

REPORT ON NESAC USER INTERACTION MEET **NeUIM-2022**

To promote maximum utilization of Space Science & Technology for developmental planning activities and research in NE region

May 23-24, 2022



VENUE

North Eastern Space Applications Centre
Department of Space, Government of India
Umiam, Ri Bhoi Meghalaya - 793103



VISIT US

Background

The North Eastern Space Applications Centre (NESAC) was established in September 5, 2000 at Umiam, Shillong, Meghalaya as an autonomous institution under the Department of Space (DOS), jointly with the North Eastern Council (NEC). NESAC is enabled to address the issues and challenges of the 8 North Eastern states with the support of space science and technology. NESAC provides operational remote sensing and geographic information system aided support for effective management of the abundant natural resources, rich biodiversity, infrastructure planning and monitoring etc. During the last 21 years, NESAC has generated a large volume of geospatial database and has developed a number of dashboard and mobile applications for dissemination of those databases to the different line departments of the North Eastern Region (NER) of the country for use in their governance and managements activities. In fact in the last few years, it is observed that the demand for space-based inputs and services from various user departments has greatly increased. In keeping with this development, 117 new projects involving a large number of user departments at the state and national level were conceptualized during the 9th meeting of the NESAC Society Meeting held on 24th July, 2021, of which 110 projects have been taken up as part of the Plan of Action (PoA) on the use of Space Technology in NER as envisaged by Hon'ble Union Home Minister of India. Most of the projects have already been initiated and some have already been completed. It is with this backdrop of concerted efforts at development of NER that the idea of the NESAC User Interaction Meet 2022 was mooted and planned for hosting during 23-24 May 2022 in hybrid (online or in-person) mode to understand the needs of users and prioritize the activities on possible space technology interventions in governance and research and finally get the feedback from the users on the space-based products and services that have been provided by NESAC for improvement and functional expansion.

The event was spread over the course of two days and consisted of three technical sessions, two user interaction sessions and two special sessions. A brainstorming session on “Space Technology for Governance, Academic & Research Interface and Plan for Collaboration” was also part of the special session which was conducted as per the directive of 16th Governing Council of NESAC held on 12th January, 2022.

Inaugural Programme

The inaugural event on 23 May, 2022 commenced with a lighting of the lamp followed by a welcome note by Dr. S.P. Aggarwal, Director, NESAC. The inaugural event was chaired by Shri S. Somanath, Chairman ISRO, and Secretary, Department of Space (DOS) as Chief Guest via virtual mode. During his speech, he stressed on the importance of NER of India in terms of biodiversity, natural resources as well as the data generated atop them and mentioned about the importance of betterment of governance using space and drone technology. Another point he made was regarding the expansion of outreach activities so as to spread greater awareness among the users about space technology solutions. Shri Calvin Harris Kharshiing, IA & AS, North Eastern Council (NEC) graced the occasion as Guest of Honour and he spoke at length about the history of NEC and NESAC and how this has served as an enabler to help state centres stand on their own feet with implementation of projects. He also spoke about the usefulness of the North Eastern Spatial Data Repository (NeSDR) and project monitoring portals and the fact that they were being used extensively by the state and line departments. He concluded by stating that user interaction meets are an important means of uplifting the NER to be at par with the rest of India as regards the developmental activities. The inaugural event was also elevated by the distinguished presence of the Scientific Secretary of ISRO, Shri Shantanu Bhatwadekar, Dr. Prakash Chauhan, Director, National Remote Sensing Centre (NRSC) and Dr Anil Bhardwaj, Director, Physical Research Laboratory (PRL). Shri Bhatwadekar praised NESAC for having successfully implemented more than 300 projects in the last 21 years which are currently being used extensively by

the user agencies and mentioned how NESAC has been able to carve a niche for itself in the geospatial domain by its use of geo-web services, analytics, mobile apps, UAV services and disaster management activities. He added that it is important to understand user needs not just in terms of the data used but also applications required. Dr. Chauhan mentioned the uniqueness of the problems of the region which makes user interaction particularly important. He stressed on the need to address the threats and challenges posed by climate variability as well as gaps in requirements and to identify potential to provide services to the users. He assured that NRSC shall continue to support NESAC whole heartedly in future as well. Dr Bhardwaj in his address spoke about the uniqueness of the NER region in terms of the topography, meteorology and terrain and their variations. He mentioned about collaborative efforts and the need to boost the forecasting abilities of the centre.



Shri S. Somanath, Chairman ISRO, and Secretary, Department of Space (DOS) inaugurated the NeUIM-2022 via virtual mode



Glimpses of inaugural session of NeUIM-2022

The inaugural event ended with the vote of thanks offered by Dr. KK Sarma, Scientist-SG, NESAC. The event was anchored by Dr. Kasturi Chakraborty, Scientist-SF and Shri Victor Saikhom, Scientist-SF, NESAC. Remaining sessions were anchored by Dr Rekha B Gogoi, Scientist-SE and Dr P Rocky, Scientist-SE of NESAC.



Group photo of delegates of NeUIM-2022, Former Directors of NESAC and NESAC staff

Technical Session-1: Space Technology Applications and Capabilities of ISRO/DOS

The session was chaired by Dr. Prakash Chouhan, Director, NRSC and Dr. KK Sarma served as the rapporteur. It began with a presentation by Dr. John Mathew, Associate Director (Land & Water Applications), EDPO, ISRO HQ, on *Overview of Space Programme & Societal Benefits* which provided a detailed overview of the Indian Space Programme highlighting the programmatic goals, application domains, space based inputs for sustainable development, space technology input for governance, different databases and support for disaster risk reduction, SATCOM (Satellite Communication) based telemedicine network along with the space technology spin-offs which have benefited the citizens to a large extent.



Dr. Prakash Chouhan, Director, NRSC chaired the Technical Session-1 on *Space Technology Applications and Capabilities of ISRO/DOS*

The next presentation of the session was by Ms. N Aparna, Group Director, NDC, NRSC on *Satellite Data Acquisition, Processing, Products, Archival and Dissemination*. It dealt with an overview of data available from Earth Observation satellites – from both currently operational as well as archived data from the past satellites, different need based pre-processing requirements for satellite data, value added products, data quality and evaluation and the data dissemination system followed at NDC for users. In addition, the presentation touched upon the different products available from the satellites like Cartosat 2S, Cartosat 3, EOS-04, NovaSAR etc along with their resolution specifications. The talk concluded with a highlight on the Bhoonidhi portal which is the platform for satellite data browsing and ordering from NDC. The third presentation of the session was made by Dr. Rajeev Jaiswal, Associate Director (Urban & Environment), EDPO, ISRO Hq on *Satellite Data Policy: Highlights of proposed space based remote sensing policy – 2022*. In his presentation, Dr. Jaiswal highlighted the proposed policy related to remote sensing which includes design & development of remote sensing satellite, space based systems, data collection, ground stations for telemetry and satellite data dissemination. He also underlined that the proposed policy encourages the Indian private parties to provide end-to-end services in the remote sensing domain. The purpose and functionality of IN-SPACe was also discussed. The last presentation of the session was made by Dr. SP Aggarwal, Director, NESAC on *NESAC Activities and Achievements*. The presentation provided a detailed overview of the journey of NESAC made during the last 21 years of existence. Dr. Aggarwal highlighted a brief outline of the achievements made by NESAC in its five major focus areas i.e. Remote Sensing Applications, Disaster Risk Reduction, Satellite Communication, Atmospheric and Space Science Research and Outreach and Capacity Building supplemented by details of major activities of each area.



Interaction during Technical Session

Following points have emerged from the discussion:-

- There is a need for increasing user participation in decision making in order to bring more accountability, raise quality of services and for effective utilization of space based products.
- A new remote sensing data policy is to be adopted by all the user departments for ease of access to the data and removal of bottlenecks related to procurement and use of geospatial products
- Considering the rising trend in the demand for data by user departments, satellite coverage of areas in the NER need to be improved by increasing the number of EO satellites for the region

The session ended with thanks from the Chair of Session.

Technical Session – 2A: Developmental Services of NESAC

The session was chaired by Dr. PP Nageswara Rao, Former Director, NESAC and Dr. BK Handique, Scientist-SF of NESAC served as the rapporteur. Geospatial technology applications developed and the services delivered to several users in the NER were presented by senior Thematic Scientists of NESAC.



Dr PP Nagaswara Rao, Former Director of NESAC chaired the Technical Session-2A

- Dr. BK Handique, Scientist-SF informed that under the project Coordinated Horticulture Assessment and Management using geoInformatics (CHAMAN), mapping of potential areas for the expansion of horticulture has been completed in the priority districts of NER. Geospatial technology for acreage estimation of selected crops and development of a mobile application for planning and monitoring of crop cutting experiments (CCE) and Rice Information System (MeRIS) were developed for the state of Meghalaya. Preparation of an Agro-climatic Atlas under FOCUS Project in Mizoram & Nagaland, Maize acreage estimation in NER under SUFALAM, Mapping of district wise soil fertility status of Meghalaya, assessment of soil fertility in Ri Bhoi district of Meghalaya using hyperspectral data, desertification and land degradation monitoring, vulnerability assessment, geotagging of assets created under NERTPS programme of CSB in NER, study on existence of tropical silkworm encroaches and their habitats with the help of geospatial technology etc are other important projects, which were highlighted.
- Dr. Kasturi Chakraborty, Scientist-SF informed that NESAC is providing geospatial inputs for the preparation of forest working plans for different forest divisions in NER. She further mentioned that mapping of shifting cultivation area and estimation of Jhumia population, bamboo resources, wild-life habitat analysis, forest fire risk assessment, mapping of abandoned jhum cultivation leading to forest development, wetland change detection in Deepor Beel have been carried out. She said that NESAC is encouraging usage of Google Earth Engine and hyperspectral data for several forestry and ecological applications.



Interaction with participants with regard to the possible collaboration and requirement of geospatial services

- Dr. Diganta Barman, Scientist-SF explained that in the area of hydrology and water Resources, NESAC has taken up the expansion of Flood Early Warning System (FLEWS) services to other flood prone rivers of entire NER after the successful implementation of FLEWS in Assam, where success rate of 80% was achieved at the revenue circle level with a lead time ranging from 24 to 48 hours. He further stated that as part of the Assam River Atlas project, a geoportal comprising of all the layers pertaining to water resources have been integrated. It was informed that NESAC continued monitoring and evaluation of IWMP-watersheds for NER.
- Shri Somorjit Singh, Scientist-SF informed that NESAC has given relevant inputs on site selection for construction of “The Bhupen Hazarika Setu” (Dhola–Sadiya Bridge), connecting the northeast states of Assam and Arunachal Pradesh, from the village of Dhola (Tinsukia District) in the south to Sadiya to the north, that was recently inaugurated by the Hon’ble Prime Minister of India. NESAC has completed several projects related to ground water prospecting, crustal deformation (indicators of earthquake vulnerability), surveying and mapping of mining-lease boundaries for Star Cement Ltd using DGPS. NESAC has carried out mapping of coal mining areas for planning and restoration of areas affected by coal mining in Meghalaya with the financial support of the Meghalaya State Pollution Control Board (MSPCB).
- Dr. Jenita M. Nongkynrih, Scientist-SF presented the geospatial technology-based services rendered in the areas of urban and regional planning. She gave several examples, viz., generation of spatial database layers for the Shillong Planning area under the AMRUT sub-scheme, preparation of a draft GIS-based Master Plan for the Shillong Planning area, urban sprawl monitoring, drafting of rural developmental plans in the international border area villages, urban disaster management plans, climate change and hotspot identification in urban areas.



Dr PP Nageswara Rao, Former Director of NESAC was interacting with NESAC Scientist in the exhibition area

- Shri Victor Saikhom, Scientist-SF, spoke about the usefulness of the UAVs as data collection platforms in the most cloud-covered NER whenever it is difficult to obtain very high spatial resolution satellite-sensor-based spatial data. It was informed that NESAC has five different types of UAVs, carried out 120 projects and studies for more than 20 users in the NER using UAVs. A few examples are: estimation of earth work for extension of Shillong airport, volume estimation of Khair wood logs in the depot, village resources mapping etc.
- Dr. S. S. Kundu, Scientist-SF explained the valuable services extended by the NESAC through space science and atmospheric research carried out. Using the data available from the dual-polarised S-band Doppler Weather Radar (DWR), installed at Sohra (Cherrapunjee), Meghalaya, NESAC is providing inputs for early warning of hydro-meteorological disasters, convective systems, cloud and precipitation physics, etc. A network of 17 automatic weather stations (AWS) has been set up to support flood forecasting activities. Utilizing the data from the multi-instrumented aerosol observatories (at NESAC, Umiam; Tawang, Arunachal Pradesh; and Lachung, Sikkim) set up in collaboration with Space Physics Laboratory (SPL), NESAC is able to characterise the Spatio-temporal variability of aerosols and its impact on weather and climate over the Himalayan region. Using several instruments, tethered balloon launching facility and a high-performance parallel computing system with several numerical weather prediction models installed and post-processing tools, NESAC is able to improve weather forecasting, disaster risk reduction, and better insights into the regional climate variability in the NER.
- Shri Ramani K. Das, Scientist-SF gave an insight into the services rendered by NESAC using the satellite communication (SATCOM) technologies. With the fully operational GSAT-29, the Tele-Education and Tele-Medicine services in the NER have improved. Shri Das informed that all the seven HUBs cum Teaching end and 330 Satellite Interactive Terminal (SIT) are operational in all

the NE states. NESAC is equipped with a number of Satellite Mobile Radio (SMR) and SatSleeve terminals under GSAT-6 satellite for emergency communication. The transportable VSAT system and a node under the ISRO DMS network is facilitating communication with NDMA, New Delhi and SDMA of all NER states at the time of emergency. A few satellite phones are also helping in an emergency situation.



Dr SP Aggarwal, Director, NESAC felicitated Shri Moses Chalai, IAS, Secretary, NEC who graced the occasion as Guest of Honour

During the interactions, one of the participants from Assam state requested NESAC to prepare small spring shed maps that could be a source of water during summer months. Dr. S. P. Aggarwal clarified that such work can be taken up under hydro-geomorphological mapping project of ISRO-NRSC and the inputs would be supplied to the users. Dr J. S. Parihar advised the teams working on space science and atmospheric research to take stock of the usage of the instruments, their maintenance and utilization. Shri Moses Chalai, IAS, Secretary, NEC has also graced the event. At the outset he appreciated the several layers of spatial information generated by NESAC and advised the state-level functionaries to make best use of the information in developmental planning and project monitoring and performance evaluation. He desired that all participants, especially the youth of the region, should take home the message that the NESAC has very rich spatial planning tools that should be used by the heads of the departments at state-level as well as at district-level. He recalled the recently launched Project Monitoring portal for project progress monitoring by the Hon'ble President of India. He advised the NESAC team to develop appropriate mechanisms for reaching the users in the interior areas of the NER through web-enabled information systems and satellite communication technologies.



Shri Moses Chalai, IAS, Secretary, NEC interacted with the delegates of NeUIM-2022

Following suggestions are made during the interactions:-

- The NER of country shares 98% of its border with foreign countries. Land connectivity through Myanmar and sea connectivity through Bangladesh will open up all the ways to ASEAN countries and beyond. This calls for terrain analysis and identification of corridors for connectivity using DTM and DSM by NESAC in collaboration with SRSACs of NER.
- The yield levels of horticulture crops in the NER are much lower than the national average despite having favourable agroclimatic conditions. NESAC has to extend the CHAMAN project to all major culturable lands in NER in addition to current / abandoned Jhum lands.
- There is need for assessing the benefits of SILKS project on ground and take measures to reach out to sericulture farmers of NER.
- Geosciences group of NESAC has to collaborate with Geological Survey of India (GSI) and identify thrust areas like mineral prospecting and earthquake vulnerability assessment that are not yet fully explored.
- The space and atmospheric science research team at NESAC should assess the impact of aerosols on precipitation in the upper reaches of major river basins.
- SATCOM applications should largely focus on empowering the human resources in the NER through improved access to education and health care facilities. Expansion of satellite-based telemedicine and tele-education are very critical technologies in the rugged inaccessible terrain of NER.

Technical Session-2B: Repository and Disaster Management Services

The session was chaired by Dr. S Sudhakar, Former Director, NESAC and Dr. Diganta Barman, Scientist-SF of NESAC served as the rapporteur. Dr. Sudhakar, in his opening remark expressed about the importance of geo-spatial technologies for overall management of different natural disasters and the NE Region in particular. He also requested to update the NEDRP portal which will help the district administration in their planning process.



Dr SP Aggarwal, Former Director of NESAC felicitated Dr S Sudhakar for chairing the Technical Session-2B

- The first presentation of the session was delivered by Dr. KK Sarma, Scientist-SG & DPD, NER-DRR wherein he elaborated on the activities of NER-DRR highlighting major activities such as Operational Flood Early Warning, Forest Fire Monitoring, Landslide Studies, Health GIS in Epidemics, Agricultural Damage Assessment due to Flooding, Thunderstorm & Lightning related applications etc. He also spoke briefly about the institutional linkages specific to NER-DRR during his presentation.
- The other presentation of this session was on a major governance application, North Eastern Spatial Data Repository (NeSDR). Shri Puyam S Singh, Scientist-SE elaborated on the functionalities of NeSDR and its data availability pertaining to NE region. The NeSDR is one of the major programme of NESAC taken up as per the directive of North Eastern Council (NEC)/Ministry of DoNER with the objective to establish Geospatial Network among State Remote Sensing Applications Centres (SRSACs) of NE region through augmentation of existing IT infrastructures as well as creating the catalogue of existing geospatial data generated at different scales, different time frame available with SRSACs or user and line departments. NESAC as Central Node hosts regional database including State data whereas respective State Node is responsible for State data generated by SRSACs or other Line Departments. The communication link between Central Node and respective State Node is through Virtual Private Network (VPN) to enable data cataloguing, sharing, retrieving etc. in a decentralized mode from

respective State Nodes. NeSDR facilitates users to visualize, retrieve, Geo-process and publish geospatial layers of interest through online registration via secure authentication gateway. Shri PS Singh said that currently NeSDR is populated with more than 1200 thematic layers pertaining to land and water resources, infrastructure and disaster management supports inputs. He further informed the audience that currently 219 active users have registered at NeSDR for data request and more than 384 layers have been shared to various Govt. users. More than 30 User Departments have been served with NeSDR data.

- This was further complemented by a detailed demo on the NeSDR and NeSDR Analytics portal by Shri Nilay Nishant, Scientist-SD. He highlighted the various functionalities of the portal such as data search and download, map generation and printing, metadata and statistics visualization, on the fly analytics on various domains such as vegetation, land use change, weather related datasets etc. on the geoportal

Following points have emerged from the discussion:-

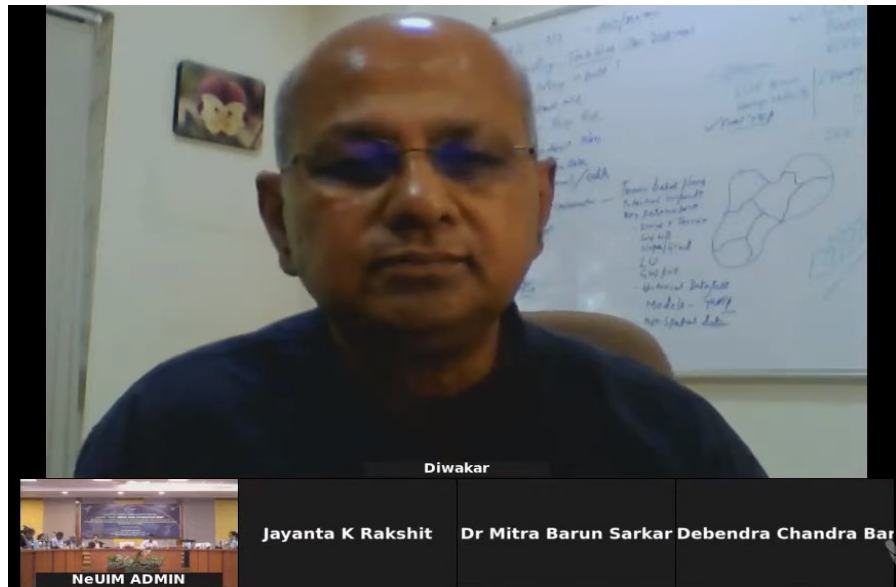
- There is a growing need to shorten the turnaround time for products generated for disaster mitigation and they should be generated near real time to assist the efforts at disaster mitigation / analysis.
- Multi agency collaboration e.g. that between NESAC and NDMA will be able to provide high quality geospatial products for disaster mitigation and decision making hence this should be encouraged
- There is a need to aggressively popularize space technology products like NeSDR by organizing in-person user interaction workshops and track user usage of the portal and data products closely to understand and serve users needs better

Technical Session-3: ISRO/DOS Geoportals and Services

The session was chaired by Dr. PG Diwakar, Former Director, NESAC and Dr. Dibyajyoti Chutia, Scientist-SF served as the rapporteur. There were 5 technical presentations from SAC, NRSC and NESAC Scientists.

- The session began with a presentation by Shri Hiren Bhatt, Head-CGDD-VRG-EPSC, SAC on *Geoportal and Services* which provided an overview of the two portals VEDAS (Visualization of Earth Observation Data and Archival System) and MOSDAC (Meteorological and Oceanographic Satellite Data Archival Centre). Shri Bhatt talked about the change of focus from data conversion to spatial analysis in the recent years and how with increased user participation, there has been an evolution of data provision from 2D to 3D and even 4D with temporal datasets using web GIS platforms and also the availability of near real time (NRT) data from numerous Earth Observation space missions. He mentioned about the various applications encompassed by the VEDAS portal for Coastal Zone Studies, Hydrology, Marine Ecosystem etc. while also elaborating on the features of the portal. He spoke briefly about certain case studies such as solar energy studies, site suitability for solar panels using solar rooftop potential, hydrology based studies for flood detection, web GIS based crop monitoring, NDVI profile generation at various administrative levels, multi-temporal data for change in vegetation dynamics. He also mentioned about the collaborative international charter for space and major disasters which enables data sharing between space technology utilizing organizations for rapid response and decision making whenever necessary. Shri Bhatt then

proceeded to outline the main features of the MOSDAC portal which offers multiple datasets on meteorology and oceanography. He spoke about the satellite missions like KALPANA1, INSAT3A, SARAL/Altika etc. being used for NRT data, forecast and alert dissemination with 8 satellite missions, 194 products, 23 applications and 13 million products disseminated to 139 countries till date. He touched upon some major applications like Ocean-Eye, SCORPIO, Netra and SafeBeach which along with on the fly data analytics provide users with a wealth of data and services. He also emphasized the increasing utility of machine learning and deep learning based applications using geospatial data such as automated building footprint detection and concluded the talk with a quick demo of the VEDAS portal.



Dr PG Diwakar, Former Director of NESAC chaired the Technical Session-3 on ISRO/DOS Geoportal services via virtual mode



Shri Hiren Bhatt, Head-CGDD-VRG-EPsA, SAC presented on *Geoportal and Services* which provided an overview of the two portals VEDAS and MOSDAC via virtual mode.

- The next presentation on *Bhuvan Geoportal & Services* was made by Shri Arul Raj, Group Head, Bhuvan Geoportal and Web Services Group, BG & WSA. Shri Arul spoke about the brief

history of development of the Bhuvan portal from its initial release in 2009 to current day where multiple ministries use governance applications hosted through Bhuvan. He mentioned about the capabilities of Bhuvan such as 2D/3D viewing and availability of free data for download on various themes like disaster, climate and multiple thematic applications with a shifting focus to analytics and data science based applications in the recent years. He detailed about the statistics of the portal – 60TBs of data hosted, with 195 portals, 100 themes and 70 mobile apps used for a variety of purposes like asset mapping, inventorying, planning and development, monitoring, decision making, reporting, resource management and location based services. He added that the feedback facility helps the portal to become increasingly citizen centric along with crowd sourcing and spoke about the different facilities like geoprocessing and querying on temporal data as well as API frameworks exposed through the portal. Shri Arul additionally mentioned about collaborative ventures currently taking place with other agencies for serving the public using datasets from areas like administrative information, hydrological data, infrastructure and Pol datasets etc. at scales ranging from 1:10000 to 1:50000. He concluded the presentation by mentioning about BhuvanLite v1.0, a lighter version of Bhuvan and the BhuvanWiki which has a huge selection of topics and information about the portal.

- The next presentation on *River Atlas Geoportal of Assam* was made by Dr. Diganta Barman, Scientist-SF. Dr. Barman spoke briefly about the inception of the project in 2017-18 in collaboration with the Government of Assam, stemming out of a need to have a single window access to all the river systems in Assam particularly for the engineering departments. He also mentioned that the River Atlas project is the only portal in the country that offers river maps at 1:5000 scale at district level and 1:25000 scale at the catchment level and added that other information like source of origin of the rivers, Land Use Land Cover, elevation, embankments and catchment areas along with flood layers were also available. Dr. Barman also conveyed about how the rich database of river information – 264 maps in 33 districts of Assam – is being able to replace some of the surveys that used to be carried out by the engineering department for restoration and planning works. The session concluded with a demonstration of the portal by Dr. Anupam Baruah, Research Scientist, NESAC.
- The following presentation delivered by Shri Avinash Chouhan, Scientist-SD was on *Mobile Apps for Various User Departments of NE Region*. Shri Chouhan talked about the development of hybrid Android mobile apps using the vanilla Android Studio API as well as the Ionic Framework for rapid development and deployment adding that NESAC had developed more than 22 mobile apps for various user departments, with successful geotagging of more than 80,000 records till date using some of these apps. Some mobile apps of significance were the NEC Project Monitoring app which was recently released by the Hon'ble President of India, as well as the Banadhikar app developed for the Directorate of Land Records and Settlements, Tripura which was launched by the Hon'ble Union Minister of Rural Development & Panchayati Raj. He also spoke about the FeverTracker app developed for ICMR, Dibrugarh which had recently been granted copyright as well as being featured in a research publication. Shri Chouhan touched upon other mobile apps such as the Forest Fire Incident Reporting app, the Geotourism app and the eAtlas and Traccar apps.
- The final presentation of this session on *Governance Dashboard for User's Departments* was delivered by Shri Siddhartha Bhuyan, Scientist-SC. The presentation provided a concise overview of some of the important governance dashboards developed by NESAC such as the NEC Project Monitoring Dashboard, the Geotourism Dashboard, the Manipur State Assembly Election 2022 Dashboard and the Meghalaya Rice Information System Dashboard while highlighting the representative facts and figures. Shri Bhuyan also spoke at length about the

capabilities and expertise of NESAC as regards development of dashboards and supporting mobile apps. In the concluding section, Shri Bhuyan provided a glimpse into some other dashboards which were undergoing development / enhancement such as the FightFever Dashboard, the African Swine Fever Management and Monitoring Dashboard, the Meghalaya Forest Fire Information Dashboard, the Assam Cancer Case Information Dashboard, the Banadhikar Dashboard etc.

Following points have emerged from the discussion:-

- Mobile apps play a crucial role in monitoring the status of governance projects as well as natural disasters by providing field level data for validation of remotely sensed observations or physical/numerical models for understanding natural phenomena. They can help fill some data gaps and complement remote sensing approaches, thus reducing the response times. Crowd sourcing is another highly useful approach for rapid collection of data which can be further analyzed to determine specific trends or anomalies etc. This also increases user participation in the governance processes. Hence development and use of mobile apps in implementation of space technology based solutions in governance should be encouraged.
- User requirement driven dashboards can serve not only dissemination of useful information but also provide a means of interconnecting multiple organizations and user departments through data sharing. There needs to be more efforts at inter-centre knowledge sharing and interoperability between applications through mashups.

Interactive Session-1: Understanding User's Needs and Feedback

The session was chaired by Shri P.L.N. Raju, Former Director, NESAC and Dr. Jonali Goswami, Scientist-SF of NESAC served as the rapporteur. During the interactions, participants from four states namely Arunachal Pradesh, Assam, Manipur and Meghalaya shared their needs and feedback which are as follows:



Dr SP Aggarwal, Director, NESAC felicitated Shri PLN Raju, Former Director of NESAC for chairing the Interactive Session-1

- **Arunachal Pradesh**

- ✓ Satellite data availability is a problem during pre and post monsoon disasters. Director, SRSAC requested NESAC to facilitate those data. He requested restructuring the geospatial data policy so that it can be shared with State User Departments.
- ✓ Support is required from NESAC in executing few projects using UAV.
- ✓ Development of Rice Information System for Arunachal Pradesh in similar line with Meghalaya to be taken up.
- ✓ Flood Early Warning System for major river basins is another need for the state of Arunachal Pradesh.
- ✓ Bamboo area mapping in the state of Arunachal Pradesh which was done in 2009 needs to be updated.
- ✓ SRSAC also shared their issues related to internet in using NeSDR and quality of Carto DEM in few places.

- **Assam**

- ✓ Director, ASSAC made a brief presentation on the various activities and how NESAC can play a role for the state of ASSAM by extending their technical and scientific expertise. The following are the requirements of Assam:
 - In addition to traditional mapping, user departments need customized applications specific to their needs. This necessitates discussions with the concerned Departments. The main focus of the MoU signed between STCCD and NESAC is the same. ASSAC will play a pivotal role in fulfilling the overall needs. NESAC is therefore requested to support accordingly.
 - NESAC to support ASSAC for initiating training and capacity building programme in Assam.
 - NESAC to initiate state specific user meet in association with SRSACs.
 - All the spatial data generated are to be made available through NeSDR seamlessly along with other value added products.

- **Manipur**

- ✓ The users requested development of techniques for identifying and mapping poppy cultivated areas. NESAC was requested to coordinate with other ISRO/DOS Centres in addressing this important issue.

- **Meghalaya**

- ✓ Soil and Water conservation department requested NESAC to give priority in mapping and rejuvenating spring water.

- ✓ NESAC is involved in Microzonation of city wards for Shillong city benefitting users for incidence response system, addressing the MSDMA needs. They informed that City Disaster Management Planning is completed for Shillong city. 12 more districts to be included after completion of first phase. Remaining districts of Meghalaya to be included in HRVA.
- ✓ Department of Agriculture and Horticulture, Government of Meghalaya expressed their need for a comprehensive Agri-Horti database for the state of Meghalaya.
- ✓ Agroclimatic zone-wise land use planning for the state of Meghalaya was also requested.
- ✓ The users also suggested a user meet for the regional PoA project ASAAN.
- ✓ Department of Horticulture has shown interest on UAV mapping of Ginger cultivated area.
- ✓ Project monitoring for NECTAR funded projects and geo-tagging of completed projects by NECTAR to be taken up.

Other requests which made during the discussion were:-

- It was requested that NESAC should study the impact of the environment on the silk industry, particularly the Muga industry.
- Mapping of gullies using geospatial technology for the department of Soil and Water Conservation was also requested.

Interactive Session-2: Understanding User's Needs and Feedback

The session was chaired by Shri KC Bhattacharyya, Former Director, NESAC and Dr. Kasturi Chakraborty, Scientist-SF of NESAC served as the rapporteur. During the interactions, participants from four states namely Mizoram, Nagaland, Sikkim and Tripura shared their needs and feedback which are as follows:



Shri KC Bhattacharyya, Former Director of NESAC chaired the Interactive Session-2.

- **Mizoram**

- ✓ Samuel Lalmalsawma Sailo, Technical Officer, SCERT, Govt. of Mizoram who attended the program online, expressed concern for the EDUSAT users and mentioned that the SITs in Mizoram are facing problems and the equipments are now obsolete. He requested for improved ISRO bandwidth in the education network system. He further requested for sensitization programs to raise awareness among stakeholders regarding space applications. He has also mentioned for a common point of contact for the state. Director, NESAC has responded that there is meeting held with ISRO HQ and more bandwidth will be provided soon. Sri Ramani Kr Das, Scientist/Engineer 'SF', NESAC informed that a GSAT hub is coming up in Guwahati, Assam, and VSAT terminal can be employed to improve the service.
- ✓ In response to internet connectivity in schools, General Manager, BSNL has informed that there is a huge network of Bharatnet optical fibre connections in the interior villages for which huge funds have been invested. The concerned can get in touch with General Manager BSNL, Mizoram or any other respective states.
- ✓ Sri Lalmalsawma Pachuau, Secretary, Planning and Programme Implementation, Govt. Of Mizoram attended the meeting online and provided his remarks during the event. He expressed happiness that Mizoram Remote Sensing Applications Centre (MIRSAC) and NESAC are working closely and completed several important projects since its inception in the year 2000. Sri Pachuau referred to the 16th NESAC governing council notes. He requested for sharing the data for Mizoram on mapping of the shifting cultivation areas and jhumia population estimation. He conveyed his compliments on completion of Geotagging and Geo monitoring project by NESAC and requested to host another cycle of monitoring and geotagging projects. He further requested for updation / development of a new system of Mizoram election eAtlas for the upcoming election next year. He requested to increase the applications of Artificial Intelligence, Machine Learning and Deep Learning techniques in different applications. Further, he requested for capacity building for MIRSAC scientists. He expressed satisfaction on taking up PoA projects and wished for a remarkable future with significant outcomes.

- **Nagaland**

- ✓ Dr Nesatalu Hiese, Scientist-D, Nagaland Science and Technology Council, Kohima, attended the session online and presented an overview of the projects carried out with NESAC and also shared various projects carried out by the centre and the capabilities of the centre to carry out remote sensing projects. Dr Hiese presented a list of projects where both the centres could jointly work. Few of the suggested projects are Ground Water Prospect Mapping, Terrace Cultivation, Socio Ecological Vulnerability and Risk in relation to Climate Change in Forestry Sector, Bamboo Mapping, GIS Based Master Plan Preparation, Biodiversity Mapping etc. and requested for capacity building trainings and support for improving infrastructure of the centre. Director, NESAC requested to hold a separate meeting with NASTEC to discuss these points.
- ✓ Shri Kithan, while attending the event online, mentioned about the demand for SIS-DP 1:10k project for planning and developmental activities. He also wished for utilization of the NESAC training facility to reach out in a bigger way. He requested for a healthy

competition among the state centres which will be rewarded for the service and requested NESAC support to complete PoA projects.

- **Sikkim**

- ✓ Dr. S Shrestha, Director, Sikkim State Remote Sensing Centre attended the event online. He requested for real time AWS connectivity. Sri Narpati Sharma informed about the non-functioning of the AWS and the need for more number of AWS. Sri Sharma requested for support from NESAC on glacier monitoring and early warning studies. He also requested for setting up of sensors for real time glacier monitoring. He informed about the UAV which is out of order and needs replacement.
- ✓ Sri Kshitij Saxena, IFS, ACF (Territorial) Chungthang sub-division, Mangan Forest and Environment Department Sikkim, attended the program online and provided a list of domains where NESAC support is requested. He has requested for an app on forest fire incident reporting as developed for Meghalaya, UAV support in forest fire handling due to difficult terrain conditions, hazard vulnerability and zonation of GLOFs (Glacial Lake Outburst Floods), identification of critical glacier moraines facing accelerated melting due to climate change.
- ✓ Dr Rakesh Ranjan, Assistant Professor, Sikkim University, Gangtok, Sikkim in his online message requested for capacity building in the field of (a) Aerosol Characterization and Radiative Forcing Estimates (b) Springshed Management and (c) GLOF study.

- **Tripura**

- ✓ Users from SCERT requested for a user interaction meet with Chief Secretary and Policy makers in Tripura stressing that remote sensing based outputs and health care facility coverage should reach to people at grassroots level.
- ✓ Shri Santimoy Debbarma, Deputy Director, Land Records and Settlement Directorate, Govt. of Tripura requested for modifications in the Banadhikar mobile app for Patta lands developed by NESAC.



Dr SP Aggarwal, Director, NESAC felicitated Shri KC Bhattacharyya, Former Director of NESAC for chairing the Interactive Session-2

Special Session-1: Reminiscence and Way Forward

The special session on *Reminiscence and Way Forward* was a unique session that brought together all the Former Directors of NESAC for a discussion and sharing of thoughts gleaned from their rich experience with the centre as well as possible plans and areas that merit attention for NESAC in the near future. The session was chaired by Dr JS Parihar, Former Director, NESAC while Shri Ramani Kumar Das, Scientist-SF of NESAC acted as the rapporteur. The following were the important observations made by the Former Directors of NESAC.

- **Shri PLN Raju:** Shri Raju thanked all the Former Directors of NESAC for their valuable contributions and help and also expressed gratitude for the current Director of NESAC for having provided this opportunity in the form of NeUIM-2022 to the users. He proceeded to make the following observations:-
 - NESAC may celebrate silver jubilee in 2025 (25 years of existence).
 - NESAC shall support all the SRSAC of NE States as a big brother.
 - NESAC shall support Assam in bigger way in various front of DMSP like mitigation of flood, erosion, siltation, landslide forecasting, forest fire alert, lightening alert etc.
 - NESAC shall support Assam in treatment of watershed area, study on water holding capacities in upstream etc.
 - NESAC shall support Assam in various capacity building initiatives.

- NESAC may organise state specific user meet for each NE states in collaboration with SRSAC.
- NESAC may carry out a study on zoom/shifting cultivation in NE states using latest data and report may be provided to each NE states.
- Site suitability analysis for various needs may be integrated in the NeSDR portal.
- One dashboard for whole NE states may be designed for various services.
- Expression of Interest (Eoi) may be floated by NESAC for empanelment of vendors for various service in NE states, which may be untallied by states.



Dr SP Aggarwal, Director, NESAC felicitated Dr JS Parihar, Former Director of NESAC for chairing special session on Reminiscence and Way Forward

- **Dr. Singuluri Sudhakar:** Dr. Sudhakar in his talk mentioned remembering about the tasks assigned to him for Forestry and DMS in the initial days of his tenure. He also spoke about the initiation of FWP in NE states, sericulture project with CSB, NEDRP and SISDP projects, impetus on open source software and the NERDRR node. He spoke about having organized training for the scientists in another organization after procuring laptops (35 in nos.) for them and also executed empanelment of industry to outsource work. He made the following remarks:
 - Capacity building program to continue.
 - NESAC may recruit district resource personnel to coordinate district needs. One scientist may be identified as focal person.

- More mobile apps may be designed for various needs.
 - UAV applications may be expanded.
 - Use of microwave applications may be increased for various activities.
 - More user interaction may be initiated.
- **Dr. P P Nageswara Nao:** Dr. Rao reminisced about his longest serving experience which was at NESAC and elaborated on the initiation of the APIB and SILKS project at the national level. He also spoke about drafting a High Powered Committee report for NESAC along with NERDRR. Another aspect he mentioned was the establishment of the Army Telemedicine Network in the NE states. He touched upon the following points:
 - The role of HRD in education and health sector.
 - SATCOM based TE and TM to be strengthened further.
 - Skill development activities to be initiated.
 - Community based National Resource Management is to be initiated using space technology. Bamboo and cane to be considered as National Resource and works for setting industry for same may be initiated
 - Infrastructure development for Horticulture, Floriculture and Sericulture
 - Use of space technology in tourism Sector
 - Initiation of Mineral Resource Survey at 1: 50 K
 - Geo-tagging of various resources / Infrastructure
 - To encourage Start ups/MSME in Space Applications
 - Input to enhance connectivity among neighbourhood countries under Act East policy
 - To adopt latest technology to empower the people of NE States
 - **Shri KC Bhattacharyya:** Shri Bhattacharyya remembered his appointment to NESAC and spoke about the construction of the NESAC building along with gradual infrastructure development for the organization. He added that NeUIM-2022 was something much awaited as far as the users were concerned praising the efforts of all concerned. He made the following remarks:
 - NESAC shall provide data to NE States for economic development
 - NESAC shall do more work for betterment of society in NE states
 - **Dr. PS Roy:** Dr. Roy spoke about his 'accidental' joining of NESAC as the Director and offered profuse thanks to all the ISRO centres for supporting NESAC in the initial days. He added that

he was very happy to see the growth and development of NESAC over the years. The following were his remarks:

- Training and Capacity building program to continue. The Capability of SRSACs maybe strengthened in terms of human resources and infrastructure.
 - Utilization of Space Technology for societal benefits.
 - Work for climate change
 - Analysis and identification of the bottlenecks in space applications in NE States
 - Technology transfer to industry
 - Partnering with industry
 - Study of disaster prone areas at higher scale.
 - Study in change in weather pattern in NE states and mitigation plan
 - Involvement of various institute, central/state University through collaboration for mitigation in DMS
 - Work to overcome forest degradation. Strategy for restoration and revival of degraded forests. Development of natural systems
- **Dr. JS Parihar:** Dr. Parihar remembered his joining of NESAC and meeting with all the Chief Secretaries / top level officials of NE states during formation of NESAC. He also spoke at length about the formation of the by-laws and GC/Society of NESAC and about the revival of the old NESAC building. He made the following remarks:
 - NESAC may focus on DMS for NE States. May place the need to ISRO for better payloads, system, services etc.
 - Better scope for atmospheric research
 - Clear visualization from technology point of view. New Technology may be developed and transferred to User/industry
 - Users to be defined. Need based assessment may be done on continuous basis. To develop a good/reliable relation with user
 - Every new Director may add some new element of activities to NESAC
 - Training and capacity building program to continue.

Special Session-2: Space Technology for Governance, Academic & Research Interface and Plan for Collaboration

The Brainstorming Session on “Space Technology for Governance, Academic & Research Interface and Plan for Collaboration” was chaired by Dr. P. S. Roy, Former Director, NESAC and Dr. Shyam S Kundu, Scientist-SF of NESAC served as the rapporteur. The session included inputs from Academia, Research Institutes, and Industries on how the space technology can be better utilized for development and governance as well as the potential areas of research collaboration. Dr P S Roy appreciated the idea of keeping the brainstorming session and invited the galaxy of participants to share their views. He first invited the participants from the Academic institutes followed by others to contribute to the session. The following points emerged during the discussion:-

- Prof G D Sharma, Vice Chancellor, USTM, Meghalaya informed that NESAC signed MoU with USTM which needs to be renewed. He wished that under the New Education Policy (NEP) – 2020 of Government of India, NESAC and USTM may jointly develop credit based course along with all relevant contents on different areas related to sustainable development goals (SDG) identified by the UN. He also called for development of new technologies and methods to address the challenges towards attaining the SDGs and put joint effort to patent such ideas.
- Dr P P Nageswara Rao, Former Director, NESAC told that while most of the courses on geoinformatics across the country in intensive on lectures, they lack in practical and skill development section. He told that the academic institutes of NER should start courses having computer science and geoinformatics as subjects with NESAC playing important role in providing hands on experience.



Dr PS Roy, Former Director NESAC chaired the Brainstorming Session on “Space Technology for Governance, Academic & Research Interface and Plan for Collaboration” via online mode.

- Dr Sanjeev from IIM, Shillong informed that three centres in IIM, Shillong named A P J Abdul Kalam Centre for Policy Research and Analysis, Centre for development of NER, and an Incubation Centre

is contributing to the development of the NER. He requested NESAC support for conducting short term courses on utilization of space technology in development and policy research. He also expressed interest for collaborative research with NESAC.

- Prof Bhabesh Deka from Tezpur University requested NESAC support in utilizing the drones for different applications like crop health monitoring, drone data processing, etc.
- Dr Nupur Choudhury from Assam Don Bosco University requested NESAC support for capacity building on practical applications of space based tools and software. She also requested NESAC support as resource persons for relevant B Tech and M Tech courses.
- Dr Sujit Pradhan from Indian Institute of Geomagnetism informed about different collaborative work done with NESAC and requested for more active collaboration in research in the areas of earthquake prediction and other aspects of geomagnetism.
- Dr J S Parihar, Former Director, NESAC requested all academic institutions to focus on utilization of space based tools for imparting education. He told that effective utilization of space based tools could enable the youths of the region to compete more at the national and international level.
- Ms Namrata Tiwari, General Manager, BSNL stressed on expansion of space based communication / broadband links to the remote areas of NER.
- Dr B U Choudhury from ICAR-NEH, Umiam mentioned that many maps (LULC, Wasteland, etc) prepared by ISRO at national level has four to five years of old data and unwanted classes. He also told that different organisation generates different statistics on same application that creates lot of ambiguities. He wished that there should be one authenticate platform for data and statistics. He also wished that NESAC should lead for preparation of maps for the NE region so that the temporal gap can be removed and only relevant class for the NER are included in the map.



Prof G D Sharma, Vice Chancellor, USTM, Meghalaya interacted with the participants during Brainstorming session

- Shri Debajit Das, DGM, NEEPCO thanked NESAC for continuous support. He mentioned that due to non-functioning of the MOSDAC, SAC earth station during 2021 for several times, the data from the AWSs installed with funding support from NEEPCO could not be accessed, which lead to problem in dam management and consequent flood management in the downstream area. He requested that all effort should be made to keep the AWSs network and data access fully operational. He also requested if the ISRO AWS network data frequency can be increased to 30 minutes from current frequency of 60 minutes. He suggested for installation of Doppler Weather Radar in different parts of Arunachal Pradesh for better monitoring of rainfall and mapping of vulnerable zones for rock mass slide in different parts of NER, so that the disaster that happened in Rishiganga and Dhauliganga valley in Uttarakhand in 2021 could be avoided to happen in NER.
- Dr Harnam Singh representing industries told that NESAC has developed good expertise in service delivery and wished that NESAC can be a forum between the industries and other user departments.
- Dr S P Aggarwal, Director, NESAC welcomed the suggestions from all participants and told that NESAC will continue to exchange knowledge and mentor for better utilization of space technologies. He told that capacity building initiatives are being taken up aggressively and NESAC will be happy to conduct any customized training program. He also told that the researchers for the region may visit the centre and use the facilities for their research.
- Dr P S Roy, while summarizing the session mentioned that NESAC has made tremendous impact in the region and created good requirement of space based services leading to more users approaching NESAC. He advised that, NESAC may start preparing a new decadal plan taking suggestions from the peers and incorporating all advanced technologies and tools.

The session ended with thanks to the Chair.

Cultural programme

The Day-1 evening on 23rd May, 2022 was also enlivened by a lilting cultural program and dinner in which students visiting NESAC under the YUVIKA program of ISRO also participated.



NESAC staff performed cultural event on 23rd May, 2022

Finally vote of thanks was offered by Dr Dibyajyoti Chutia, Organizing Secretary, NeUIM-2022.

Participant details

Total 399 participants from different parts of the country attend the event via hybrid mode. The event was attended by 62 participants in-person. Most of the participants were from various state Govt. departments of NE states and remaining were from various central Govt. departments like NEGRIMS, ICAR, ICMR, CWC, NEIST, NERIWALM, Brahmaputra Board, including NEHU, Tezpur University, NITs of NE region, Guwahati University, Dibrugarh University, Assam Donbosco University, USTM, Assam Agriculture University, Technology Industry etc. In addition, more than 337 views was observed in YouTube live video streaming. The state-wise and category-wise break-up of the participants are given below.

State-wise break-up of the participants (online registration)

Sl. No.	State	No of participants
1	Arunachal Pradesh	16
2	Assam	133
3	Manipur	27
4	Meghalaya	84
5	Mizoram	26
6	Nagaland	23
7	Sikkim	26
8	Tripura	57
9	Others	62

Category-wise details

Sl. No.	State	No of participants
1	State Govt	234
2	Central Govt	47
3	PSU	9
4	Academia	76
5	Students	72
6	Industry/Others	16



NESAC User Interaction Meet (NeUIM-2022)

To promote maximum utilization of Space Science and Technological products and services for research and developmental activities of NE region with understanding user's needs and feedbacks

May 23-24, 2022

INAUGURAL PROGRAMME (11.00-12.00 hrs, May 23, 2022)

Venue: NESAC Outreach building via Hybrid Mode (online or in-person)

11:00 – 11:05 hrs	Invocation and Lighting of Lamp	
11:05 – 11:10 hrs	Welcome and overview of NeUIM-2022	Dr SP Aggarwal, Director, NESAC
11:10 – 11:30 hrs	Address by Shri Shantanu Bhatawdekar, Scientific Secretary, ISRO	
	Address by Dr. Prakash Chauhan, Director, NRSC	
	Address by Dr. Anil Bhardwaj, Director, PRL	
11:30 – 11:40 hrs	Address by Guest of Honour	Shri K. Moses Chalai, IAS, Secretary, NEC
11:40 – 11:55 hrs	Address by Chief Guest	Shri S. Somanath, Chairman ISRO, Secretary DOS
11:55 – 12:00 hrs	Vote of Thanks	Dr KK Sarma, Scientist-SG, NESAC



NESAC User Interaction Meet (NeUIM-2022)

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May 23-24, 2022

PROGRAMME SCHEDULE

Registration cum Networking Tea: 10:00 – 11:00 hrs

Venue: NESAC via Hybrid Mode (online or in-person)

Day-1: May 23, 2022	
11:00 – 12:00 hrs	Inaugural Session
12:15 – 13:00 hrs	Technical Session-1: <i>Space Technology Applications and Capabilities of ISRO/DOS</i> Chair: Dr. Prakash Chauhan, Director, NRSC Rapporteur: Dr KK Sarma, NESAC • Overview of Space Programme & Societal Benefits - Dr John Mathew, Associate Director (Land & Water Applications), EDPO Programme Office, ISRO Hq. • Satellite Data Acquisition, Procurement and Dissemination- Dr. N. Aparna, Group Director, NDC, DPA, NRSC • Satellite Data Policy - Dr Rajeev Jaiswal, Associate Director (Urban & Env.), EDPO Programme Office, ISRO Hq. • NESAC Activities and Achievements- Dr SP Aggarwal, Director, NESAC
13:00 – 14:00 hrs	Lunch Break
14:00 – 15:00 hrs	Technical Session – 2A: <i>Developmental services of NESAC</i> Chair: Dr PP Nageswar Rao, Former Director, NESAC Rapporteur: Dr BK Handique, NESAC • Agriculture & Allied areas – Dr BK Handique, NESAC • Forestry & Ecology – Dr Kasturi Chakraborty, NESAC • Water Resources – Dr Diganta Barman, NESAC • Geosciences – Shri M Somorjit Singh, NESAC • Urban and Regional Planning – Dr Jenita M Nongkynrih, NESAC • UAV Applications - Shri Victor Saikhom, NESAC • Space and Atmospheric Science- Dr SS Kundu, NESAC • SATCOM Applications – Shri Ramani K Das, NESAC • Interaction with participants

15:00 – 16:00 hrs	Technical Session – 2B: Data Repository and Disaster Management Services Chair: Dr S Sudhakar, Former Director, NESAC Rapporteur: Dr D Barman, NESAC 1. Role of North Eastern Regional Node for Disaster Risk Reduction (NER-DRR) – Dr KK Sarma, NESAC • Flood Early Warning System (FLEWS) • Forest fire • Landslide • Health GIS • Crop Damage Assessment and Monitoring Services • Thunderstorm and lightning 2. North Eastern Spatial Data Repository (NeSDR): Data catalogue & data availability for NE region under different thematic domains; various Governance services etc. • Overview of NeSDR portal and data availability for NE region – Shri PS Singh, NESAC • Live demo on NeSDR Geoportal/NeSDR analytics & various GeoWeb-Services – Shri N Nishant, NESAC 3. Interaction with participants
16:00 – 16:15 hrs	Tea break
16:15 – 17:30 hrs	Interactive Session-1: Understanding User's Needs and Feedbacks • Arunachal Pradesh • Assam • Manipur • Meghalaya Chair: Shri PLN Raju, Former Director, NESAC Rapporteur: Dr Jonali Goswami, NESAC
17:30 – 18:00 hrs	Tea break
18:30 – 19:30 hrs	Cultural Event at NESAC Auditorium
19:30 – 20:30 hrs	Dinner
Day-2: May 24, 2022	
10:00 – 10:45 hrs	Technical Session-3: ISRO/DOS Geoportals and Services Chair: Dr PG Diwakar, Former Director, NESAC Rapporteur: Dr D Chutia, NESAC • Geoportal and Services – Shri Hiren Bhatt, Head-CGDD-VRG-EPISA, SAC

	• Bhuvan Geoportal & Services – Shri M. Arul Raj, Group Head, Bhuvan Geoportal and Web Services Group, BG & WSA • River Atlas geoportal of Assam – Dr D Barman, NESAC • Mobile Apps for various user's Deptts of NE region – Shri A Chouhan, NESAC • Governance Dashboard for User's Departments – Shri S Bhuyan, NESAC
10:45 – 11:00 hrs	Tea break
11:00 - 12:00 hrs	Interactive Session-2: Understanding User's Needs and Feedbacks • Mizoram • Nagaland • Sikkim • Tripura Chair: Shri KC Bhattacharyya, Former Director, NESAC Rapporteur: Dr K Chakraborty, NESAC
12:00 - 12:45 hrs	Reminiscence and way forward - Former Directors of NESAC Dr JS Parihar, Dr PS Roy, Shri KC Bhattacharyya, Dr PPN Rao, Dr S Sudhakar, Dr PG Diwakar and Shri PLN Raju Chair: Dr JS Parihar, Former Director, NESAC Rapporteur: Shri RK Das, NESAC
12:45 – 13:45 hrs	Brainstorming Session on Space Technology for Governance, Academic & Research Interface and Plan for Collaboration Representatives from Governments/Academic Institutions/PSU/Industry etc. Chair: Dr PS Roy, Former Director, NESAC Rapporteur: Dr SS Kundu, NESAC
13:45 – 13:50 hrs	Vote of Thanks Dr Dibyajyoti Chutia, Organizing Secretary, NeUIM-2022
13:50 hrs onwards	Lunch



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