**Vanshika Dhamija**

**Project Title:** Integrated vulnerability assessment of wheat and paddy crops under earth system climate model scenarios, district level analysis in India

**Host Organization:** Jawaharlal Nehru University, New Delhi

**Year:** 2016

**ABSTRACT:**

Agriculture Sector in India is vulnerable to the projected global warming and associated climate change. This study assesses vulnerability as a function of exposure, sensitivity and adaptive capacity. GFDL ESM2G modelled data for climate projections has been used for the analysis of the vulnerability of wheat and paddy crops under current scenario (1975-2005) and across RCP 4.5 and RCP 8.5 exposure scenarios developed under Representation Concentration Pathway (RCP), in near future (2021-2050). The analysis was carried out at district level by using composites of proxy indicators. Two methods were used for giving weights (1) Analytical Hierarchy Procedure (AHP), and (2) Equal weights. This study further assigns consistency to vulnerability classes of all districts in the study area. The results of the vulnerability profile suggest high vulnerability of wheat crop in Northern region under current and future scenarios (RCP 4.5 and RCP 8.5) whereas in case of paddy crop, vulnerability is concentrated more towards eastern region whereas southern and central region shows low vulnerability. This study will enable to identify regions where wheat and rice crops will be adversely affected due to climate change. This information is a pre-requisite by decision makers and planners to prepare strategies to address the adverse impacts of climate change and for efficient allocation of resources.

**Shahnaz Khatun**

**Project Title:** Stream flow modelling In a part of Satluj basin using swat model

**Host Organization:** National Institute of Hydrology (NIH), Roorkee

**Year:** 2017

**ABSTRACT:**

Adoption of mathematical models for evaluation of hydrology of watershed is most popular and prevailing trend. The most trending techniques in present time, to derive out the information related to watershed, are GIS and Remote Sensing. SWAT is a universal, semi-distributed, mathematical river basin model that needs a large number of input parameters. In the current study, the model is accomplished for gaining knowledge of hydrological behavior of the study area which is in between Suni to Kasol in the state of Himachal Pradesh, India.For model calibration, daily observed stream flow data (1986-1998) was used, while for validation data from 1999 to 2011 have been used. The applicability of SWAT model is assessed by using various graphical and statistical methods which helped to determine the capacity of the model for simulation of runoff for this particular basin. SWAT-CUP is one of the new developments for calibration/uncertainty analysis of watershed models. It gives an efficient graphical interface for depicting outcomes, it takes into account both simulated and observed data, best-fit model results and 95PPU for all variables used in model calibration. SUFI-2 procedure is effective but need more iterations as well as modification of the parameter ranges for better results. This method is flexible allowing users to adopt different measures and objective functions. This method has been chosen for this study. The model is calibrated by using eleven most sensitive parameters namely CN2, SOIL_K, RCHRG_DP, CH_K2, ALPHA_BF, ESCO, GW_DELAY, SOL_AWC, GW_REVAP, GWQMN, REVAPMN.The $R^2$ for daily runoff was derived 0.99during Calibration period with Nash Sutcliff of 0.98, whereas0.97 and 0.96were found respectively at Kasol outlet for the validation period as well. It shows the effectiveness and appropriateness of the SUFI-2 method for the study area. As per water balance study, the water yield and ET of the catchment varies from 45-50% and 40-45% of the total precipitation, respectively. It is necessary to acquire spatial and hydro meteorological database for the study by installing the Automatic Weather Stations (AWS) to measure more accurate meteorological data.The results of non-parametric approach indicates that during monsoon season there is rising trend in rainfall at both stations. The rainfall is found to be falling during pre-monsoon, post-monsoon and winter season.

Keywords: SWAT, Global Sensitivity Analysis, Calibration, Validation, Trend Analysis

**Rituparna Das**

**Project Title:** Characterizing Indian agriculture based on climate resilience/vulnerability using time-series climate and vegetation data

**Host Organization:** Regional Remote Sensing Centre- EAST

**Year:** 2018

**ABSTRACT:**

Long term (1982-2015) gridded precipitation data along with time-series NDVI were used to study the relationship between the meteorological and agricultural drought over Indian agricultural area. Several meteorological drought parameters, e.g. duration, magnitude and extend, were computed for Indian summer monsoon season (June-Sept) based on the standardized precipitation index (SPI) at different time scale at district level. A new approach, i.e. Weighted Drought Index (WDI), was proposed in the study to quantify the meteorological drought by considering all major drought parameters. Subsequently, the long term NDVI data was used to detect the major crop phenological stages during the kharif season over the Indian agricultural area. A unique approach, i.e. Agricultural Drought Index (ADI), was proposed towards quantification of the agricultural drought by combining several standardized phenological parameters, like length of growing period, seasonal NDVI etc. A Mann-Kendall test which is non-parametric and Sen's slope method were carried out to analyze the trend in the meteorological and agricultural drought parameters along with two new indices. Finally, the correlation study was carried out to identify the relationship between WDI and ADI, and to classify Indian agricultural area based on its climate vulnerability/resilience. As a result it can be seen that throughout the north to northeast region and western peninsular region maximum agricultural drought was found. In the northeast region increasing trend was found for meteorological drought whereas in the southern peninsular decreasing trend were found. In some districts along the Indo-Gangetic plain and some districts of Madhya Pradesh, western Gujarat were more climate vulnerable whereas in the northwest districts were more resilient. Some isolated districts in southern peninsular region were found to be vulnerable.

**Sucheta Bhattacharjee**

**Project Title:** In-season crop distribution and simulation of crop phenology over Nakashipara block, Nadia district, W.B.

**Host Organization:** Regional Remote Sensing Centre- East, NRSC, ISRO

**Year:** 2019

**ABSTRACT:**

The substantial increase in agricultural food production is one of the key targets to supports the rapidly rising global population. Since the population has been growing in a rapid manner the global food security is a major challenge which can be faced in this century. India being an agrarian country, 50% of the population's livelihood depends on the agricultural sector so, the regular monitoring and assessment of agricultural crops are essential to avoid the impacts of any un-foreseen incidents. The accurate estimation of crop specific sown area and accurate mapping of crop distribution are the key steps to monitor crops. So, this study aims to classify in-season crop accurately and simulation of crop phenology. For classifying in-season crop different sensors and approaches has been used to classify the crop types accurately over Nakashipara region. Sentinel-2A, Landsat, Hysis and NDVI time-series data, and NDVI NDWI threshold-based classification has been used to classify the crop types accurately over the time. In which, Snetinel-2A gives more accurate results than the other two sensor and NDVI time series profile-based classification reached the maximum accuracy compare to those methods. For the simulation of crop phenology two approaches has been used one is derivative approach by which we estimate the maximum greenness of mustard crop and the other one is depending on sowing date criteria. The validation has been made for the simulation process in which the results are very closely related to estimated maximum greenness. From this simulating result we can estimate crop phenology for any crop by knowing its sown date.

**Sweta Kumari Shaw**

**Project Title:** Flood hazard mapping using integrated modelling and geospatial techniques

**Host Organization:** Indian Institute of Remote sensing, Dehradun

**Year:** 2019

**ABSTRACT:**

Basin of Mahanadi river experience very high frequency of flood and faces devastating impact of flood almost every year. This study is performed for a stretch of Tel river, a tributary of Mahanadi river which is a flood prone river. The study reach of river consists two gauging stations Kesinga (upstream) and Kanatamal (downstream). This study aims to show the important characteristics of Terrain based index over a physical model, and also how flood frequency analysis can be integrated into this. Flood plain mapping has been done in this study with use of both the abovementioned models. 'Height Above Nearest Drainage (HAND)' is used as Terrain based index and HEC-RAS is physical model in which hydrodynamic modelling has been performed. 'Flood Frequency Analysis' has been performed using 'Gumbel', 'Log Normal' and 'Log Pearson type 3' distribution methods. To know the best suited distribution for the data, R2 and NSE values were considered between observed and expected data, on basis of it appropriate method was selected. Sensitivity analysis, Calibration and Validation has been done for the HD model. Flood hazard maps has been prepared for 2008 and 2010. The scenario generated by HD modelling for 100- year return period with the discharge value estimated by flood frequency analysis has been compared with the map developed with the help of HAND for same extreme event (100-year return period). At last Accuracy assessment was performed to check the similarity of flood plain developed from HAND with that of HEC-RAS. It was seen that HAND is giving good and reliable results, which means HAND was able to create almost similar flood extent with respect to HD modelling from the aspects of Meandering, Confluence, etc. But there are some limitations with threshold value determination for HAND. Overall HAND can be considered as an alternative for flood mapping for disaster management and near real time results.

**Aminu Abdulwahab**

**Project Title:** Geospatial approach in modelling of wetland ecosystem along river Benue-Gongola tributaries of Adamawa State

**Host Organization:** Federal Polytechnic Mubi Adamawa State Nigeria

**Year:** 2020

**ABSTRACT:**

Wetland has been known as the major transition zone between the terrestrial and aquatic regions. As water on the soil or near the surface gets saturated seasonally or permanently over the year, geospatial technology based on remote sensing and Geographic information system can help in analyzing and investigating the loss or gain in the wetland natural resources for sustainable development. This project was designed to investigate the spatiotemporal variation of the wetland's ecosystem along the major tributary of Upper Benue and River Gongola at Numan using multiple remote sensing techniques (Optical remote sensing, Microwave Remote sensing, and Advanced Spaceborne thermal emission and reflection radiometer/Shuttle Radar Topography Mission Digital Elevation Model). This was achieved through 1) spatiotemporal inventory, modelling and depicting the wetland potential basins and ponds, 2) investigating the spatial multitemporal change of land-use land-cover dynamics in wetland ecosystem 3) computational analysis of major ponds areas from Sentinel 1 Synthetic Aperture Radar/ optical (Enhanced thematic mapper (ETM/ETM+)), 4) comparing multiple technologies of optical and microwave remote sensing technique with Advanced Spaceborne thermal emission and reflection radiometer/Shuttle Radar Topography Mission DEM 5) publishing the major outputs on a web-based and mobile platform for easy assessment of the research findings. As three to six land surface area of the earth comprises of wetlands, the geospatial technique from multitemporal Landsat satellites images (Enhanced thematic mapper) and Microwave (Synthetic Aperture Radar) data covering the research area was acquired ranging from 2003, 2007, 2011, 2015 and 2019. Field data was the primary data sources for this project, Global mapper 19, Google Earth Pro, ArcGIS 10.7, Erdas Imagine 2015 and SNAP Tool software were used for data analysis while Google earth engine and R were adopted for scripting and coding for the best output of the analysis such as the classification of a digital image, change detection, Time series, Accuracy Assessment and calculation of area and visualization of cartographic features. The result shows that the wetland areas were at an increasing rate from 1103.976 hectares (4%) 2003 to 1980.5058 hectares (7%) 2019 and it also conformed with the "Ramsar sites with International Importance" based on Criteria 1,2,3,4,6,7, and 8. The result also indicates that the wetlands A = 3.443m, B = 4.237m, and C = 5.169m figure 11/12 confirmed with the depth, not exciding 6-meter wetland criteria. Therefore, the project area can be included under the Ramsar sites of Nigeria.

**Abhishek Pandey**

**Project Title:** Effective radio frequency planning for 5G- spatial decision support system (Sdss)

**Host Organization:** HERE solutions pvt. ltd

**Year:** 2020

**ABSTRACT:**

5G, the upcoming mobile network is the fastest network ever developed having potential to provide speed of 10 gigabits per second and ultra-low latency. It consists of high band mmWave frequencies which cannot penetrate buildings and canopies hence requires spatial decision support tools to maximize its coverage and select best possible site for radio frequency (rf) planning. This site selection process is carried out twin' which requires high resolution GIS inputs called 'geodata' using simulation in a 'digital twin' with submeter accuracy. Here, a methodology has been proposed to create high resolution geodata which are required for radio frequency planning which can help in site selection and effective planning of 5G networking such as line of sight analysis. Specifically, these geodata are, Clutter i.e. land use surface information, 3D building models, Digital terrain model i.e. bare earth elevation, Tree crown cover or canopy model. The data used for creation of clutter is high resolution Worldview 2 RGB imagery, using which, Support vector machine algorithm was carried out to produce land use with an accuracy of 87% and further merged with building footprint data to produce clutter based on Maryland classification scheme. The 3D building model was created using footprint data consisting of height attribute with vertical accuracy of 50 cm. Terrain model was obtained from lidar data & this lidar data was further segmented using PointCNN, a deep learning model. The precision and recall achieved from PointCNN for canopy is 98.3% and 96% respectively. Analytic hierarchy process (AHP) and weighted overlay analysis were carried out with geodata to locate suitable sites. 90 locations were identified to be highly suitable for rf planning. 5G is more than just data flow, its about IoTs, location intelligence, smart cities and vehicles etc.