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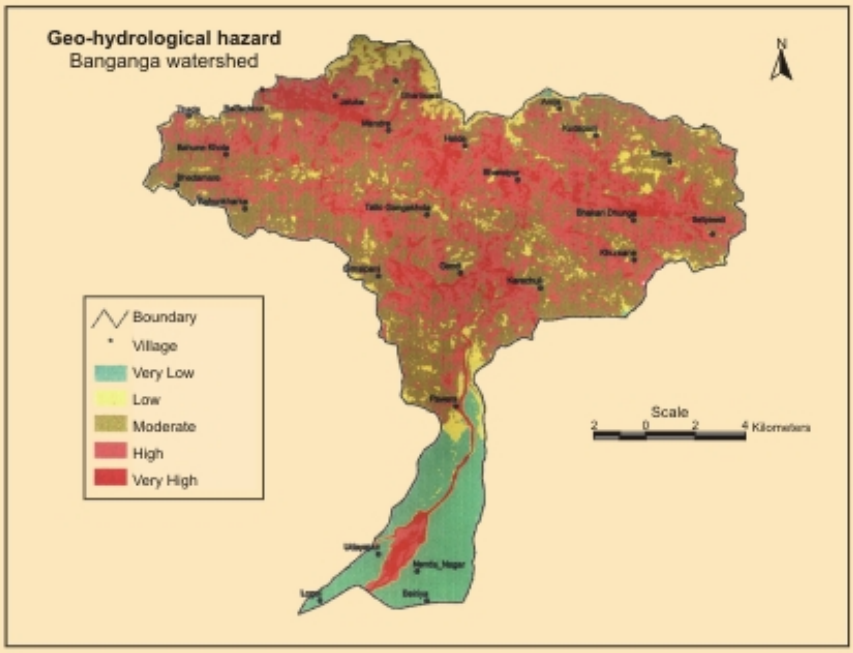
GEO-HYDROLOGICAL PROCESSES AND THEIR IMPACT ON THE ENVIRONMENT AND SOCIO-ECONOMY OF A WATERSHED

Mr. Motilal Ghimire, Nepal

(A case study of the Banganga Watershed in the Western Developmental region of Nepal using Remote Sensing and Geographic Information Systems)

The impact of geo-hydrological processes such as mass wasting, erosion, landslide, ground water action and river action on bio-physical and socio-economic condition of any region is a well known fact. In the present study, a small watershed in the Western Developmental region of Nepal is taken up to study the impact of geo-hydrological hazards on bio-physical and socio-economic condition of Banganga watershed. The Banganga watershed is an elongated basin with average relief of 830 meters lies between 27°41'30" to 27°54'07" north latitude and 80°04'22" to 80°18'56" East longitude covering an area approx. about 207.33 sq. km. Physiographically the area is a ridge-valley topography with 86% of the area covered by hills and valleys and 16% area lies in the Banganga fan. Forest is the dominant land use / land cover of the study area (70%) followed by cultivated land (23.5%). The



estimated house holds in the Banganga watershed are 3969 and they spread over 41 settlements.

The study area has a typical geological set-up with Siwalik group of rocks of Neogene period occupying the southern half of the watershed and lesser Himalayan rocks ranging from Pre-Cambrian to Eocene age occupying the northern half of the watershed. The main lithology of the area varies from sandstone, mudstone and conglomerate of Siwalik group to Slate, shale, Phyllite, limestone, dolomite and quartzite of lesser Himalayan rocks. Main Boundary thrust passes through the middle of the study area separating Siwalik group of rocks from the Lesser Himalayan rocks.

The impact of geo-hydrological hazard in the area is significant. Most landslides in this area are affecting the forest and shrub lands. The extreme events of flooding and landslides have occurred in the year 1961, 1979, 1998, 1999 during last 75 years. In terms of damage/loss rendered the disaster of 1961 was worst which destroyed 77 ha of cultivable land, 537 ha of forest, 15 houses and 2 lives. The geo-hydrological hazard map generated by GIS based bivariate statistical method has displayed high degree of reliability as overwhelming numbers of active and old landslides scars occur in high and very high hazard zones. About 43% of the area lies in high and very high hazard zone, which contains 83% of the active landslides. Similarly about 99% of the old slides occur on high and very high hazard zone. Most of the area under high and very high hazard lies in the middle reaches of the Banganga river. About 8% of the total agricultural land lies in the high hazard zone. Like wise about 30% of forest cover comprise the high hazard zone. In the study area, 111 houses (4%) are located in the high hazard zone. Damage to forest land is expected from 50% of the landslides. Landslides were more frequent in the mid-north part of the study area, nevertheless the damage was more in the areas that have lesser frequency of geo-hydrological events.

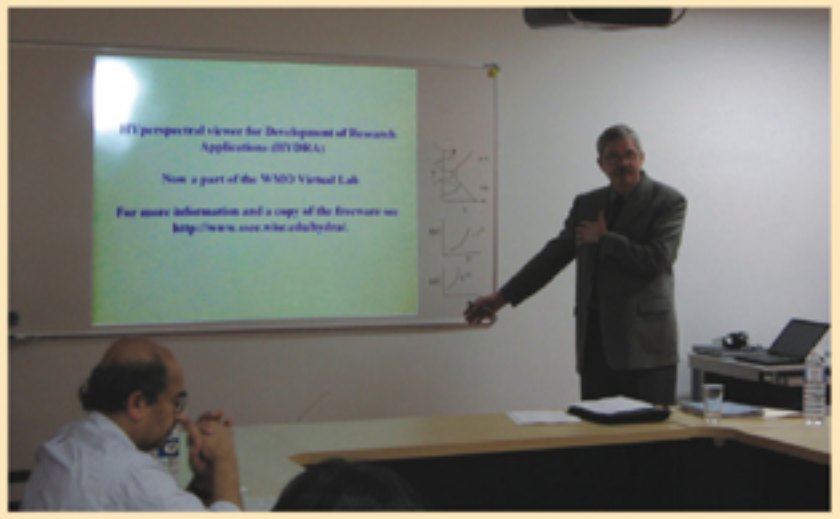
The floods in the study area are potentially dangerous to the agricultural land lying particularly on the debris fan formed at the

FOURTH PG COURSE ON SATELLITE METEOROLOGY & GLOBAL CLIMATE

The fourth SATMET course of CSSTEAP, commenced on the August 2, 2004 at the New SAC Campus, Bopal, of Space Applications Centre (SAC), Ahmedabad. 15 Participants from 10 countries in A-P region are attending the course.

At the end of the Module II, Theory & Practical examinations were conducted. After the examinations the Participants undertook a Study Tour to South India to visit Goa and Bangalore. In Goa, they visited National Institute of Oceanography (NIO) and National Centre for Antarctic and Oceanic Research (NCAOR) to get familiarized with various activities of these organizations. In Bangalore, they visited ISRO Satellite Centre (ISAC), ISRO Headquarters and Regional Remote Sensing Service Centre (RRSSC). Participants got the opportunity to visit various facilities at ISAC. In ISRO Headquarters the Additional Secretary, Mrs. Veena Rao briefly met the Participants.

Participants at NCAOR, Goa with Director Dr. P.C. Pandey



Dr. Paul Menzel, Senior Scientist of NOAA, USA delivering lecture

Participants were also taken around places of tourist and historical importance such as Mysore, Srirangapattanam, North & South Goa. Few Participants had the feel and experience of the ocean for the first time in their life. They enjoy the magnificent beaches of Goa.

Dr. Paul Menzel, Senior Scientist of NOAA, USA visited Ahmedabad and delivered four lectures to the CSSTEAP - SATMET - IV course Participants. The topics included Radiative Transfer, METSAT Data Applications and demonstration of Software Package "Hydra" to analyze the spectral data. Dr. Menzel distributed CD's containing his WMO published lecture notes on "Satellite Meteorology" to all the participants. Participants benefited immensely by this interaction with Dr. Paul Menzel, the leading expert in Satellite Meteorology.

The last three month module on Pilot Project commenced on February 1, 2005. In consultation with their parent organization in their home country the Participants have finalized the topics of the respective Pilot Projects. They were also given a scientific paper as basis for their Pilot Project and they were required to make a presentation about the formulation of their Project. The Pilot Projects were reviewed by the Focal Point (Pilot Projects) in consultation with the Project Guides, to ensure the data availability

Course Participants & Faculty with Dr. Paul Menzel

FOURTH PG COURSE ON SPACE AND ATMOSPHERIC SCIENCE

The modules 3 and 4 of the course have been completed by first week of February. The course in module 3 included Astronomy, Astrophysics as well as Spacecraft Technology, whereas module 4 covered a variety of experiments. Experts from various institutes, namely, Prof Udaya Shankar from Raman Research Institute, Bangalore, Mr B L Agrawal from ISRO Satellite Center

Prof. Narayana Rao, Director NMRF Gadanki, Tirupati addressing the participants

Bangalore, Mr. CL Ojha from VSSC Trivandrum and Prof R K Manchanda from TIFR, were some of the invited faculty members who covered respective portions of the course. The examinations for the module 3 were over by second week of February.

The participants were taken on the second educational tour after completion of their examinations. During the first leg of the journey the group was taken to Bangalore where they visited ISRO Satellite Centre (ISAC), ISRTRAC and Raman Research Institute, apart from a short trip to Mysore and other local places of interest. From Bangalore the group proceeded to Trivandrum, where every one had a chance, to see a sounding rocket launch from TERLS, VSSC. The participants also visited Centre for Earth Sciences Studies (CESS), a few places of interest around Trivandrum including visit to Kanyakumari.

A brief halt for 12 hours on February 28 was utilized to visit MST Radar at Tirupati. The participants spent their final part of tour at Hyderabad and Visited NRSA, TIFR Balloon Facility and a few local places of interest.

The Group returned to Ahmedabad, revitalized to start the work on their pilot project with full thrust. As of now everyone is engaged in completing his/her work which is to be

NINTH PG COURSE ON REMOTE SENSING & GIS PG COURSE

The Ninth Post Graduate Course on Remote Sensing & GIS (RS & GIS) of CSSTEAP which started at Indian Institute of Remote Sensing, Dehradun on October 01, 2004, is being attended by 20 participants from 11 countries of Asia Pacific region including India. The course is now running Module II and this Module started on January 01, 2005. This module consisted of RS & GIS Applications to Thematic optional stream and also a common stream. The Thematic optional stream covers several disciplines such as Agriculture and Soils; Forestry and Ecology; Geosciences; Marine Science; Human Settlement & Urban Analysis and Water Resources. Advances in RS & GIS; Satellite Meteorology; Earth Processes; Natural Disaster Monitoring

Participants at Romoja film city, Hyderabad

Participants at Mysore Palace, Mysore

and Management; Sustainable Development and Integrated Natural Resource Management; and Environmental Analysis, Monitoring and Management. Each of the course participants has chosen one optional thematic application discipline based on his academic qualification, professional experience, and requirements of their parent organisations.

The course curriculum of this module was covered by the faculty of IIRS and additional guest lectures on specialized topics were also arranged for the academic benefit of course participants. The guest lecturers were from various Indian Organisations / Institutes / Universities such WBRSAC, Kolkata; IMD, Dehradun; DEAL Dehradun; IARI, New Delhi; NIH, Roorkee; NRSA, Hyderabad; SAC, Ahmedabad; Andhra University, Visakhapatnam etc. One international guest faculty Dr. Manjul Hazarika from Geoinformatic Centre, AIT, Bangkok delivered the lecture on Estimation of NPP by integration of Remote Sensing data with terrestrial ecosystem model

The performance of course participant was evaluated through periodic theory and practical examinations and tutorial assessment. In this module each student gave technical presentation in the form of seminar on the problems; prospects of natural resource management and potential of RS & GIS application in their respective home countries. An educational visit to two weeks

BACKGROUND OF CSSTEAP

In response to the UN General Assembly Resolution (45/72 of 11th December, 1990) endorsing the recommendations of UNISPACE-82 the United Nations Office for Outer Space Affairs (UN-OOSA) prepared a project document (A/AC.105/534) envisaging the establishment of Centres for Space Science & Technology Education in the developing countries. The Objective of the Centres is to enhance the capabilities of the member states in different areas of space science and technoloy that can advance their social and economic development. The first of such centres, named as

CSSTEAP Building

Centre for Space Science & Technology Education in Asia & the Pacific (CSSTEAP) was

established in India in November 1995. Department of Space, Government of India has made available appropriate facilities and expertise to the Centre through the Indian Institute of Remote Sensing (IIRS) Dehradun, Space Applications Centre (SAC) & Physical Research Laboratory (PRL) Ahmedabad. The Centre is an education and training institution that is capable of high attainments in the development and transfer of knowledge in the fields of space science & technology. The emphasis of the Centre is on in-depth education, training and application programmes, linkage to global programmes / databases; execution of pilot projects, continuing education and awareness and appraisal programmes. The Centre offers Post Graduate level and short courses in the fields of (a) Remote Sensing and Geographic Information System, (b) Satellite Communications and GPS, (c) Satellite Meteorology and Global Climate, (d) Space and

Ongoing Courses

- Fourth 9 month Post Graduate course in Satellite Meteorology and Global Climate at SAC, Ahmedabad from August 2, 2004
- Fourth 9 month Post Graduate course in Space & Atmospheric

Forthcoming Courses

- Fifth 9 month Post Graduate course in Satellite Communications at SAC, Ahmedabad from August 1, 2005
- International short course on Geoinformatics for Sustainable Agriculture at IIRS, Dehradun during Aug 16 -Sept 9, 2005

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CSSTEAP welcomes the views and opinions of the readers of Newsletter. Short Communications on space science and technology education which may be relevant to Asia Pacific Region are also welcome. Views

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