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REMOTE SENSING AND GIS APPROACH FOR FACILITY PLANNING OF OSH CITY, KYRGYZSTAN

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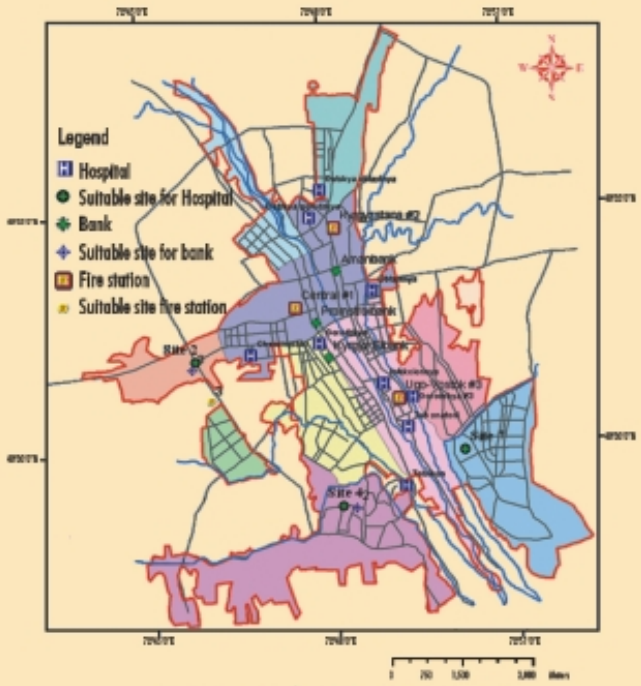
The development in IT and Geospatial technology in 21st century is supposed to change the face of planning to provide facilities to people. The process of planning for human settlement involves the use of both spatial and non-spatial data. Planners need updated accurate maps and other analytical information to prepare useful development plan. But acquiring data in the conventional way is very time consuming and costly, remote sensing on the other hand provides the means to acquire basic data on urban areas more quickly with less cost on a repetitive basis. This study is one approach to use satellite data to draw land use information using digital image processing which further help in facilities planning in Osh city by location optimisation.



Existing and optimum sites map

Satellite data is ideally used to monitor and detect land cover changes that occur frequently in urban areas as a consequence of incessant in urbanization and industrialisation. It is a lengthy process to convert satellite imagery into land cover map using the existing methods of manual interpretation and parametric image classification techniques. Principal Component Analysis method has been used to automate the process of mapping built-up areas to minimise the time factor of analysis by using the advantage of the unique spectral response of built-up areas and other land covers. Drawn information regarding land cover is used in facilities location optimisation that deals with the best location of

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different types of facilities in various settings and under various constraints.

ETM+ data (2000) has been used in this study. PCA of bands 1,2,3,4,5,7 reveals that for barren and built-up land uses have higher reflectance on 5, 3 and PC-1 layers. Henceforth, subtraction of PC-5 from PC-1 and PC-3 resulted in positive values for built-up area pixels only. PCA based digital classification method resulted in 91% of accuracy in classified built-up area, which further analysed for location of various facilities.

Re-location of any service may not be feasible economically, but location-allocation models can be used to identify new potential locations. In this project, optimization models are used extensively to fulfil two main objectives. First, an attempt is made to examine availability, spatial accessibility and efficiency levels of facilities of Osh city. Second, to simulate new potential locations and evaluate the feasibility of optimization models for planning additional public services in the Osh city. In order to prepare a development plan basic information regarding location of existing facilities, their accessibility and development trends, in relation to socio-economic structure of the city is needed. This problem is well known as *p-median* location-allocation models. This model is concerned with the optimum location of a set of *p* incapacitated supply centers to minimize the total demand-weighted travel distance between them and *i* demand points (Beaumont, 1987). In continuous space, the *p-median* problem can be expressed as,

Minimize Z =

Inputs:*i* = index of demand node, *j* = index of potential facility site, *n* = number of demand locations, *m* = number of candidate locations, w_i= weight at demand node *i*, d_{ij} = distance between demand node *i* and potential facility site *j*, *P* = number of facility to be located.
In general, the input to a facility location problem includes a weighted set D of demand locations, a set F of feasible facility locations, and a distance function d that measures the cost of travel between a pair of locations. P-median mathematical model used to establish various facilities in Osh city using Existing land use map (2003) and demographic data. Main objective is to determine population weighted optimal locations for all the facilities in a city. A series of location-allocation models were developed based on facility location as a generalized form. The main concept of all models is the optimization of travel cost or distance to achieve facilities. Substantial progress has been made in locating central facilities/public facilities, so that the population concerned enjoys the best possible geographical access to the services.

PCA method is effective and advantageous in mapping general built- up areas and it can serve as worthwhile alternative for quickly mapping of built-up area. Further work can be done using

FIFTH POST GRADUATE COURSE ON SATELLITE COMMUNICATIONS

The SATCOM V announcement brochure was sent to various organisations/Universities in the Asia Pacific region inviting applications for the course. Forty candidates from the region responded and 15 candidates from 8 different countries were selected. However, 3 candidates opted out due to personal reasons and 12 participants have joined the course.

The fifth SATCOM course of CSSTEAP, commenced on the August 1, 2005 at the New

Dr. K.N. Shankara delivering the inaugural address

Participants with Mr. P.P. Kale

SAC Campus, Bopal, of Space Applications Centre (SAC), Ahmedabad. The participants were welcomed by Dr. R.R. Navalgund, Director, SAC, Mr. B.S. Bhatia, Director, DECU and the Faculty Members of the SATCOM V course.

The course was inaugurated on August 12, 2005 by, Dr. K.N. Shankara Director ISAC, Bangalore

Mr. Kale delivering lecture to the participants

and Mr. N. Pant, Member Space Commission was the Guest of Honour. Dr. Shankara in his inaugural address gave presentation on the developments in the area of satellite communications and stressed upon the need for satellite communications in the developing countries. Mr. Pant in his address enlightened the audience with the sequence of developments in the field of telecommunications and Satellite communications in a chronological order and stressed upon the importance of Satellite communications in the developing countries. Dr. R.R. Navalgund, Director SAC welcomed the Chief Guest and Mr. S.K. Sharma, Officiating Director CSSTEAP gave a brief introduction of CSSTEAP, its activities and its achievements. Mr. S.K. Sharma also gave a brief about the facilities and the arrangements at the New SAC Campus, Bopal. Mr. R.K. Gupta, Course Director gave the details of the SATCOM V course such as the course structure and the various other aspects including the educational & technical visits etc.

The orientation course for the participants (Module #0) was conducted from August 1 - 5, 2005 where in the participants were given a brief introduction on the geography, social customs, and the festivals of India. A 3-day workshop on Communication Skills was also conducted for the participants.

Module-01 on Communication Systems was conducted from August 8 - 26, 2005 the module covered various aspects on Communication techniques, Information theory, Analog & Digital Modulation Techniques, Microwave Theory & Techniques, Optical communications, Principles of Networking and Data

communications including Computer architecture. The lectures were delivered by eminent faculty working in the field from industries and universities.

Module-02 on Satellite communication started on August 29, 2005. Mr. P. P. Kale, Former Director, SAC/VSSC, ISRO has been a regular faculty in this module ever since the course began at SAC. The participants had very good interaction with Mr. Kale during his stay at SAC while delivering lectures starting from basic satellite communications to launch vehicles and orbits etc. The lectures on Satellite Payload Systems where delivered by faculty drawn form Space Applications Centre.

The first technical study tour will be starting on

INTERNATIONAL SHORT COURSE ON "GEOINFORMATICS FOR SUSTAINABLE AGRICULTURE"

An International Training Short Course on " Geoinformatics for Sustainable Agriculture" was conducted at Indian Institute of Remote Sensing (IIRS), Dehradun for CSSTEAP during 16 August to 09 September, 2005. Every year this short course is offered on specific theme. This year the theme selected was on "*Geoinformatics for Sustainable Agriculture*". Applications of Geoinformatics are gaining importance in Agricultural resource management and Sustainable agriculture is key issue to achieve overall development of the resources. Keeping into account the fact the course contents were designed. The whole course was divided into in three modules.

Module I (Ist week): (Fundamentals of Remote Sensing) :Under the module Principles of RS, Satellite RS- Sensors and Platforms; Visual and digital analysis of RS data, Principles of analog and digital Photogrammetry were covered.

Course participants with Chief Guest of inaugural function, Dean & faculty of IIRS

Participants with Director, CSSTEAP, Dean & Faculty of Agriculture & Soils Division, IIRS

Module II (IInd week): (Introduction to Geoinformation Science): The module covered topics of principle of Geoinformatics, Concepts of database; Spatial analysis and modeling, Digital Cartography and Fundamentals of Global Positioning system-GPS.

Module III (III & IVth weeks): It dealt with the applications of Geoinformatics in Sustainable Agriculture. The overall contents covered in the modules were:

- *Concepts and Issues of sustainable agriculture*
- *Biophysical & socio-economic agricultural sustainability indicators*
- *Geoinformatics in Sustainable agriculture - an overview*
- *Geoinformatics in Agriculture resources inventory*
- *Agro-ecological characterization*
- *Land Degradation*
- *Watershed management*
- *Integrated Nutrient Management*
- *Agricultural water management*
- *Satellite Agrometeorolgy*
- *Precision Agriculture*
- *Sustainable land use planning.*

The practical were conducted by demonstration and also trainees got hands on experience on working with GIS and remote sensing data. In addition to faculty from IIRS, Dehradun, several eminent Guest faculties from various reputed international and national organizations viz. ICRISAT, NRSA, ADRIN, Hyderabad; CSWCR&T, Dehradun; IARI, New Delhi, were invited to deliver lectures on specialized topics on the theme of the course.

The course was attended by 17 participants from 9 countries in the Asia Pacific region, viz. Afganistan, Bangladesh, Nepal, Kyrghystan, Azerbaijan, Mongolia, Philippines, Iran and India.

The course was formally inaugurated on August 19, 2005. Dr. A.K. Singh, Project Director,

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 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

CSSTEAP office Building, Dehradun

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 Atmospheric Sciences. A set of standard curricula developed by the United Nations is adapted for the educational programmes.

Ongoing Courses

- Fifth 9 month Post Graduate course in Satellite Communications
  at SAC, Ahmedabad from August 1, 2005.

Forthcoming Courses

EDITORIAL COMMITTEE

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 expressed in the articles of the newsletter are those of the authors.

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