CSSTEAP Report on UN-ESCAP supported Participants in 2018-19

# Report

## on

Md. Abdul Hamid Mia, Bangladesh Mr. Erdenebayar Bavuu, Mongolia Mr. Kyaw Min Hlaing, Myanmar Mr. Kenjaev Firuz, Tajikistan

# For RS & GIS Course (2018-19)





Centre for Space Science and Technology Education in Asia and the Pacific Indian Institute of Remote Sensing Campus No. 4, Kalidas Road, Dehradun-248001, India

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# ESCAP FUNDED PARTICIPANTS FOR 23<sup>rd</sup> RS & GIS COURSE AT CSSTEAP

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## 23<sup>rd</sup> RSGIS Course at CSSTEAP

The twenty-third PG course on Remote Sensing and Geographic Information System of CSSTEAP commenced on July 1, 2018 at Indian Institute of Remote Sensing (IIRS), ISRO, Dehradun, one of the host institutions of CSSTEAP. The course started with an 'Induction week' where the participants were exposed to geographic perspective of India, social systems, customs and festivals of India, overview of space science, technology and applications, etc.

#### **A. PGD Course Modules**

In Module-IA participants were imparted information on Remote Sensing and Geographic Information System and their application in natural resource management, where the emphasis is on the development and enhancement of knowledge and skills through classroom lecture, tutorials, field visits, seminars and hands on session. The participants were taken to several field excursions for ground truth collection and for interpretation and analysis of satellite data. In Module-IB participants were introduced to the recent trends in RS & GIS and Environmental assessment and Monitoring with special emphasis on Sustainable Development Goals (SDGs). Participants were given an overview on how space technology can be useful in addressing SDGs. In Module-II course participants had to choose one of the eight electives i.e. Agriculture & Soils, Forestry & Ecology, Geosciences & Geo-hazards, Marine & Atmospheric Science, Water Resources, Urban & Regional Planning, Satellite image analysis & photogrammetry and Geo-informatics, based on their academic qualification, technical requirement of their parent organization and their professional experience. ESCAP sponsored candidates one from Bangladesh chose Marine & Atmospheric Science and remaining three chose from Mongolia, Myanmar and Tajikistan chose Water Resources. Module-III is of three months duration, and the participants worked on a pilot project, based on the knowledge gained during the course by utilizing space inputs. Abstract of project work done are given separately. The participants were awarded PG Diploma valedictory function held on March 26, 2019 for successful completion of the course work.

#### **B.** Special English Classes

In addition to the academic activities special efforts were also put for improving the level of competency of spoken English, understanding and writing skills in English of the participants from Asia Pacific Region. English language classes after office hours were conducted in campus during the first three months with special emphasis on pronunciation/accent, grammar and vocabulary,

which was helpful to the participants in understanding the subjects taught in classes with more clarity.

#### C. Educational Trips & Exposure to Indian Culture and Landscape

As part of the course curricula the participants were taken for technical visits to Andhra University, Visakhapatnam, National Remote Sensing Centre (NRSC), Hyderabad and U R Rao Satellite Centre (URSC), Bengaluru during September 16 to October 3, 2018. During technical visits, participants also had an opportunity to visit cultural & natural landscape in Visakhapatnam, and Hyderabad and have an understanding of Indian culture, heritage and traditions. During first lap of the technical visit, course participants were taken to Andhra University where they attended lectures on specialized topics (on rainwater harvesting, flood mitigation and coastal hazard vulnerability and GIS modelling), met Vice Chancellor of Andhra University and also their documents were verified for finding M.Tech eligibility. During second lap of the technical visit, course participants were taken to National Remote Sensing Centre (NRSC), Hyderabad where the participants had an opportunity to see Integrated Multi-mission Ground Segment for Earth Observation Satellites (IMGEOS) facility and also witnessed real time acquisition of EO data at Shadnagar, Hyderabad. During the third lap of the technical visit, course participants were taken to U R Rao Satellite Centre (URSC) at Bengaluru which is the lead Centre of the Indian Space Research Organisation (ISRO) responsible for design, development, assembly & integration of communication, navigation, remote sensing, scientific and small satellite missions. During ISPRS Workshop in 2019, participants visited to Taj Mahal (UNESCO world heritage site) at Agra.

#### **D.** Exposure to Workshops/Tutorials/Conferences

- Participated in ISPRS Technical Commission V Symposium on "Education & Outreach Geospatial technology - Pixel to People" at Indian Institute of Remote Sensing, Dehradun, India during Nov 2023, 2018.
- Attended pre-symposium ISPRS tutorials on the emerging topics like Big Data Analytics, Ground-Based 3D Modeling, Citizen Science and its applications and Space Education for Educators as part of APRSAF.
- Participated in Post-symposium tutorials organized under ISPRS WG III/10, GEOGLAM, ISRS Joint International Workshop on "Earth Observations for Agricultural Monitoring" covering advanced topics like UAV Remote Sensing for Agriculture, Machine Learning

Tools, Satellite Observations of Fire and SAR for Rice, during 21-22 February, 2019 at New Delhi.

• The participants got an opportunity to display their pilot project work through posters in IIIRS Academia Meet (IAM) organized on March 14, 2019 at IIRS Campus.

### **E. Guest Lectures:**

- 'Science of Remote Sensing'-Dr. George Joseph (Honorary Distinguished Professor (ISRO): 17 July, 2018.
- 'Space Law"- Dr. V. Gopala krishnan, Associate Director, Policies, ISRO: 27 Oct., 2018.
- 'Overview of Sustainable Development Goals' -Dr Shirish Ravan, Senior Programme Officer, United Nations Office for Outer Space Affairs (UNOOSA): 8 Oct., 2018.
- One-to-one Interaction with Dr. T Syed Ahmed of United Nations Economic and Social Commission for Asia and the Pacific (ESCAP):23 Nov. 2018.

# F. Anticipated Benefits after attending CSSTEAP Course

The four ESCAP participants who attended the course were subjected to survey of their knowledge on selected SDGs. Most of them responded that their knowledge was little before attending this course. They agreed their knowledge towards application of satellite data for SDG's has enhanced significantly, after the completion of their PG Course.



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# **PILOT PROJECTS**

## Investigation of Tropical Cyclogenesis using NWP Model Analysis and Forecasts over the Bay of Bengal

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#### Supervisor

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A tropical cyclone (TC) is a warm-core intense low-pressure system around which air circulates in anti-clockwise direction in the northern hemisphere and in clock-wise direction in the southern hemisphere. TCs are one of the most devastating hazardous weather events in the world. Formation of TCs over Bay of Bengal (BoB) is significant due to long and low line coast and highly dense populated area with poor socioeconomic conditions. So, accurate predictions of genesis, intensity, track and landfall can reduce the loss of lives and property.

In the present study, Genesis Potential Parameter (GPP) has been used to predict the tropical cyclogenesis using the Numerical Weather Prediction (NWP) model analysis as well as forecasts (up to 96-hour). The National Centers for Environmental Prediction (NCEP) Global Forecast System (GFS) high resolution  $(0.25^{\circ} \times 0.25^{\circ})$  data is used to detect the genesis of tropical cyclone before classified as a tropical cyclone (intensity  $\geq$  34 kt.) by the India Meteorological Department (IMD). In order to identify the genesis, a threshold value of the above discussed parameter is determined by maximizing the probability of detection (POD) and minimizing the false alarm ratio (FAR). The threshold value has been computed using the data during the period 2015-17 and it applied to predict the tropical cyclogenesis of 4 tropical cyclones which formed over the BoB in the year 2018. The threshold value 60 is found as an optimum threshold to predict the cyclogenesis using GFS forecasts fields. To ensure that the model wind fields are realistic, the GFS wind fields is compared with the scatterometer SCATSAT-1 wind fields also. The result analysis shows that the tropical cyclogenesis can be predicted prior 24 to 60-hour of tropical cyclone formation.





Fig. 1: Maximum GPP at 48-hour forecast on 09 NOV 2018 for Cyclone GAJA.



Fig. 2: The 850 hPa wind fields at 00 UTC of 09 NOV 2018 for Cyclone GAJA.



at 02:05 UTC of 09 NOV 2018 for Cyclone GAJA. Source: <u>https://mosdac.gov.in/</u> <u>scorpio</u>

## Snowmelt Runoff Modeling in TUUL River Basin, Mongolia

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The TUUL River originates in the Khan-Khentein-mountain Nature Reserve, in the Erdene sum of Töv province, pass through central and northern Mongolia. It is 898 km long and the watershed area is 57,764 sq. km. The basin annual average precipitation amounts to 246.7 mm (in the vicinity of Ulaanbaatar city). It is estimated that 48.4% of annual average precipitation becomes evapotranspiration and 51.6% becomes surface water and groundwater recharge. The lowest temperature of -48.0 °C is recorded in the month of January. The highest temperature of 43 °C is recorded in the month of August. The annual mean daily temperature lies between -48°C to 43°C. In the present study, the hydrological simulation of Tuul River with emphasis on snowmelt was carried out using the Variable Infiltration Capacity (VIC) model. The model has been setup with data SRTM DEM, FAO soil texture, MODIS LULC, MODIS snow cover area, ground observed hydrological data of 02 and meteorological data of 10 stations. The general elevation of the land surface of the study area ranges from 776 m to 2793 m above mean sea level. The snowmelt runoff during time between April and June. Between 2004 and 2016, the range of long term snow cover ranges between 5 and 95% between October and April. The model simulates daily stream flow in mountainous and other types of basins where snowmelt is a major runoff contributor. The period 2011–2016 was used for calibration and validation of VIC. After calibration the value of  $R^2$  between simulated and observed discharge was 0.75 for Tuul-Ulaanbaatar and 0.71 for Tuul-Altanbulag station. Average measured runoff is 16.5 (m<sup>3</sup>/s), average computed runoff is 13.9 (m<sup>3</sup>/s); and maximum measured runoff is 206.0 (m<sup>3</sup>/s), maximum computed runoff is 237.5 (m<sup>3</sup>/s) in Tuul-Ulaanbaatar station. Average measured runoff is 12.7 (m<sup>3</sup>/s), average computed runoff is 19.2 (m<sup>3</sup>/s); and maximum measured runoff is 124.2 (m<sup>3</sup>/s), maximum computed runoff is 290.3 (m<sup>3</sup>/s) in Tuul-Altanbulag station.

(m<sup>3</sup>/s), maximum computed runoff is 290.3 (m<sup>3</sup>/s) in Tuul-Altanbula

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