GEOLOGICAL SURVEY OF INDIA
TRAINING INSTITUTE, HYDERABAD
PHOTOGEOLOGY AND REMOTE SENSING DIVISION

COURSE REPORT ON THE SIXTH COURSE ON APPLICATION OF GEOINFORMATICS DISASTER MANAGEMENT

(GSITI-ISRO COLLABORATIVE PROGRAMME UNDER NNRMS)

(27th June 2011to 27th July 2011)

One of the major activities of the Natural Resources Management System (NNRMS) is to formulate appropriate human resource development strategies, which will enable training and education opportunities in the field of Remote Sensing (RS) and Geographic Information System (GIS) applications. Over the past of 20 years, concerted efforts under the NNRMS have enabled conducting various training programmes for application of RS and GIS in agriculture, urban geology, ground water soils and landuse. Geological Survey of India (GSI) has been in the forefront in the applications of aerial photo interpretation and remote sensing techniques in its activities having started the use of aerial photos in the early 1950s and satellite images in 1973. The GSI has forayed into Digital techniques in the field of geoinformatics since middle 90s. Off late GSI has been identified as nodal agency for landslide studies.

The natural disasters taking the toll of life and propertyhave become matter of concern all over the world. There is a need to collect, collate, analyse and disseminate the geoinformatics data to evolve decision support system for effective disaster management. Considering the expertise of GSI in the area of Disaster management a pre cursor-trainingprogramme on Geoinformatics for Disaster Management has been conducted during December 15, 2004 to January 13, 2005 at GSITI, Hyderabad, where 17 candidates participated. Subsequently an MOU was signed for collaborative attempt between ISROandGSITI FOR CONDUCTING FIVE TRAINING COURSES FOR THE PERIOD OF FIVE YEARS. From 2006 to 2010 a total of 59 candidates have been trained till date.

The present course being the last one in five year 2nd cycle and 13 candidates have participated in the program. The course is taken up as part of FS item 2010-2012/C-DM/GSITI/PGRS/2012/021 page No 54.

The core faculty associated with the programme included:

N.S.Gadagkar, Senior Geologist, PGRS Division, GSITI, Hyderabad

J.P.Mohakul, Senior Geologist, PGRS Division, GSITI, Hyderabad

V.Aneel Kumar, Senior Geologist, CGMT, GSITI, Hyderabad

P.V.KrishnaRao , Senior Geologist, CGMT, GSITI, Hyderabad

Apart from the above core faculty, a number of eminent geoscientists from GSI and other organizations delivered guest lectures on specialized topics including case studies on application of RS and GIS for Disaster Management.

The course was inaugurated on 27.06.2011 by G.Behera, Dy. Director, NRSC, Hyderabad and Dr.K.Ayyasami, Dy.D.G and HOD GSITI chaired the session. After a brief self-introduction by the participants, Sri N.S. Gadagkar, Sr. Geologist and faculty, PGRS Divn. Gave a brief account of the course

Overview and

the curriculum. Dr.K.Ayyasami Dy. D.G., GSITI and Chairman advised the participants to interact with the faculty and guest faculty to extract maximum benefit during the training programme. N. Kutumba Rao Director (CT) addressed the participants. The chief guest DrBehra, in his key note address, dealt about Remote sensing data products their utility for assessment, monitoring of natural disaster and development of support system for remedial measures. The satellite data with high spatial and temporal resolutions can effectively be utilized for studies related to earthquakes, demarcation of landslide prone zones, urban flooding, drought, forest fires and such other natural calamities. He advised the participants to visit the Natural Disaster Management Authority (NDMA) site and appraise themselves of the 27 natural disasters identified and the disaster preparedness that can be attempted to. The knowledge can further be disseminated to others so that the entire society gets the benefit. He said the data from the recently launched satellite RESOURCESAT-2, having 12 bit data and low swath with repetitive coverage of two days will be of great help in making studies related to disasters.

The course was planned in 4 modules:

1. Aerial Remote sensing and Photogrammetry -3 days
2. Digital Image Processing including Digital Photogrammetry - 9 days
3. Project work in Aerial Photo and satellite imagery, Interpretation - 3 days
4. Geographic Information System (GIS) - 7 days
5. Case studies and applications - 4 days
6. Visit to national laboratories (NRSC and INCOIS) - 1 day
7. Field visit - 1 day

Under Module I– photogeology and Remote Sensing – The participants were introduced to the fundamentals aspects like aerial photography, flight planning and mission execution, various types of aerial photo mosaic, image/photo interpretation criteria, principles of photogrammetry and it's application in determining true slope/dips, physics of remote sensing, data acquisition systems, sensors and platforms, multi spectral remote Sensing. The participats were introduced

to interpretation of lithology, structure and landforms of sedimentary, igneous and metamorphic terrains.

Under Module II- Digital Image Processing – Participants were introduced to Digital Image Processing comprising Image preprocessing, geometric rectification of raw data, various image enhancement and classification techniques, image mosaicking and map composition, using ERDAS Imagine software (9.1 version). Besides specialized topics like frequency domain filtering and accuracy assessment of multispectral classification were also dealt with. The various aspects were covered through a series of lectures, demo and hands on practice followed by a project work where the participants applied all these techniques to the data products (LISS - III, LISS IV and CARTOSAT -1 mono) of a selected blocks(Hyderabad and Ramagiri area) and appreciated the results.

The following topics were covered in the Digital Image Processing module

1. Different digital image formats
2. Loading of different satellite images and subsetting
3. Geometric rectification of the spatial data
4. Statistical analysis of digital data
5. Various enhancement (radiometric, spectral and spatial) techniques
6. Multi band enhancement techniques – including band ratioing, Principal Component Analysis, RGB –HIS transformation, resolution merge, image fusion and frequency domain filtering.
7. Image classification (supervised and unsupervised) techniques and accuracy assessment
8. Mosaicking and map composition

   Besides, the participants were introduced to digital Photogrammetry comprising Digital image orientation, Aerial and Space Triangulation, DEM and Orthophoto generation, 3D visualization in virtual GIS, 3D feature extraction and creation of thematic layers (landforms, structure and lithology) through lectures and demo for three days followed by a project work

Under Module III -Geographic Information System

Conducted at the CGMT laboratory, topics like general concepts of spatial data models, spatial data capturing techniques, Geo-referencing and on screen digitization, Automatic and semi-automatic vectorization using Arc scan, Spatial data editing, Concepts of GPS and mobile mapping, Spatial adjustments, GIS analysis and Modeling techniques, were covered using propriety software ArcGIS 10 of ESRI. As part of this GIS module a project work was carried out using the data product of area around Ramagiri.

Case studies on application of geoinformatics for disaster management were presented by eminent scientist from NRSC, NGRI, Survey of India, AP State Remote Sensing Application Center (APSRAC), Indian National Center for Ocean Information Service (INCOIS) and serving GSI officers.

Module IV : Case studies and applications

1. Spatial inputs for disaster mitigation, management with special reference to flood
2. Earth quakes and seismic microzonation
3. Seismicity of western india
4. Earthquake hazards-a case study from bhuj earthquake
5. Landslides, causes, suspectibility zonation and control
6. Geoinformatics for landslide hazard and risk management
7. Urban flooding and mitigation measures case study from Kurnool flooding 2009
8. Earthquake hazards and its management
9. Drought management

Module IV: Project work –

After attaining a fair degree of confidence in photo interpretation techniques, the trainees were given work for the Digital Image Processing module for Ramagiri area and for Photogrammetry module Medak area in AP. The trainees have successfully completed the project work.

Enthusiastically participated in the group discussions and presented their observations during the project work both in the digital image processing and block interpretation. An evaluation test was also conducted in which all the trainees performed well.

VISITS to LABS:

The participants were taken to data processing center of NRSC at Balanagar and which provided unique opportunity for them to get a first hand experience on the data processing of remote sensing data. Visits to NDC to NRSC gave them the insight into the acquisition procedure of RS data by online transactions. Demo on installing and browsing Bhuvan was an added attraction during NRSC visits. Further, the participants were taken to the Indian National Ocean Information System (INCOIS) Kukkatpally, Hyderabad for first hand information on tsunami warming and hazard mitigation. Insight into the application of OCEANSAT data, sea surface temperature monitoring, fishing zone demarcation were some new techniques were briefed by scientists of INCOIS during the visit.

One day field visit to Nagarjun Sagar was made where the participants could study the dam site geology and the eparchean unconformity. Ehipotala fault and resulting landform were studied. Project work included the Ramagiri for digital image processing part while for photogrammetry project the MEDAK area data was used.

A demo on what is new in ERDAS 2010/11 was arranged. The availability of RADAR data from the NRSC in the near future will be available and keeping this aspect in consideration a demo on RADAR mapping suite was organized. The participants had gainful interaction with the engineer from Leica Geosystems Geospatial India Pvt. Ltd.