ITC NEWS

**REFRESHER COURSE
IN UGANDA**

ASSESSMENT AND
PLANNING OF HIGHWAYS

BIOFUELS IN ZAMBIA

DIRECTORATE IN INDONESIA

FOSS for Geoinformatics

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Free and Open Source Software (FOSS) is liberally licensed to grant users the right to study, change, and improve its design through the availability of its source code. It has more scope for availability in multiple languages and for being adapted or tweaked to particular needs. FOSS enables users to freely copy and distribute the software. This option benefits students, researchers, teachers and scientists with modest budgets who want to use legal software appropriate to their needs. FOSS has gained both acceptance and momentum in India, and indeed worldwide as the potential benefits have become increasingly recognized globally. reproduced, adapted or distributed.

Open source software packages are those for which the human-readable source code is made available under a copyright licence (or arrangement such as the public domain) that meets the open source definition (www.fsf.org/). Copyleft (such as GNU General Public License) is a form of licensing and may be used to modify copyrights for works such as computer software, documents, etc. It also allows the work to be reproduced, adapted or distributed.

Over the last decade, the paradigm of FOSS development has made strides in the GIS arena, resulting in the creation of several highly sophisticated GIS software projects for numerous purposes. FOSS for Geoinformatics aids study of the variation in landscapes over multiple spatial and temporal scales, encompassing a variety of research areas, such as land use and land cover change, climate change, water resources, urban development, and natural disaster mitigation. Increasingly, FOSS GIS is being used as the principal tool for digital exploration of the variation in landscapes, as it provides the necessary functions for spatial data collection, management, analysis and representation. Among the many GIS tools that are frequently used, desktop GIS, mobile GIS, remote sensing and image processing software, GIS extensions and libraries, spatial database management systems, Mapserver and geostatistical tools are those most commonly used to facilitate customization, provide good support via forums and e-mail lists, and maintain up-to-date documentation.

OSGeo-Live is a self-contained bootable DVD, USB thumb drive or virtual machine based on Xubuntu that allows a wide variety of open source geospatial software without installing anything. It provides preconfigured applications for a range of geospatial applications, including storing, publishing, viewing, analysing and manipulating data (http://live.osgeo.org/en/index.html).

FOSS avoids reinventing the wheel and allows adaptation without restrictions. In addition to these general research advantages, the use of FOSS licences can enhance education and knowledge transfer, particularly in developing countries that lack (financial) resources. Students can freely and legally download the software and study the algorithms. Finally, it benefits society in general, as the use of free software licences can facilitate the application of new technologies and knowledge, thus enabling a sustainable use of resources. If such unified software development and research efforts can be initiated, then we see great potential for accelerating geoinformatics research worldwide.

Based on GRASS GIS (http://wgbis.ces.iisc.ernet.in/grass), GRDSS (Geographic Resources Decision Support System) is one such FOSS GIS that aids data management, image processing, graphics production, spatial modelling and visualization (http://wgbis.ces.iisc.ernet.in/foss).
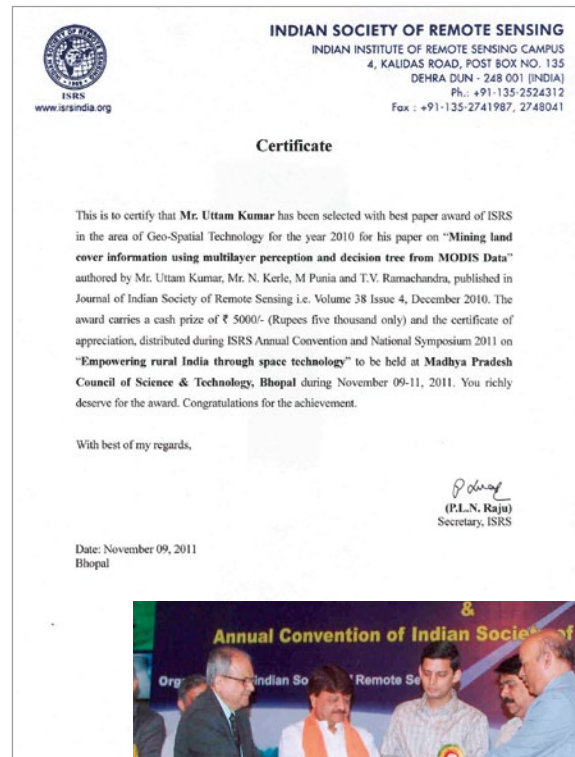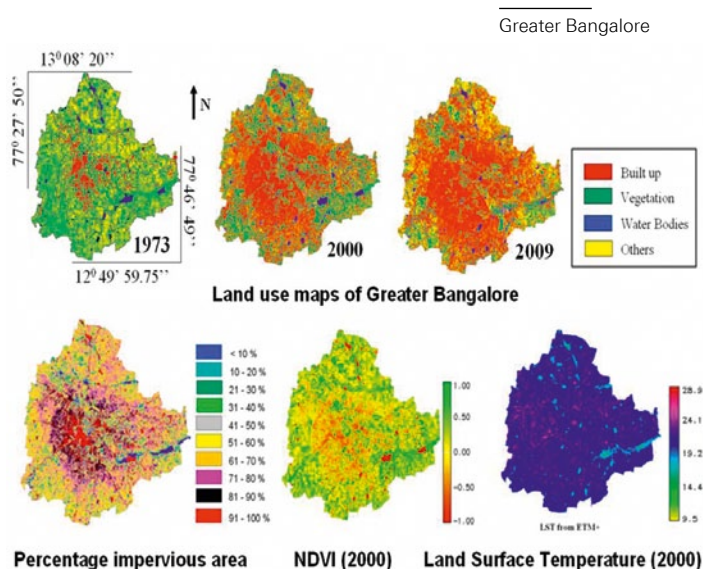
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FOSS

Case Study

Bangalore, one of the fastest growing cities in Asia, has been experiencing unprecedented urbanization and sprawl in recent times, owing to concentrated development activities with the impetus on industrialization for the economic development of the region (http://wgbis.ces.iisc.ernet.in/energy/water/paper/P25_1/index.htm). This concentrated growth has resulted in an increase in population, with the consequent pressure on infrastructure and natural resources, and ultimately giving rise to a plethora of serious challenges, such as climate change, enhanced green-house gas emissions, lack of appropriate infrastructure, traffic congestion, and lack of basic amenities (electricity, water and sanitation) in many localities. Using GRDSS, a study was carried out using multi-resolution remote sensing data, which showed 632% urban growth over 37 years (1973 to 2009). The urban heat island phenomenon is evident in a large number of localities, with higher local temperatures with an increase of 2 to 2.5°C. Natural resources such as vegetation have declined by 76% and water bodies have decreased by 79%, necessitating appropriate strate-gies for sustainable management (http://wgbis.ces.iisc.ernet.in/energy).

Urbanization and the consequent loss of vegetation and water bodies have led to the decrease in catchment yield, water storage capacity, wetland area, number of migratory birds, flora and fauna diversity and ground water table. As land is converted from an agricultural to an impervious surface, it loses its ability to absorb rainfall. The relationship between land surface temperature and NDVI investigated through Pearson's correlation coefficient at a pixel level and the significance tested through a one-tailed Stu-dent's t-test confirmed the relationship for all land use types. The urban growth poles are towards the north, northeast, south and southeast of the city, indicating an intense urbanization process attributable to growth agents such as the setting up of IT and biotechnology corridors, industrial units, etc. Newly built-up areas in these regions consist of the maximum number of small-scale industries, software companies, multi-storied buildings and private houses, which have sprung up in the last two decades. The growth in the northern direction is attributed to the new Bangalore International Airport, encouraging other commercial and residential hubs. ■

Uttam Kumar (third from right) receiving the award at the ISRS Annual Convention and National Symposium

Useful links:
- http://wgbis.ces.iisc.ernet.in/foss
- http://live.osgeo.org/en/index.html
- www.osgeo.org/
- www.opensourcegis.org
- www.spatialanalysisonline.com

The Indian Society of Remote Sensing has awarded ITC alumnus Uttam Kumar (Department of Management Studies and Centre for Sustainable Technologies, Indian Institute of Science) the ISRS 2010 Best Paper Award in the field of geospatial technology for his paper on mining land cover information using multilayer perception and decision tree from MODIS data.

The paper is co-authored by Norman Kerle (ITC Department of Earth Systems Analysis), Milap Punia (Centre for the Study of Regional Development, Jawaharlal Nehru University), and T.V. Ramachandra (Centre for Ecological Sciences and Centre for Sustainable Tech-nologies, Indian Institute of Science) and has been published in the *Journal of Indian Society of Remote Sensing* (Vol. 38, Issue 4, December 2010). The award, which carries a cash prize of 5,000 rupees and a certificate of appreciation, was presented during the ISRS Annual Convention and National Symposium 2011 held from 9 to 11 November 2011 in Bhopal, India.

Greater Bangalore

Land use maps of Greater Bangalore

Percentage impervious area   NDVI (2000)   Land Surface Temperature (2000)