ISSN 0972-5776

GIS India

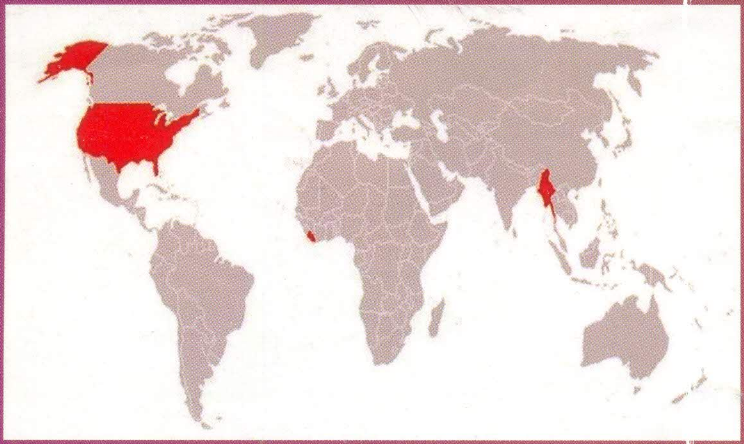
Volume 23 No.4 India's first GIS Journal since 1992 April 2014

Price Rs.100/-

The author Riaz Hasan is standing with light blue Half shirt.

Mr. GS Kumar reviewer of the extreme right standing

Details on page 15



Countries of the world not using metric system

Panoramic view of PSLV C-24 on the First Launch pad with mobile service tower at a distance

Innovative and Cost Effective Spatial Positioning

Scope of geospatial technologies in large scale land resource inventory

G.P. Obi Reddy, Principal Scientist, National Bureau of Soil Survey & Land Use Planning, Nagpur-440 033

In recent years, there is an increasing demand for large scale land resource inventory and mapping to meet the various demands in the fields of land resource planning, management, conservation and sustainable agriculture. With the advent of geospatial technologies (high resolution remote sensing, Geographic Information System, Global Positioning System), the process of land resource inventory and mapping has changed significantly. Various geospatial technologies have much potential to contribute to understand the spatial distribution of terrain, soils, land use/land cover and other landscape qualities, which affect land resource planning and management. Large scale land resource inventory provide a wealth of information about the distribution of main landscape qualities like climate, soil and water, their properties, limitations, and expert interpretations for land use planning and management. It also provides the details on slope, soil depth, erosion, drainage, hydrolic conductivity, pH, groundwater depth, land capability and irrigability of the given area.

Data acquisition and processing is important stage in any large-scale mapping exercise. High resolution satellites like Cartosat-1, dedicated to stereo viewing for large scale mapping and terrain modeling applications. Standard products are generated after accounting for radiometric and geometric distortions while precision products are ortho-rectified. Ortho- rectified products are corrected for terrain distortions and camera tilt effects with the help of control points and using Stereo Strip Triangulation (SST) based DEM (only for Indian region). Cartosat-1 data products supplied with 10 bit radiometry for both PAN Fore and Aft cameras. The geo-referenced IRS P6 satellite data could also be effectively used with suitable image enhancements to facilitate the delineation and interpretation of different thematic information. It would be more appropriate to adopt the Universal Transverse Mercator (UTM) coordinate system with WGS 84 datum. It is also compatible with GPS, remote sensing data and the Open Map Series now under preparation by Survey of India.

It is essential to have accurate base maps for any large scale resource inventory, so in large scale land resource inventory, transfer of spatial components from high resolution satellite images to map is crucial. With the published topographical maps, the capabilities of base maps generation is possible at 1:50,000/1:25,000 scale. In view of this constraint, it is a necessary prerequisite to generate large scale base maps for use in land resource inventory and mapping. With the available latest satellite technology, the large-scale map could be generated using high-resolution space borne imagery as Digital Topographical Database comprises both vector and raster layers representing the topography of a given area. Geospatial technologies like remote sensing, digital elevation data, and ground based sensor data provide a wealth of site-specific resource information with dependable ground truth datasets. However, collecting detailed ground truth information is to be cost effective for land resource inventory, land use planning and management applications.

> **Geospatial technologies like remote sensing, digital elevation data, and ground based sensor data provide a wealth of site-specific resource information with dependable ground truth datasets.**

In data interpretation, visual and digital interpretation methods could be used to prepare pre-field interpreted map. The satellite data could be interpreted based on photo elements like tone, texture, size, shape, pattern, aspect, association etc. These pre-field interpreted maps and digitally enhanced satellite data could be used on the ground to identify different landform units and elements of various themes. Suitable field sampling techniques like transects/random sampling/quadrants could be followed to assess the interpreted elements and relate with satellite data. In present day, the field data collection is eased by GPS in order to locate the ground verification points on the image and ground for further incorporation of details. During sample collection for the identified field points, collection of attribute information like vegetation, geomorphologic, soil and topographic parameters will be of immense help in finalization of thematic maps.

In land resource inventory and mapping, based on lithology, relief, drainage pattern, natural vegetation, land use and satellite image elements, the distinct landscape/landform units to be delineated. Necessary field verification is essential to finalize interpreted landscape units through satellite imagery. Then, the soil profile points to be decided based on the geological /Geomorphological/ soil heterogeneity mapped from the satellite data. During inventory, through study of landscape elements and soil profiles, delineates the soil boundaries of different kinds of soils whose characteristics are markedly different due to the various factors affecting soil formation. The detailed study of soil-site properties to be undertaken in each soil-mapping unit by traversing and collecting surface soil, minipit and soil profile observations depends on landscape heterogeneity and soil variability. The collected soil samples need to be analyzed based on standard methods for determination of various soil physical and chemical properties. Based on the landform units, soil properties and necessary ground truth verification, final soil maps could be prepared on 1:10,000 scale. Such type of detailed soil maps and spatial information enable the planners and scientists for effective land resources planning, management and adoption of suitable conservation measures.

Geospatial technologies discussed in this article also stand as a necessary tool in the design of land resource information systems and decision support systems in GIS for sustainable management of land resources. In GIS, the attribute database on soil site characteristics, physical, morphological and soil chemical properties could be entered in a seamless soil polygon layer based on the unique soil mapping unit. GIS technology can integrate both spatial and non-spatial data through polygon processing and common database operations such as query and statistical analysis with unique visualization through maps. The framework of land information system in GIS is the ability to systematically organize, search, discover, access, visualize and even update geospatial land and allied data to develop services through customized user interface. The attribute database could be used to generate various thematic maps and generation of area statistics. The outputs are of the converted data, can easily be translated into information. Development of metadata on various parameters of land information system provides a formal structure to identify the land resource databases of a given area and it assist to identify, discover and use of detail land information of that area.

It is evident that geospatial technologies have immense potential in inventory, planning and management of land resources. The appropriate geospatial tools and techniques need to be adopted in execution of land resource inventory, so that much needed standardized geospatial information could be generated for effective implementation of various land use plans to enhance the agricultural productivity. Not only is the combined use of GIS, GPS and remote sensing technologies essential for land resource inventory and development of spatial data, which are indispensable devices in decision making across all sectors of land resource planning and management in the given area. The availability of digital land resource databases in GIS enhances its utility in applications like thematic mapping and analysis, soil-landscape modelling, agro-ecological characterization, land degradation assessment, land evaluation, crop suitability evaluation, land use planning, development of soil conservation strategies, and development of spatial decision support systems for land use planning.

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GIS India
A monthly Publication
India's First GIS Journal Published since 1992

Our Address
The Managing Editor
GIS India
6-3-1216/50, F2, Nest Apartments
Methodist colony, Begumpet
Hyderabad 500 016. INDIA
Ph: +91-40-66667776,
Tel.& Fax :+91-40-66667333
gisindia.in@gmail.com www.gisindia.in