1), 28324.
7. Bhuyan, J. M., Nandy, S., Padalia, H., Pebam, R., Nath, A. J., Kushwaha, S. P. S., & Das, A. K. (2025). Harnessing Time-Series Satellite Data and Deep Learning to Monitor Historical Patterns of Deforestation in Eastern Himalayan Foothills of India. *Journal of the Indian Society of Remote Sensing*, 53(4), 993-1008.
8. Chouhan, A., Sur, A., Chutia, D., & Aggarwal, S. P. (2024). TMLNet: Triad Multitask Learning Network for multiobjective based change detection. *Neurocomputing*, 599, 128080.
9. Chyne, B. L., Das, R., Sarmah, R., Saha, A., Sarma, K. K., & Aggarwal, S. P. (2025). Utilizing geospatial tools for the assessment of river bank erosion and migration patterns in complex braided and meandering river systems. *Earth Surface Processes and Landforms*, 50(1), e6043.
10. Gautam, R., Borgohain, A., Pathak, B., Kundu, S. S., & Aggarwal, S. P. (2024). Investigation of meteorological variables and associated extreme events over North-East India and its adjoining areas using high-resolution IMDAA reanalysis. *Natural Hazards*, 1-36.
11. Gautam, R., Pathak, B., Bhuyan, P. K., Borgohain, A., & Kundu, S. S. (2024). Long-term trend analysis of surface temperature over North-East India and adjoining regions based on CRU and ERA5 reanalysis. *Journal of Earth System Science*, 133(3), 141.
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 3. Das, R. (2024). Bank line Migration Studies of Brahmaputra, Barak and selected tributaries. NESAC-SR-323-2024.
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Book Chapters

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AUDITOR'S REPORT AND STATEMENT OF ACCOUNTS FOR THE FINANCIAL YEAR 2024-2025



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INDEPENDENT AUDITORS' REPORT

To,
The Members of North Eastern Space Applications Centre
Shillong

Report on the Audit of the Standalone Financial Statements

Opinion

1. We have audited the standalone financial statements of **North Eastern Space Application Centre which comprise the Balance Sheet as at 31st March 2025**, and the statement of Income and Expenditure then ended, and notes to the financial statements, including a summary of significant accounting policies and other explanatory information.
2. In our opinion and to the best of our information and according to the explanations given to us, the aforesaid standalone financial statements give the information required by the Act in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India in case of:
 - (a) The Balance Sheet, of the state of affairs of the organization as at 31st March 2025, and
 - (b) In the case of the Statement of Income and Expenditure, of the Deficit for the year ended on that date.

Basis for Opinion

3. We conducted our audit in accordance with the Standards on Auditing (SAs) issued by the Institute of Chartered Accountants of India (ICAI). Our responsibilities under those Standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of our report. We are independent of the Institution in accordance with the Code of Ethics issued by the Institute of Chartered Accountants of India (ICAI) together with the ethical requirements that are relevant to our audit of the financial statements and we have fulfilled our other ethical responsibilities in accordance with these requirements and the Code of Ethics. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.



Management's Responsibility for the Financial Statements

4. Management is responsible for the preparation of these financial statements that give a true and fair view of the financial position and financial performance of the organization in accordance with the accounting principles generally accepted in India. This responsibility includes the design, implementation and maintenance of internal controls relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatements, whether due to fraud or error.

Auditor's Responsibilities for the Audit of the Financial Statements

5. Our objectives are to obtain reasonable assurance as to whether the financial statements as a whole are free from material misstatement, either due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with SAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

Emphasis of Matter:

6. Without qualifying our opinion as stated above, we report that the following matters which requires attention:
1. In Case of Outstanding Liabilities amounting to Rs.3,07,94,609.00,the organization has not maintained the Party -Wise details.
 2. Software: The amount of Rs. 1,62,36,648.00 booked under this head has substantially increased as a result of 'Capitalisation'.The Organisation should Depreciate the Software on the basis of its useful life.
 3. Organisation should Consult with GST Consultant to ensure proper compliance of GST Laws.
 4. Basis of Accounting: Hybrid Basis of Accounting is followed by the Organization. Thus, its difficult to identity whether TDS Provision are applicable or not for a particular payment.

Also, in one of the cases we found there is short deduction of Income Tax which is as under

| Head | Name | Date | Taxable Amount(₹) | Sec | TDS |
|----------|--|------------|-------------------|------|--------------|
| Software | MILLENNIUM CYBERWORKS AND CO LLP | 28/03/2025 | 1,31,85,480.00 | 194J | 13,18,548.00 |

However, Organisation has noted and adopted the same for future compliance.



L. KANT & CO
FRN: 021104C
CHARTERED ACCOUNTANTS
Address: Khliehriat, East Jaintia Hills
Nearby Police Station, Meghalaya-79200

✉ ca.modik@gmail.com
☎ 8005977946



5. General:

- (i) The report of 'CAG' for the year 2022-23 as regards:
 - (a) Non registration of land continues at the same status
 - (b) Un realized dues of rent and electricity charges of SBI-ATM remains to be realized and continues unprovided in the accounts of the Current Year
 - (c) Other matters of the remain to be responded and complied with.
6. The organization has not undertaken Physical Verification of Fixed Asset during the year. However last Physical Verification of Fixed Assets was done by the Organisation during the F.Y 23-24.

Accounting Standard:

1. AS 29 Provisions, contingent liabilities and contingent assets:

Accounting Standard– 29 “Provision, Contingent Liabilities and Contingent Assets” requires an enterprise to recognize provision when an enterprise has a present obligation as a result of past event and it is probable that an outflow of resources embodying economic benefits will be required to settle the obligation. Further, the Standard requires an enterprise to disclose for each class of contingent liability at the balance sheet date, a brief description of the nature of the contingent liability and an estimate of its financial effect. However, the Organization has not made Provision of all the liabilities payable.

For L Kant & Co
Chartered Accountants
FRN: 021104C

Sd/-

L. K Modi
(Partner)

Membership No - 411650
UDIN: 25411650BMLKBT1030

Place: Shillong
Date: 25.06.2025

भारत सरकार / GOVERNMENT OF INDIA
अंतरिक्ष विभाग / DEPARTMENT OF SPACE

उत्तर-पूर्वी अंतरिक्ष उपयोग केंद्र / NORTH EASTERN SPACE APPLICATIONS CENTRE
उमियम / UMIAM - 793103, मेघालय / MEGHALAYA

BALANCE SHEET AS AT 31-MARCH-2025

(Amount - ₹)

| CORPUS/CAPITAL FUND AND LIABILITIES | SCHEDULE | CURRENT YEAR | PREVIOUS YEAR |
|---|----------|--------------------------|--------------------------|
| Corpus/Capital Fund | 1 | 55,39,92,514.96 | 61,67,21,204.95 |
| Reserves and Surplus | 2 | - | - |
| Earmarked/Endowment Funds | 3 | - | - |
| Secured Loans and Borrowings | 4 | - | - |
| Unsecured Loans and Borrowings | 5 | - | - |
| Deferred Credit Liabilities | 6 | - | - |
| Current Liabilities and Provisions | 7 | 54,23,94,301.86 | 48,54,93,966.45 |
| Pension Fund as per contra* | | - | - |
| TOTAL | | 1,09,63,86,816.82 | 1,10,22,15,171.40 |
| ASSETS | | | |
| Fixed Assets | 8 | 65,47,78,188.52 | 67,36,06,346.52 |
| Investments - From Earmarked/Endowment Funds | 9 | - | - |
| Investments - Others | 10 | - | - |
| Current Assets, Loans, Advances etc. | 11 | 44,16,08,628.30 | 42,86,08,824.88 |
| " Miscellaneous Expenditure (to the extent not written off or adjusted) " | | - | - |
| Pension Fund as per contra* | | - | - |
| TOTAL | | 1,09,63,86,816.82 | 1,10,22,15,171.40 |
| Significant Accounting Policies | 24 | | |
| Contingent Liabilities and Notes on Accounts | 25 | | |

This is the Balance Sheet to in our report of even date

for **L Kant & Co**
Chartered Accountants

for and on behalf of
NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(L K Modi)
PARTNER
UDIN: 25411650BMLKBT1030

Sd/-
(SUBAKORDOR SYIEMLEH)
ACCOUNTS OFFICER

Sd/-
(DR SHIV PRASAD AGGARWAL)
DIRECTOR

Date: 25.06.2025

भारत सरकार / GOVERNMENT OF INDIA
 अंतरिक्ष विभाग / DEPARTMENT OF SPACE

उत्तर-पूर्वी अंतरिक्ष उपयोग केंद्र / NORTH EASTERN SPACE APPLICATIONS CENTRE
 उमियम / UMIAM - 793103, मेघालय / MEGHALAYA

INCOME AND EXPENDITURE ACCOUNT FOR THE PERIOD/YEAR ENDED 31-MARCH-2025

(Amount - ₹)

| INCOME | SCHEDULE | CURRENT YEAR | PREVIOUS YEAR |
|--|----------|--------------------------|--------------------------|
| Income from Sales/Services | 12 | 2,22,69,932.00 | 67,01,211.00 |
| Grants/Subsidies | 13 | 31,71,63,570.00 | 31,87,89,217.00 |
| Fees/Subscriptions | 14 | - | - |
| Income from Investments (Income on Invest. From earmarked/endow. Funds transferred to Funds) | 15 | - | - |
| Income from Royalty, Publication etc. | 16 | - | - |
| Interest Earned | 17 | 1,01,96,632.00 | 98,84,904.00 |
| Other Income | 18 | 9,42,525.90 | 55,88,995.66 |
| Increase/(decrease) in stock of Finished goods and works-in-progress | 19 | - | - |
| Incomes from Services | | - | - |
| TOTAL (A) | | 35,05,72,659.90 | 34,09,64,327.66 |
| EXPENDITURE | | | |
| Establishment Expenses | 20 | 19,35,02,876.00 | 18,07,24,707.00 |
| Other Administrative Expenses etc. | 21 | 17,57,28,566.89 | 17,72,70,688.97 |
| Expenditure on Grants, Subsidies etc. | 22 | - | 0.00 |
| Interest | 23 | - | - |
| " Depreciation *(Net total at the year-end – corresponding to schedule 8) " | | 11,85,83,739.00 | 9,56,86,374.00 |
| TOTAL (B) | | 48,78,15,181.89 | 45,36,81,769.97 |
| Balance being excess of Expenditure over Income (A-B) | | (13,72,42,521.99) | (11,27,17,442.31) |
| Transfer to Special Reserve (Specify each) | | - | - |
| (-) Add Prior Period Interest Earned from Secured Advance | | 11,34,239.00 | - |
| (+) Less prior period expenses | | 3,25,021.00 | 9,35,920.00 |



| | | | |
|--|----|--------------------------|--------------------------|
| BALANCE BEING SURPLUS/ DEFICIT CARRIED TO CORPUS/CAPITAL FUND | | (13,64,33,303.99) | (11,36,53,362.31) |
| SIGNIFICANT ACCOUNTING POLICIES | 24 | | |
| CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS | 25 | | |

This is the Income & Expenditure Account to in our report of even date

for **L Kant & Co**
Chartered Accountants

Sd/-
(L K Modi)
PARTNER

UDIN: 25411650BMLKBT1030

for and on behalf of
NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(SUBAKORDOR SYIEMLEH)
ACCOUNTS OFFICER

Sd/-
(DR SHIV PRASAD AGGARWAL)
DIRECTOR

Date: 25.06.2025

भारत सरकार / GOVERNMENT OF INDIA अंतरिक्ष विभाग / DEPARTMENT OF SPACE
 उत्तर-पूर्वी अंतरिक्ष उपयोग केंद्र / NORTH EASTERN SPACE APPLICATIONS CENTRE
 उमियम / UMIAM - 793103, मेघालय / MEGHALAYA

RECEIPTS AND PAYMENTS FOR THE PERIOD/YEAR ENDED 31-MARCH-2025

(Amount - ₹)

| | RECEIPTS | CURRENT YEAR | PREVIOUS YEAR | | PAYMENTS | CURRENT YEAR | PREVIOUS YEAR |
|-----------|-------------------------------------|-----------------|-----------------|-------------|--|-----------------|-----------------|
| I. | Opening Balances | | | I. | Expenses | | |
| | a) Cash in Hand | - | 10.00 | | | | |
| | b) Bank Balances: | | | | a) Establishment Expenses (corresponding to Schedule 20) | 14,71,19,529.00 | 13,94,51,295.00 |
| | i) In current accounts | 3,57,56,047.17 | 1,48,21,679.37 | | b) Administrative Expenses (corresponding to Schedule 21) | 17,00,44,041.00 | 17,93,37,922.00 |
| | ii) In deposit accounts | 15,85,29,540.49 | 15,29,41,958.60 | | | | |
| | iii) Savings accounts | 21,67,16,006.22 | 19,21,97,959.28 | II. | Payments made against funds for various projects | | |
| II | Grants Received | | | | (Name of the fund or project should be shown alongwith the particulars of payments made for each project) | 25,53,69,353.79 | 14,83,23,489.06 |
| | a) From Government of India: | | | | | | |
| | i) For Salaries | 14,81,55,000.00 | 14,20,00,000.00 | | | | |
| | ii) For General | 18,16,81,000.00 | 18,50,00,000.00 | III. | Investments and deposits made | - | - |
| | iii) For Creation of Capital Assets | 6,08,65,000.00 | 9,00,00,000.00 | | a) Out of Earmarked Endowment funds | | |
| | b) From State Government | | | | b) Out of Own Funds (Investments - Others) | | |



| | | | | | | | |
|-------------|--|-----------------|----------------|----------------|-------------|---|----------------|
| | c) From other sources (details) | - | - | - | | | |
| | i) NEC | | | | IV. | Expenditure on Fixed Assets & Capital Work-In-Progress | |
| | GIA- General | 15,09,91,878.00 | 2,00,00,000.00 | 2,00,00,000.00 | | a) Purchase of Fixed Assets | 6,08,65,000.00 |
| | GIA- Creation of Capital Assets | 1,75,00,000.00 | - | - | | b) Purchase of Fixed Assets from General | 40,93,627.00 |
| | ii) ISRO DMSP Programme | | | | | c) Expenditure on Capital Work-in-progress (NEC & NESAC) | 2,74,30,635.00 |
| | GIA- General | 1,39,03,781.00 | - | - | | | 3,11,11,032.00 |
| | GIA- Creation of Capital Assets | 20,00,000.00 | - | - | | | |
| III. | Income on Investments from | | | | | | |
| | a) Earmarked/Endow. Funds | - | - | - | | | |
| | b) Own Funds (Oth. Investment) | - | - | - | V. | Refund of surplus money/ Loans | |
| IV. | Interest Received | | | | | a) To the Government of India | 85,78,803.00 |
| | a) On Bank Deposits | 79,42,279.00 | 89,08,653.00 | 89,08,653.00 | | b) To the State Government | |
| | b) Loans, Advances, etc. | - | 80,309.00 | 80,309.00 | | c) To other providers of funds | |
| V. | Other Income (Specify) | | | | | i) ISRO DMSP Programme | 62,91,038.00 |
| | a) Tender Fee | - | 17,400.00 | 17,400.00 | VI. | Finance Charges (Interest) | |
| | b) Institutional Overhead | 2,03,40,956.00 | 66,88,288.00 | 66,88,288.00 | | | |
| | c) Rent | - | 11,80,076.57 | 11,80,076.57 | VII. | Other Payments (Specify) | |
| | d) Licensee fee | - | 95,322.09 | 95,322.09 | | a) Advances to Staffs | - |
| | e) CHSS | - | 2,47,469.00 | 2,47,469.00 | | b) Advances to Projects | - |
| | f) Misc Income | 2,08,515.90 | 22,99,824.00 | 22,99,824.00 | | c) Training/Others | 1,84,42,567.89 |
| VI. | Amount Borrowed | | | | | d) Payment of Recoveries | 7,94,05,505.00 |
| | | - | - | - | | e) Security Deposits | 18,13,813.00 |
| VII. | Any other receipts (give details) | | | | | f) ISTRAC Expenses | 44,73,020.00 |
| | | | | | | | 44,86,021.00 |

| | | | | | | |
|---|--------------------------|--------------------------|--------------|---|--------------------------|--------------------------|
| a) Other Receipt | 4,38,23,512.00 | 6,97,78,971.79 | | g) DWR Cheerapunji/ NER-DRR Deposits | 1,00,50,714.00 | 92,05,771.00 |
| b) Recovery of Advances and Deposits from: | | | | | | |
| i) Staffs (Cont., Imprest, TA/ DA & LTC Advance) | 5,79,730.89 | 1,66,468.00 | | | | |
| ii) Others Receipts from Collaborative Agency | 9,92,55,863.00 | 2,91,25,369.00 | | | | |
| c) Receipts on ISRO Projects | 93,50,956.00 | 2,23,55,925.00 | | | | |
| d) Receipts on USER Projects | 4,17,71,464.10 | 5,04,70,503.00 | VIII. | Closing Balances | | |
| e) Trainings | 32,00,755.00 | 25,31,074.00 | | a) Cash in Hand | - | - |
| f) UAV Activities | 24,90,513.00 | 43,28,514.00 | | b) Bank Balances: | | |
| g) Receipts on "PoA Dos Bangalore" | - | 1,02,38,904.00 | | i) In Current Accounts | 3,31,22,943.77 | 3,57,56,047.17 |
| h) Receipts on "PoA NEC Shillong" | - | 9,10,95,783.00 | | ii) In Deposit Account | 17,70,81,831.00 | 15,85,29,540.49 |
| i) Security Deposits | 50,76,854.00 | 54,21,014.00 | | iii) In Savings Account | 21,76,36,501.53 | 21,67,16,006.22 |
| J) Income generate from Grant-In-Aid | 16,79,271.21 | - | | | | |
| TOTAL | 1,22,18,18,922.98 | 1,10,19,91,474.70 | | TOTAL | 1,22,18,18,922.98 | 1,10,19,91,474.70 |

This is the Receipts & Payments Account referred to in our report of even date

for **L Kant & Co**
Chartered Accountants

Sd/-
(L K Modi)
PARTNER
UDIN: 254116508MLKBT1030

Date: 25.06.2025

for and on behalf of
NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(SUBAKORDOR SYIEMLIEH)
ACCOUNTS OFFICER

Sd/-
(DR SHIV PRASAD AGGARWAL)
DIRECTOR



भारत सरकार / GOVERNMENT OF INDIA
अंतरिक्ष विभाग / DEPARTMENT OF SPACE
उत्तर-पूर्वी अंतरिक्ष उपयोग केंद्र / NORTH EASTERN SPACE APPLICATIONS CENTRE
उमियम / UMIAM - 793103, मेघालय / MEGHALAYA

SCHEDULE FORMING PART OF BALANCE SHEET AS AT 31-MARCH-2025

(Amount - ₹)

| SCHEDULE 1 - CORPUS/ CAPITAL FUND: | CURRENT YEAR | | PREVIOUS YEAR | |
|--|-------------------|------------------------|-------------------|------------------------|
| Balance as at the beginning of the year | 61,67,21,204.95 | | 51,82,82,490.98 | |
| Add/(Deduct) : Balance of net income/(expenditure) transferred from the Income and Expenditure Account | (13,64,33,303.99) | | (11,36,53,362.31) | |
| Add: GIA for Creation of Capital Asset for FY 2021-22 & 2022-23 | - | | 11,04,90,436.28 | |
| Add: GIA for Creation of Capital Asset during the year | 6,08,65,000.00 | | 7,64,48,927.00 | |
| Add: GIA for General (Capitalised) during the year | 40,93,627.00 | | 51,52,713.00 | |
| Add: GIA for Creation of Capital Asset - NEC | 87,45,987.00 | 55,39,92,514.96 | 2,00,00,000.00 | 61,67,21,204.95 |
| BALANCE AS AT THE YEAR END | | 55,39,92,514.96 | | 61,67,21,204.95 |
| | | | | |
| SCHEDULE 2 - RESERVES AND SURPLUS: | CURRENT YEAR | | PREVIOUS YEAR | |
| 1. Capital Reserve: | | | | |
| As per last Account | - | | - | |
| Addition during the year | - | | - | |
| Less: Deductions during the year | - | - | - | - |
| 2. Revaluation Reserve: | | | | |
| As per last Account | - | | - | |
| Addition during the year | - | | - | |



| | | | | |
|----------------------------------|---|---|---|---|
| Less: Deductions during the year | - | - | - | - |
| 3. Special Reserves: | | | | |
| As per last Account | - | - | - | - |
| Addition during the year | - | - | - | - |
| Less: Deductions during the year | - | - | - | - |
| 4. General Reserve: | | | | |
| As per last Account | - | - | - | - |
| Addition during the year | - | - | - | - |
| Less: Deductions during the year | - | - | - | - |
| TOTAL | | - | | - |

for **L Kant & Co**
Chartered Accountants

for and on behalf of
NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(L K Modi)
PARTNER
UDIN: 25411650BMLKBT1030

Sd/-
(SUBAKORDOR SYIEMLIEH)
ACCOUNTS OFFICER

Sd/-
(DR SHIV PRASAD AGGARWAL)
DIRECTOR

Date: 25.06.2025

भारत सरकार / GOVERNMENT OF INDIA
अंतरिक्ष विभाग / DEPARTMENT OF SPACE
उत्तर-पूर्वी अंतरिक्ष उपयोग केंद्र / NORTH EASTERN SPACE APPLICATIONS CENTRE
उमियम / UMIAM - 793103, मेघालय / MEGHALAYA
SCHEDULE FORMING PART OF BALANCE SHEET AS AT 31-MARCH-2025

(Amount - ₹)

| SCHEDULE 3 – EARMARKED/ENDOWMENT FUNDS | FUND-WISE BREAK UP | | | | TOTALS | |
|--|--------------------|---------|---------|---------|--------------|---------------|
| | Fund WW | Fund XX | Fund YY | Fund ZZ | Current Year | Previous Year |
| a) Opening balance of the funds | | | | | - | - |
| b) Additions to the Funds: | | | | | - | - |
| i) Donations/grants | | | | | - | - |
| ii) Income from investments made on account of funds | | | | | - | - |
| iii) Other additions (specify nature) | | | | | - | - |
| TOTAL (a+b) | | | | | - | - |
| c) Utilisation/Expenditure towards objectives of funds | | | | | | |
| i) Capital Expenditure | | | | | - | - |
| - Fixed Assets | | | | | - | - |
| - Others | | | | | - | - |
| ii) Revenue Expenditure | | | | | - | - |
| - Salaries, Wages and allowances etc. | | | | | - | - |
| - Rent | | | | | - | - |
| - Other Administrative expenses | | | | | - | - |
| Total | | | | | - | - |
| TOTAL (c) | | | | | - | - |
| NET BALANCE AS AT THE YEAR-END (a + b - c) | | | | | - | - |

for L Kant & Co
Chartered Accountants

Sd/-
(L K Modi)
PARTNER

UDIN: 25411650BMLKBT1030

Date: 25.06.2026

for and on behalf of
NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(SUBAKORDOR SYIEMLIEH)
ACCOUNTS OFFICER

Sd/-
(DR SHIV PRASAD AGGARWAL)
DIRECTOR



भारत सरकार / GOVERNMENT OF INDIA
अंतरिक्ष विभाग / DEPARTMENT OF SPACE
उत्तर-पूर्वी अंतरिक्ष उपयोग केंद्र / NORTH EASTERN SPACE APPLICATIONS CENTRE
उमियम / UMIAM - 793103, मेघालय / MEGHALAYA

SCHEDULE FORMING PART OF BALANCE SHEET AS AT 31-MARCH-2025

(Amount - ₹)

| SCHEDULE 4 – SECURED LOANS AND BORROWINGS: | CURRENT YEAR | | PREVIOUS YEAR | |
|---|---------------------|-------------|----------------------|-------------|
| 1. Central Government | | 0.00 | | 0.00 |
| 2. State Government (Specify) | | 0.00 | | 0.00 |
| 3. Financial Institutions | | | | |
| a) Term Loans | 0.00 | | 0.00 | |
| b) Interest accrued and due | 0.00 | 0.00 | 0.00 | 0.00 |
| 4. Banks: | | | | |
| a) Term Loans | 0.00 | | 0.00 | |
| - Interest accrued and due | 0.00 | | 0.00 | |
| b) Other Loans (specify) | 0.00 | | 0.00 | |
| - Interest accrued and due | 0.00 | 0.00 | 0.00 | 0.00 |
| 5. Other Institutions and Agencies | | 0.00 | | 0.00 |
| 6. Debentures and Bonds | | 0.00 | | 0.00 |
| 7. Others (Specify) | | 0.00 | | 0.00 |
| TOTAL | | 0.00 | | 0.00 |

Note: Amounts due within one year

for **L Kant & Co**
Chartered Accountants

Sd/-
(L K Modi)
PARTNER
UDIN: 25411650BMLKBT1030

for and on behalf of
NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(SUBAKORDOR SYIEMLIH)
ACCOUNTS OFFICER

Sd/-
(DR SHIV PRASAD AGGARWAL)
DIRECTOR

Date: 25.06.2025

भारत सरकार / GOVERNMENT OF INDIA
अंतरिक्ष विभाग / DEPARTMENT OF SPACE
उत्तर-पूर्वी अंतरिक्ष उपयोग केंद्र / NORTH EASTERN SPACE APPLICATIONS CENTRE
उमियम / UMIAM - 793103, मेघालय / MEGHALAYA

SCHEDULE FORMING PART OF BALANCE SHEET AS AT 31-MARCH-2025

(Amount - ₹)

| SCHEDULE 5 – UNSECURED LOANS AND BORROWINGS: | CURRENT YEAR | PREVIOUS YEAR |
|---|---------------------|----------------------|
| 1. Central Government | - | - |
| 2. State Government (Specify) | - | - |
| 3. Financial Institutions | - | - |
| 4. Banks: | | |
| a) Term Loans | - | - |
| b) Other Loans (specify) | - | - |
| 5. Other Institutions and Agencies | - | - |
| 6. Debentures and Bonds | - | - |
| 7. Fixed Deposits | - | - |
| 8. Others (Specify) | - | - |
| TOTAL | - | - |
| Note: Amounts due within one year | | |
| SCHEDULE 6 – DEFERRED CREDIT LIABILITIES: | CURRENT YEAR | PREVIOUS YEAR |
| a) Acceptances secured by hypothecation of capital equipment and other assets | - | - |
| b) Others | - | - |
| (i) Caution Money | - | - |
| (ii) Earnest Money Deposits | - | - |
| (iii) Security Deposits | - | - |
| (iv) Withheld Amounts from contractors | - | - |
| TOTAL | - | - |

Note: Amounts due within one year

for **L Kant & Co**
Chartered Accountants

Sd/-
(L K Modi)
PARTNER

UDIN: 25411650BMLKBT1030

Date: 25.06.2025

for and on behalf of
NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(SUBAKORDOR SYIEMLIH)
ACCOUNTS OFFICER

Sd/-
(DR SHIV PRASAD AGGARWAL)
DIRECTOR



भारत सरकार / GOVERNMENT OF INDIA
अंतरिक्ष विभाग / DEPARTMENT OF SPACE
उत्तर-पूर्वी अंतरिक्ष उपयोग केंद्र / NORTH EASTERN SPACE APPLICATIONS CENTRE
उमियम / UMIAM - 793103, मेघालय / MEGHALAYA

SCHEDULE FORMING PART OF BALANCE SHEET AS AT 31-MARCH-2025

(Amount - ₹)

| SCHEDULE 7 – CURRENT LIABILITIES AND PROVISIONS | CURRENT YEAR | | PREVIOUS YEAR | |
|---|-----------------|---|-----------------|---|
| | | | | |
| A. CURRENT LIABILITIES | | | | |
| 1. Acceptances | - | | - | |
| 2. Sundry Creditors: | | | | |
| a) For Goods | - | | - | |
| b) Others | - | - | - | - |
| 3. Advances Received | | | | |
| 4. Interest accrued but not due on: | | | | |
| a) Secured Loans borrowings | - | | - | |
| b) Unsecured Loans/borrowings | - | - | - | - |
| 5. Statutory Liabilities: | | | | |
| a) Overdue | - | | - | |
| b) Others | - | - | - | - |
| 6. Other current Liabilities | | | | |
| a) Establishment Expenses | 1,22,47,851.00 | | 1,90,08,550.00 | |
| b) Other Administrative Expenses | 1,47,42,857.00 | | 8,19,912.00 | |
| c) Others | 80,69,231.00 | | 67,26,124.00 | |
| d) Audit Fee | 87,900.00 | | 1,29,200.00 | |
| e) User Projects | 12,19,16,909.65 | | 10,79,64,864.34 | |
| f) ISRO Projects | 2,98,01,638.11 | | 4,09,89,480.11 | |
| g) NEC Projects | - | | 2,45,561.00 | |
| h) ISTRAC | 46,37,782.00 | | 74,82,021.00 | |
| i) ISRO HQ | 18,03,457.00 | | 78,45,379.00 | |
| j) Other Organisation | 47,08,621.00 | | 59,08,231.00 | |
| k) Statutory Recoveries payable | 4,04,662.00 | | 1,153.00 | |
| (l) Caution Money | 49,000.00 | | 49,000.00 | |



| | | | | |
|--|--------------|------------------------|--------------|------------------------|
| (m) Earnest Money Deposits | 33,12,065.00 | | 26,62,064.00 | |
| (n) Security Deposits | 46,24,623.00 | | 24,77,802.00 | |
| (o) Withheld Amounts from contractors | 54,00,000.00 | | 49,25,000.00 | |
| (p) Earning from GIA/ other receipt from TSA | 71,50,847.10 | | | |
| | - | 21,89,57,443.86 | | 20,72,34,341.45 |
| TOTAL (A) | | 21,89,57,443.86 | | 20,72,34,341.45 |
| B. PROVISIONS | | | | |
| 1. For Taxation | | - | | - |
| 2. Gratuity | | 5,49,73,091.00 | | 4,70,07,642.00 |
| 3. Superannuation Pension | | 20,94,47,758.00 | | 18,12,94,533.00 |
| 4. Accumulated Leave Encashment | | 5,90,16,009.00 | | 4,99,57,450.00 |
| 5. Trade Warranties Claims | | - | | - |
| 6. Others (Specify) | | - | | - |
| TOTAL (B) | | 32,34,36,858.00 | | 27,82,59,625.00 |
| TOTAL (A+B) | | 54,23,94,301.86 | | 48,54,93,966.45 |

for **L Kant & Co**
Chartered Accountants

Sd/-
(L K Modi)
PARTNER

UDIN: 25411650BMLKBT1030

Date: 25.06.2025

for and on behalf of
NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(SUBAKORDOR SYIEMLIH)
ACCOUNTS OFFICER

Sd/-
(DR SHIV PRASAD AGGARWAL)
DIRECTOR

भारत सरकार / GOVERNMENT OF INDIA अंतरिक्ष विभाग / DEPARTMENT OF SPACE
उत्तर-पूर्व अंतरिक्ष उपयोग केंद्र / NORTH EASTERN SPACE APPLICATIONS CENTRE
उमियम / UMIAM - 793103, मेघालय / MEGHALAYA

SCHEDULE FORMING PART OF BALANCE SHEET AS AT 31-MARCH-2025

SCHEDULE 8 – FIXED ASSETS

(Amount - ₹)

| Sl. No | DESCRIPTION Particular | GROSS BLOCK Cost/Valuation as at the beginning of the year | Additions during the year | Deductions during the year | Cost/Valuation as at the end of the year | Rate (%) | DEPRECIATION As at the beginning of the year | On additions during the year | On deduction during the year | Total up to the year-end | NET BLOCK "As at the Current year-end" | As at the previous year-end |
|--------|-------------------------------------|--|---------------------------|----------------------------|--|----------|--|------------------------------|------------------------------|--------------------------|--|-----------------------------|
| | | 1 | 4 | 5 | 7=(3+4-5-6) | | 8 | 10 | 11 | 12=(8+9+10-11) | 13=(7-12) | 14 |
| 1 | Land & Land Development | 5,02,62,139.00 | - | - | 5,02,62,139.00 | 0% | - | - | - | - | 5,02,62,139.00 | 5,02,62,139.00 |
| 2 | Boundary of New Land | 89,42,015.00 | - | - | 89,42,015.00 | 10% | 33,05,106.00 | 8,45,537.00 | - | 41,50,643.00 | 47,91,372.00 | 82,88,834.00 |
| 3 | Renovation of lease Buildings | 52,40,087.00 | - | - | 52,40,087.00 | 10% | 46,22,642.00 | 92,617.00 | - | 47,15,259.00 | 5,24,828.00 | 5,48,840.00 |
| 4 | Machinery & Equipment | 93,30,802.00 | - | - | 93,30,802.00 | 15% | 87,63,069.00 | 1,27,740.00 | - | 88,90,809.00 | 4,39,993.00 | 4,67,545.00 |
| 5 | Furniture & Fixtures | 3,43,15,377.76 | 15,643.00 | - | 3,43,31,020.76 | 10% | 1,85,69,821.76 | 23,62,615.00 | - | 2,09,32,436.76 | 1,33,98,584.00 | 1,79,29,943.00 |
| 6 | Office Equipments | 1,31,37,212.00 | 16,88,667.00 | - | 1,48,25,879.00 | 15% | 74,89,708.00 | 16,19,881.00 | - | 91,09,589.00 | 57,16,290.00 | 83,79,572.00 |
| 7 | Computer & Peripherals | 7,91,47,755.60 | 38,04,987.00 | - | 8,29,52,742.60 | 40% | 6,80,15,193.60 | 74,40,534.00 | - | 7,54,55,727.60 | 74,97,015.00 | 2,09,81,382.00 |
| 8 | Library Books | 6,70,57,292.49 | 39,82,433.00 | - | 7,10,39,725.49 | 40% | 6,42,03,273.93 | 27,15,669.00 | - | 6,69,18,942.93 | 41,20,782.56 | 35,26,564.84 |
| 9 | Telephones Installation | 21,85,430.00 | - | - | 21,85,430.00 | 15% | 15,22,761.00 | 1,49,100.00 | - | 16,71,861.00 | 5,13,569.00 | 8,28,928.00 |
| 10 | Other Equipments | 22,88,00,387.96 | 3,71,70,455.00 | - | 26,59,70,842.96 | 15% | 9,38,69,585.00 | 3,45,98,974.00 | - | 12,84,68,559.00 | 13,75,02,283.96 | 22,78,96,147.96 |
| 11 | NE-SAC Complex | 18,71,25,312.00 | - | - | 18,71,25,312.00 | 10% | 12,52,72,326.00 | 92,71,948.00 | - | 13,45,50,274.00 | 5,25,75,038.00 | 6,03,08,779.00 |
| 12 | Vehicles | 60,50,214.00 | - | - | 60,50,214.00 | 15% | 21,77,961.00 | 8,71,257.00 | - | 30,49,218.00 | 30,00,996.00 | 62,97,029.00 |
| 13 | Air Conditioner (Heating & Cooling) | 40,53,381.00 | 20,59,794.00 | - | 61,13,175.00 | 15% | 23,84,092.00 | 5,30,075.00 | - | 29,14,167.00 | 31,99,008.00 | 18,65,078.00 |
| 14 | Apple I-Pad | 71,250.00 | - | - | 71,250.00 | 15% | 60,221.00 | 2,481.00 | - | 62,702.00 | 8,548.00 | 9,083.00 |
| 15 | Aquarium | 35,630.00 | - | - | 35,630.00 | 15% | 30,115.00 | 1,241.00 | - | 31,356.00 | 4,274.00 | 4,542.00 |
| 16 | CSFBarrack | 27,08,604.00 | - | - | 27,08,604.00 | 10% | 15,40,053.00 | 1,75,283.00 | - | 17,15,336.00 | 9,93,268.00 | 10,38,712.00 |
| 17 | Motorised Treadmill | 1,26,000.00 | - | - | 1,26,000.00 | 15% | 1,06,496.00 | 4,389.00 | - | 1,10,885.00 | 15,115.00 | 16,062.00 |
| 18 | SMF Batteries | 15,12,600.00 | - | - | 15,12,600.00 | 15% | 10,32,008.00 | 1,08,133.00 | - | 11,40,141.00 | 3,72,459.00 | 3,95,782.00 |
| 19 | Water Dispenser | 1,02,200.00 | - | - | 1,02,200.00 | 15% | 63,245.00 | 8,765.00 | - | 72,010.00 | 30,190.00 | 32,080.00 |
| 20 | Wifi Connectivity | 14,45,666.00 | - | - | 14,45,666.00 | 15% | 9,00,387.00 | 1,22,688.00 | - | 10,23,075.00 | 4,22,591.00 | 4,49,053.00 |

| | | | | | | | | | | | | |
|----|---------------------------------|--------------------------|------------------------|------------------|--------------------------|-----|------------------------|------------------------|--------------------|------------------------|------------------------|------------------------|
| 21 | Residential Guest House Complex | 15,97,49,009.00 | - | - | 15,97,49,009.00 | 10% | 7,90,12,716.00 | 1,21,10,444.00 | - | 9,11,23,160.00 | 6,86,25,849.00 | 7,17,65,594.00 |
| 22 | Outreach Facilities | 22,58,55,540.00 | - | - | 22,58,55,540.00 | 10% | 10,36,62,495.00 | 1,83,28,957.00 | - | 12,19,91,452.00 | 10,38,64,088.00 | 10,86,16,040.00 |
| 23 | CISF Quarter/Barrack | 9,69,79,654.00 | - | - | 9,69,79,654.00 | 10% | 3,95,29,268.00 | 86,17,558.00 | - | 4,81,46,826.00 | 4,88,32,828.00 | 5,10,67,010.00 |
| 24 | Residential Complex Phase II | 6,77,54,132.00 | - | - | 6,77,54,132.00 | 10% | 2,27,59,154.00 | 67,49,247.00 | - | 2,95,08,401.00 | 3,82,45,731.00 | 4,03,01,716.00 |
| 25 | Creche Building | 6,67,629.00 | - | - | 6,67,629.00 | 10% | 2,29,598.00 | 65,705.00 | - | 2,95,303.00 | 3,72,326.00 | 3,89,361.00 |
| 26 | Computer Software | 1,64,77,780.00 | 1,62,36,648.00 | - | 3,27,14,428.00 | 40% | 1,08,37,882.00 | 68,57,580.00 | - | 1,76,95,462.00 | 1,50,18,966.00 | 1,06,65,837.00 |
| 27 | Annex Building Office | 4,09,23,202.00 | - | - | 4,09,23,202.00 | 10% | 89,27,730.00 | 47,99,321.00 | - | 1,37,27,051.00 | 2,71,96,151.00 | 4,37,26,734.00 |
| | Capital Work In Progress: | | | | | | | | | | | |
| 29 | Multi-Convention Centre | 3,24,36,952.00 | 3,47,96,954.00 | - | 6,72,33,906.00 | 0% | - | - | - | - | 6,72,33,906.00 | 3,24,36,952.00 |
| | TOTAL FOR CURRENT YEAR | 1,34,24,93,253.81 | 9,97,55,581.00 | - | 1,44,22,48,834.81 | | 66,88,86,907.29 | 11,85,83,739.00 | - | 78,74,70,646.29 | 65,47,78,188.52 | 76,84,95,339.80 |
| | TOTAL FOR PREVIOUS YEAR | 1,23,06,72,210.81 | 11,27,12,672.00 | 94,400.00 | 1,34,24,93,253.81 | - | 59,13,82,970.29 | 7,82,04,777.00 | 7,00,840.00 | 66,88,86,907.29 | 67,36,06,346.52 | 54,62,80,401.24 |

for **L Kant & Co**
Chartered Accountants

Sd/-
(L K Modi)
PARTNER

UDIN: 254116508MLKBT1030

Date: 25.06.2025

for and on behalf of

NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(SUBAKORDOR SYIEMLIEH)
ACCOUNTS OFFICER

Sd/-
(DR SHIV PRASAD AGGARWAL)
DIRECTOR



भारत सरकार / GOVERNMENT OF INDIA
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उमियम / UMIAM - 793103, मेघालय / MEGHALAYA

SCHEDULE FORMING PART OF BALANCE SHEET AS AT 31-MARCH-2025

(Amount - ₹)

| SCHEDULE 9 – INVESTMENTS FROM EARMARKED/ ENDOWMENT FUNDS | CURRENT YEAR | PREVIOUS YEAR |
|---|---------------------|----------------------|
| 1. In Government Securities | - | - |
| 2. Other approved Securities | - | - |
| 3. Shares | - | - |
| 4. Debentures and Bonds | - | - |
| 5. Subsidiaries and Joint Ventures | - | - |
| 6. Others (to be specified) | - | - |
| TOTAL | - | - |
| | | |
| SCHEDULE 10 – INVESTMENTS - OTHERS | CURRENT YEAR | PREVIOUS YEAR |
| 1. In Government Securities | - | - |
| 2. Other approved Securities | - | - |
| 3. Shares | - | - |
| 4. Debentures and Bonds | - | - |
| 5. Subsidiaries and Joint Ventures | - | - |
| 6. Others (to be specified) | - | - |
| TOTAL | - | - |

for **L Kant & Co**
Chartered Accountants

Sd/-
(L K Modi)
PARTNER

UDIN: 25411650BMLKBT1030

Date: 25.06.2025

for and on behalf of
NORTH EASTERN SPACE APPLICATIONS CENTRE

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उमियम / UMIAM - 793103, मेघालय / MEGHALAYA

SCHEDULE FORMING PART OF BALANCE SHEET AS AT 31-MARCH-2025

(Amount - ₹)

| SCHEDULE 11 – CURRENT ASSETS, LOANS, ADVANCES ETC. | CURRENT YEAR | | PREVIOUS YEAR | |
|---|-----------------|------------------------|-----------------|------------------------|
| A. CURRENT ASSETS: | | | | |
| 1. Inventories: | | | | |
| a) Stores and Spares | 13,56,101.00 | | - | |
| b) Loose Tools | - | | - | |
| c) Stock-in-trade | | | | |
| Finished Goods | - | | - | |
| Work-in-progress | - | | - | |
| Raw Materials | - | 13,56,101.00 | - | - |
| 2. Sundry Debtors: | | | | |
| a) Debts Outstanding for a period exceeding six months | - | | - | |
| b) Others | - | - | - | - |
| 3. Cash balances in hand (including cheques/drafts and imprest) | - | - | - | - |
| 4. Bank Balances: | | | | |
| a) With Scheduled Banks: | | | | |
| - On Current Accounts | 3,31,22,943.77 | | 3,57,56,047.17 | |
| - On Deposit Accounts (includes margin money) | 17,70,81,831.00 | | 15,85,29,540.49 | |
| - On Savings Accounts | 21,76,36,501.53 | 42,78,41,276.30 | 21,67,16,006.22 | 41,10,01,593.88 |
| b) With non-Scheduled Banks: | | | | |
| - On Current Accounts | - | | - | |
| - On Deposit Accounts | - | | - | |
| - On Savings Accounts | - | - | - | - |
| 5. Post Office - Savings Accounts | | | - | - |
| TOTAL (A) | | 42,91,97,377.30 | | 41,10,01,593.88 |
| B. LOANS, ADVANCES AND OTHER ASSETS: | | | | |
| 1. Loans: | | | | |
| a) Staff | - | | - | |



| | | | | |
|---|--------------|------------------------|--------------|------------------------|
| b) Other Entities engaged in activities/objectives similar to that of the Entity | - | | - | |
| c) Other (specify) | - | - | - | - |
| 2. Advances and other amounts recoverable in cash or in kind or for value to be received: | | | | |
| a) On Capital Account | - | | - | |
| b) Prepayments | - | | - | |
| c) Others | | | | |
| TA/ DA / LTC | | | 1,12,818.00 | |
| Contingencies | | | 12,500.00 | |
| Imprest to Staffs | 25,000.00 | | 20,000.00 | |
| Project | 52,900.00 | | 4,14,061.00 | |
| Deposit with BSNL & NRSC | 20,79,275.00 | | 20,79,275.00 | |
| Advances to Contractors | 28,88,467.00 | 50,45,642.00 | 89,03,074.00 | 1,15,41,728.00 |
| 3. Income Accrued: | | | | |
| a) On Investments for Earmarked Endowment Funds | - | | - | |
| b) On Investments - Others | - | | - | |
| c) On Loans and Advances | - | | - | |
| d) Others (on MOD) | 45,67,931.00 | | 37,42,474.00 | |
| TDS Recoverable from IT office (includes income due unrealised - Rs) | 23,76,822.00 | 69,44,753.00 | 23,23,029.00 | 60,65,503.00 |
| 4. Claims Receivable | | 4,20,856.00 | | - |
| TOTAL (B) | | 1,24,11,251.00 | | 1,76,07,231.00 |
| TOTAL (A+B) | | 44,16,08,628.30 | | 42,86,08,824.88 |

for **L Kant & Co**
Chartered Accountants

for and on behalf of
NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(L K Modi)
PARTNER

Sd/-
(SUBAKORDOR SYIEMLIEH)
ACCOUNTS OFFICER

Sd/-
(DR SHIV PRASAD AGGARWAL)
DIRECTOR

UDIN: 25411650BMLKBT1030

Date: 25.06.2025

भारत सरकार / GOVERNMENT OF INDIA
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उमियम / UMIAM - 793103, मेघालय / MEGHALAYA

**SCHEDULE FORMING PART OF INCOME AND EXPENDITURE
ACCOUNT FOR THE YEAR ENDED 31-MARCH-2025**

(Amount - ₹)

| SCHEDULE 12 - INCOME FROM SALES/ SERVICES | Current Year | Previous Year |
|--|------------------------|------------------------|
| 1) Income from Sales | | |
| a) Sale of Finished Goods | - | - |
| b) Sale of Raw Material | - | - |
| c) Sale of Scraps | - | - |
| 2) Income from Services | | |
| a) Labour and Processing Charges | - | - |
| b) Professional/Consultancy Services | 1,53,44,611.00 | 67,01,211.00 |
| c) Agency Commission and Brokerage | - | - |
| d) Maintenance Services (Equipment/Property) | - | - |
| e) Others (Specify) | - | - |
| 1) Training Course | 18,44,842.00 | - |
| 2) Service of Scientist | 50,80,479.00 | - |
| TOTAL | 2,22,69,932.00 | 67,01,211.00 |
| | | |
| SCHEDULE 13 - GRANTS/SUBSIDIES | Current Year | Previous Year |
| (Irrevocable Grants & Subsidies Received) | | |
| 1) Central Government | 31,71,63,570.00 | 31,87,89,217.00 |
| 2) State Government (s) | - | - |
| 3) Government Agencies | - | - |
| 4) Institutions/Welfare Bodies | - | - |
| 5) International Organisations | - | - |
| 6) Others (Specify) | - | - |
| TOTAL | 31,71,63,570.00 | 31,87,89,217.00 |

for **L Kant & Co**
Chartered Accountants

Sd/-
(L K Modi)
PARTNER

UDIN: 25411650BMLKBT1030

Date: 25.06.2025

for and on behalf of
NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(SUBAKORDOR SYIEMLIH)
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उमियम / UMIAM - 793103, मेघालय / MEGHALAYA

**SCHEDULES FORMING PART OF INCOME & EXPENDITURE
FOR THE PERIOD/YEAR ENDED 31-MARCH-2025**

(Amount - ₹)

| SCHEDULE 14 – FEES/SUBSCRIPTIONS | Current Year | Previous Year |
|---|---------------------|----------------------|
| 1) Entrance Fees | - | - |
| 2) Annual Fees/Subscriptions | - | - |
| 3) Seminar/Program Fees | - | - |
| 4) Consultancy Fees | - | - |
| 5) Others (Specify) | - | - |
| TOTAL | - | - |

Note - Accounting Policies towards each item are to be disclosed

| | Investment from Earmarked Fund | | Investment - Others | |
|--|---------------------------------------|----------------------|----------------------------|----------------------|
| | Current Year | Previous Year | Current Year | Previous Year |
| SCHEDULE 15 – INCOME FROM INVESTMENTS (Income on Invest. From Earmarked/Endowment Funds transferred to Funds) | | | | |
| 1) Interest | | | | |
| a) On Govt. Securities | - | - | - | - |
| b) Other Bonds/Debentures | - | - | - | - |
| 2) Dividends: | | | | |
| a) On Shares | - | - | - | - |
| b) On Mutual Fund Securities | - | - | - | - |
| 3) Rents | - | - | - | - |
| 4) Others (Specify) | - | - | - | - |
| TOTAL | - | - | - | - |
| TRANSFERRED TO EARMARKED/ ENDOWMENT FUNDS | - | - | - | - |

for **L Kant & Co**
Chartered Accountants

Sd/-
(L K Modi)
PARTNER

UDIN: 25411650BMLKBT1030

Date: 25.06.2025

for and on behalf of
NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(SUBAKORDOR SYIEMLIH)
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**SCHEDULE FORMING PART OF INCOME & EXPENDITURE
FOR THE PERIOD/YEAR ENDED 31-MARCH-2025**

(Amount - ₹)

| SCHEDULE 16 – INCOME FROM ROYALTY, PUBLICATION ETC. | Current Year | Previous Year |
|--|---------------------|----------------------|
| 1) Income from Royalty | - | - |
| 2) Income from Publications | - | - |
| 3) Others (specify) | - | - |
| TOTAL | - | - |

| SCHEDULE 17 – INTEREST EARNED | Current Year | Previous Year |
|--|-----------------------|----------------------|
| 1) On Term Deposits: | | |
| a) With Scheduled Banks | | |
| Interest Earned | 20,04,019.00 | 31,56,319.00 |
| Interest Accrued | 17,50,867.00 | 9,76,251.00 |
| b) With Non-Scheduled Banks | - | - |
| c) With Institutions | - | - |
| d) Others | - | - |
| 2) On Savings Accounts: | | |
| a) With Scheduled Banks | 59,38,260.00 | 57,52,334.00 |
| b) With Non-Scheduled Banks | - | - |
| c) Post Office Savings Accounts | - | - |
| d) Others | - | - |
| 3) On Loans: | | |
| a) Employees/Staff | - | - |
| b) Others | - | - |
| 4) Interest on Debtors and other Receivables | 5,03,486.00 | - |
| TOTAL | 1,01,96,632.00 | 98,84,904.00 |

Note: Tax deducted at source to be indicated

for **L Kant & Co**
Chartered Accountants

Sd/-
(L K Modi)
PARTNER

UDIN: 25411650BMLKBT1030

for and on behalf of

NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(SUBAKORDOR SYIEMLIEH)
ACCOUNTS OFFICER

Sd/-
(DR SHIV PRASAD AGGARWAL)
DIRECTOR

Date: 25.06.2025

भारत सरकार / GOVERNMENT OF INDIA
अंतरिक्ष विभाग / DEPARTMENT OF SPACE
उत्तर-पूर्वी अंतरिक्ष उपयोग केंद्र / NORTH EASTERN SPACE APPLICATIONS CENTRE
उमियम / UMIAM - 793103, मेघालय / MEGHALAYA

**SCHEDULE FORMING PART OF INCOME AND EXPENDITURE ACCOUNT
FOR THE YEAR ENDED 31-MARCH-2025**

(Amount - ₹)

| SCHEDULE 18 - OTHER INCOME | Current Year | Previous Year |
|--|------------------------|------------------------|
| 1) Profit on Sale/Disposal of Assets: | | |
| a) Owned Assets | - | - |
| b) Assets acquired out of grants, or received free of cost | - | - |
| 2) Export Incentives realized | - | - |
| 3) Fees for Miscellaneous Services | - | - |
| 4) Miscellaneous Income | 9,42,525.90 | 55,88,995.66 |
| TOTAL | 9,42,525.90 | 55,88,995.66 |
| | | |
| SCHEDULE 19 - INCREASE/(DECREASE) IN STOCK OF FINISHED GOODS & WORK IN PROGRESS | Current Year | Previous Year |
| a) Closing stock | - | - |
| - Finished Goods | - | - |
| - Work -in-progress | - | - |
| b) Less: Opening Stock | | |
| - Finished Goods | - | - |
| - Work -in-progress | - | - |
| NET INCREASE/(DECREASE) [a-b] | - | - |
| | | |
| SCHEDULE 20 - ESTABLISHMENT EXPENSES | Current Year | Previous Year |
| a) Salaries | 11,62,46,713.00 | 10,80,46,799.00 |
| b) Allowances and Bonus | 2,02,63,655.00 | 1,79,33,780.00 |
| c) Contribution to Provident Fund | - | - |
| d) Contribution to Other Fund (NPS) | 88,58,004.00 | 89,91,048.00 |
| e) Expenses on Employees Retirement and Terminal Benefits | 29,57,271.00 | 28,66,981.00 |
| f) Provision for pension, Gratuity & Leave Encashment | 4,51,77,233.00 | 4,28,86,099.00 |
| | - | |
| TOTAL | 19,35,02,876.00 | 18,07,24,707.00 |

for **L Kant & Co**
Chartered Accountants

for and on behalf of
NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(L K Modi)
PARTNER

Sd/-
(SUBAKORDOR SYIEMLEH)
ACCOUNTS OFFICER

Sd/-
(DR SHIV PRASAD AGGARWAL)
DIRECTOR

UDIN: 25411650BMLKBT1030

Date: 25.06.2025

भारत सरकार / GOVERNMENT OF INDIA
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उमियम / UMIAM - 793103, मेघालय / MEGHALAYA

SCHEDULE FORMING PART OF INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31-MARCH-2025

(Amount - ₹)

| | SCHEDULE 21 - OTHER ADMINISTRATIVE EXPENSES ETC. | Current Year | Previous Year |
|----|--|----------------|----------------|
| 1 | Purchases of fixed assets from Govt Grant-General | 40,93,627.00 | 51,52,713.00 |
| 2 | Labour and processing expenses | | - |
| 3 | Cartage and Carriage Inwards | | - |
| 4 | Electricity and power | 1,39,76,534.00 | 1,02,28,969.21 |
| 5 | Water charges | 2,26,622.00 | 1,51,533.00 |
| 6 | Insurance | | - |
| 7 | Repairs and maintenance | 1,21,31,699.00 | 1,61,14,905.00 |
| 8 | Excise Duty | - | - |
| 9 | Rent, Rates and Taxes | 6,18,625.00 | 8,21,449.00 |
| 10 | Vehicles running and maintenance | 44,32,176.00 | 56,42,445.00 |
| 11 | Postage, Telephone and Communication Charges | 18,56,565.00 | 11,93,479.00 |
| 12 | Printing and Stationary | 30,18,265.00 | 24,58,522.00 |
| 13 | Travelling and Conveyance Expenses | 54,64,304.00 | 33,61,616.00 |
| 14 | Expenses on Seminar/Workshops/Other Notable Events | 32,27,009.00 | 4,55,899.00 |
| 15 | Subscription Expenses (books & periodicals) | 86,166.00 | 86,065.00 |
| 16 | Expenses on Fees | - | - |
| 17 | Auditors Remuneration | - | - |
| 18 | Professional Charges | 4,79,056.00 | 4,59,277.00 |
| 19 | Provision for Bad and Doubtful debts/advances | - | - |
| 20 | Irrecoverable balances written - off | 1,39,566.00 | - |
| 21 | Maintenance of Office/ Guesthouse/ Equipments | 3,10,225.00 | - |
| 22 | Freight and Forwarding Expenses | - | - |
| 23 | Advertisement & Publicity | 10,00,610.00 | 8,87,891.00 |

| | | | | |
|----|--|----------------|------------------------|------------------------|
| 24 | Bank Charges | 17,091.89 | 25,907.76 | |
| 25 | Maintenance of Garden | 1,22,727.00 | 1,39,289.00 | |
| 26 | Project Expenses [In-house] | 25,91,000.00 | 60,75,069.00 | |
| 27 | Medical Expenses | 34,10,976.00 | 23,98,127.00 | |
| 28 | DWR Cherrapunji Expenses | 26,44,335.00 | 38,25,845.00 | |
| 29 | Other Charges | 12,83,239.00 | 13,05,847.00 | |
| 30 | Sanitary Items | 5,04,482.00 | 8,40,629.00 | |
| 31 | Implementation of Hindi | 2,53,450.00 | 11,000.00 | |
| 32 | Annual Maintenance Contracts | 1,21,57,363.00 | 1,47,29,989.00 | |
| 33 | Miscellaneous Expenses | 500.00 | 17,89,418.00 | |
| 34 | Operational Charges & Maintenance of Canteen | 10,01,534.00 | 11,44,075.00 | |
| 35 | POL | 27,62,280.00 | 77,04,221.00 | |
| 36 | Outsourced DEO | 68,56,800.00 | 55,19,241.00 | |
| 37 | Outsourced Electrician | 34,94,400.00 | 32,37,575.00 | |
| 38 | Outsourced Worker for Various Services | 2,88,36,200.00 | 2,45,70,024.00 | |
| 39 | Wages of Security Guard | 59,33,259.00 | 59,61,528.00 | |
| 40 | CISF Salary | 5,42,09,566.00 | 4,99,44,536.00 | |
| 41 | DWR- Outsourced worker | 40,38,043.00 | 18,11,78,294.89 | |
| 42 | Prior Period Expenses | | 25,28,719.00 | |
| 43 | Staff Welfare Expenses | | 2,54,675.00 | 18,24,23,401.97 |
| 44 | Less: Closing stock as on 31.03.2025 | | 13,56,101.00 | - |
| 45 | Less: Amount Capitalised from General Fund | | 40,93,627.00 | 51,52,713.00 |
| | TOTAL | | 17,57,28,566.89 | 17,72,70,688.97 |

for **L Kant & Co**
Chartered Accountants

Sd/-
(L K Modi)
PARTNER
UDIN: 254116508MLKBT1030

Date: 25.06.2025

for and on behalf of

NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(SUBAKORDOR SYIEMLIEH)
ACCOUNTS OFFICER

Sd/-
(DR SHIV PRASAD AGGARWAL)
DIRECTOR

* Note: Assets worth Rs. 40,93,627/- has been transferred to capital fund i.e. Schedule 1- Capital Fund and Schedule 8- Fixed Assets



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उमियम / UMIAM - 793103, मेघालय / MEGHALAYA

**SCHEDULES FORMING PART OF INCOME & EXPENDITURE
FOR THE PERIOD/YEAR ENDED 31-MARCH-2025**

(Amount - ₹)

| SCHEDULE 22 – EXPENDITURE ON GRANTS, SUBSIDIES ETC. | Current Year | Previous Year |
|---|---------------------|----------------------|
| a) Grants given to Institutions/Organisations | - | - |
| b) Subsidies given to Institutions/Organisations | - | - |
| TOTAL | - | - |
| Note - Name of the Entities, their Activities alongwith the amount of Grants/Subsidies are to be disclosed. | | |
| | | |
| SCHEDULE 23 – INTEREST | Current Year | Previous Year |
| a) On Fixed Loans | - | - |
| b) On Other Loans (including Bank Charges) | - | - |
| c) Others (Interest Remitted to CFI through DOS) | - | - |
| TOTAL | - | - |

for **L Kant & Co**
Chartered Accountants

for and on behalf of
NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(L K Modi)
PARTNER

Sd/-
(SUBAKORDOR SYIEMLIEH)
ACCOUNTS OFFICER

Sd/-
(DR SHIV PRASAD AGGARWAL)
DIRECTOR

UDIN: 25411650BMLKBT1030

Date: 25.06.2025

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SCHEDULES FORMING PART OF THE ACCOUNTS FOR THE YEAR ENDED 31-MARCH-2025

SCHEDULE 24 – SIGNIFICANT ACCOUNTING POLICIES

1. **Accounting Convention:-** The Financial statements have been prepared on the basis of historical cost convention and on accrual method of accounting. The center prepares the financial statement as per common prescribed format of account issued by the Ministry of Finance.
2. **Revenue Recognition:** - The Centre receives the Grant-in-aid from the Government of India under OH-31 General Expenses, OH-36 Salary and Retirement benefit expenses and OH-35 Capital Expenditure for creation of Fixed Assets during the current year and the same is accounted for on Accrual Basis. The procedure is also followed for Deposit works from user agencies.
3. **Fixed Assets And Depreciation**
 - 3.1 Fixed Assets has been stated at paid value of cost and accounted for at historical cost only.
 - 3.2 Depreciation on assets acquired during the year is provided for as under:
 - Assets acquired up to 30.09.24 – 100% as per the applicable rate.
 - Assets acquired after 30.09.24– 50% as per the applicable rate.
 - 3.3 Depreciation has been provided on written down value method as per the rates prescribed in the Income Tax Act 1961.
4. **Capital Work-In-Progress:** The construction works are executed by the Construction and Maintenance Division(CMD). These are valued at actual cost incurred till date on the basis of report received from the said division. Running bill s of contractors are also accounted for as Capital Work-in-Progress till completion. No depreciation is charged on Capital Work-in-Progress. Secured advances and mobilization advances are disclosed separately under the Current Assets, Loans and Advances Entries of Capital work-in-progress are made under prescribed column of Schedule-8 Fixed Assets.
5. **Retirement Benefits:-** Pension, Gratuity and Leave Encashment liability is provided on the basis of Actuarial Valuation as at the end of each financial year. The retirement benefits in respect of deputationists are accounted for on Cash basis. This provision is routed through Income & Expenditure A/c, as per prescribed in common format by Finance Ministry.
6. **Capital Fund:** Fixed assets created out of Grant-in-aid OH-35 Capital are added under Capital Fund and Fixed Assets during the year. Addition amount related to Capital work-in-progress is also added to the Capital Fund including the asset purchased from OH-31.
7. **Foreign Currency Transaction:-** Foreign exchange transaction arising during the year if any is recorded at the exchange rates prevailing at the transaction date.
- 8 **Inventories:-** Store and spares are valued at cost at the end of March of each year.

for **L Kant & Co**
Chartered Accountants

Sd/-
(L K Modi)
PARTNER

UDIN: 25411650BMLKBT1030

Date: 25.06.2025

for and on behalf of
NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(SUBAKORDOR SYIEMLIEH)
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**SCHEDULES FORMING PART OF THE ACCOUNTS
FOR THE YEAR ENDED 31-MARCH-2025**

SCHEDULE 25 – NOTES ON THE ACCOUNTS & CONTINGENT LIABILITIES

NOTES ON THE ACCOUNTS

1. The previous year's figure was re-arranged/ regrouped where ever necessary to make them comparable.
2. Pension, gratuity and leave encashment liability has been provided till 31.03.2025.
3. Prior Period Items has been disclosed separately so that the effect thereof on the net expenditure during the year is known.

- a. Repair & Maintenance: ₹ 73,288/-
- b. Telephone Charges: ₹ 2,51,733/-

4. The Centre has created assets worth ₹40,93,627 from GIA- General and the same has been capitalized and added to the capital fund.
5. Amount reflected in Schedule 7 of the Centre doesn't reflect any deposits (EMD) of more than three years. The current liabilities of the deposits stand at following:

- a. Caution Money: ₹ 49,000/-
- b. EMD: ₹ 33,12,065/-
- c. Security Deposit: ₹ 46,24,623/-
- c. Withheld Amount from the contractor: ₹ 54,00,000/-

6. The Centre had disbursed ₹ 45,00,000 as secured advances to contractor. The secured advance was guaranteed by BG valid till 24.10. 2025.
7. An amount of ₹ 1,75,00,000 has been received from NEC towards construction of Multi Convention Centre, the same is under work in progress during the year and added to the capital fund of the Centre.
8. The summary of expenditure incurred under various project has been enclosed as Annexure.
9. Schedules 1 to 25 are annexed to and form an integral part of the Balance Sheet as at 31-March-2025 and Income & Expenditure Account for the year ended as on that date.
10. Details of Project Fund position during the year:

| SI No | Funding Agency | Opening Balance | Received during the year | Expenditure during the year | Closing Balance |
|-------|----------------|-----------------|--------------------------|-----------------------------|-----------------|
| 1. | User Funded | 10,79,64,864.34 | 8,63,18,953.10 | 7,23,66,907.79 | 12,19,16,909.65 |
| 2. | ISRO Funded | 4,09,89,480.11 | 25,77,476.00 | 1,37,65,318.00 | 2,98,01,638.11 |
| 3. | NEC Funded | 2,45,561.00 | 16,84,91,878.00 | 16,87,37,439.00 | 0.00 |

In the above expenditure during the year the figures is inclusive of Rs 5,75,050 being the prior period expenses (salary of March 2024 of project associates).

11. The Centre had received Grant-in-aid amounting to ₹3907.01/- lakh under various head like: **OH-31 General** to meet out the Administrative and General Expenses, **OH-36 Salary/ Establishment and Retirement benefit**, **OH-35 Capital expenditure to create fixed assets**. During the FY 2024-25, Grant-in-aid received, utilized and unutilized is given in the table below:

(Amount ₹ in lakh)

| S.N. | Name of head of account | Received | Utilized | Unutilized |
|------|--|----------------|----------------|--------------|
| 1. | OH-31 General Expenses | 1816.81 | 1741.38 | 75.43 |
| 2. | OH-36 Salary and Retirement benefit expenses | 1481.55 | 1471.20 | 10.35 |
| 3. | OH-35 Capital for creation of Fixed Assets | 608.65 | 608.65 | 0.00 |
| | Total | 3907.01 | 3821.23 | 85.78 |

Unutilized Grant-in-aid amounting to **₹85.78** lakh has been refunded to the Government of India during the Current Year.

12. GPF Account: GPF is treated as a separate unit of the center and is separate audited statement is annexed to the financial statement.

These are the notes to Accounts referred to in our report of even date.

As per our report of even date.

for **L Kant & Co**
Chartered Accountants

for and on behalf of
NORTH EASTERN SPACE APPLICATIONS CENTRE

Sd/-
(L K Modi)
PARTNER

Sd/-
(SUBAKORDOR SYIEMLIH)
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UDIN: 25411650BMLKBT1030

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