

Remote sensing and Urban Land Use

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Urbanization is inevitable, when pressure on land is high, agriculture incomes are low and population increases are excessive, as is the case in most of the developing countries of the world. Urbanization has been both one of the principal manifestation as well as an engine of change, and it has been the 20th century which has been the century of urban transition for human society. In a way urbanization is desirable for human development. However, uncontrolled urbanization has been responsible for many of the problems, our cities face today, resulting in substandard living environment, acute problems of drinking water, noise and air pollution, disposal of waste, traffic congestion etc. To improve these environmental degradations in and around the cities, the technological development in related fields have to address to these problems caused by rapid urbanization, only then the fruits of development will percolate to the most deprived ones. The modern technology of remote sensing which includes both aerial as well as satellite based systems, allow us to collect lot of physical data rather easily, with speed and on repetitive basis, and together with GIS helps us to analyze the data spatially, offering possibilities of generating various options (modeling), thereby optimizing the whole planning process. These information systems also offer interpretation of physical (spatial) data with other socio-economic data, and thereby providing an important linkage in the total planning process and making it more effective and meaningful.

INTRODUCTION

Expansion of urban area due to increase in population and migration from rural areas and the impact is bound to have on urban areas in terms of infrastructure, environment, water supply and other vital resources. Urbanization is considered as the most influential drivers of land use and land cover change associated with growth of populations and economy. Rapid urban development ensuing dramatic changes in the landscape have been recently witnessed in many developing countries as a result of fast economic advancements (Yeh and Li, 2001).

Since urbanization is an unavoidable process, efforts can be made to direct it in the most proper way by urban land use planning so as to protect the natural resources and the needs and rights of the people (Soffianian et al., 2010). Hence, accurate mapping of urban environments and monitoring urban growth is becoming increasingly important at the global level (Guindon and Zhang, 2009). Urbanization is inevitable, when pressure on land is high, agriculture incomes is low and population increases are excessive, as is the case of most developing countries of the world.

During the last fifty years the population of India has grown two and a half times, but urban India has increased nearly five times. In 2001, 306.9 million Indians (30.5%) were living in nearly 3,700 towns and cities spread across the country, and it is expected to increase to over 400million and 533 million by 2011 and 2021 respectively.

The majority of the world's population now resides in urban environments and information on the internal composition and dynamics of these environments is essential to enable maintenance of certain standards of living. The availability of urban land cover data is critical to policy makers, particularly for town planners, because of their ability to monitor impact of planning policies, the direction of urban growth and the development progress.

Remote sensing can provide an important source of

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data for urban land use/land cover mapping and environmental monitoring. Urban land cover/use mapping has received an increasing amount of attention from urban planners and scientists including geographers. A numbers of significant studies were made for environmental quality management. Thus, various techniques have been applied for mapping urban land use/land cover. It helps in encroaching urban problems even of very small magnitude and dire.

In order to prepare urban development plan, the planners need detailed information on the distribution of land and its use in city and its surroundings. Urban planners use these techniques in survey, analysis, planning, implementation and monitoring stages of the planning process.

REMOTE SENSING AND GIS APPLICATIONS IN URBAN PLANNING

Application of Remote Sensing technology leads to innovation in the planning process in various ways:

1. Digitization of planning base maps and various layout plans has facilitated updating of base maps wherever changes have taken place in terms of development.
2. Digital maps provide flexibility as digital maps are scale free information and maps are available in digital format, correlating various layers of information about a feature from satellite imagery.
3. Remote Sensing techniques are extremely useful for change detection analysis and selection of sites for specific facilities, such as hospital, restaurants, solid waste disposal and industry.

Aerial photographs have long been employed as a tool in urban analysis. In India, city planning has been largely confined to aerial photography. Various types of cameras and sensors black and white, colour, colour infrared are used for aerial photography.

For obtaining accurate land use data the following points should be considered:

- (i) Characteristics of imagery: scale of the photography, geometric fidelity, contrast, sharpness, and resolving power of film etc., waveband used, photographic or digital format.
- (ii) Characteristics of land use: consistency of the relationship between form and function, degree of multiple uses, the amount of ground control,

and change since imagery was obtained.

- (iii) Characteristics of user: interpretation skill, use of stereoscopic techniques etc.

Urban Land Use Classification Criteria

Classification is an activity of sub-dividing a group of objects in two or more groups, i.e. to arrange objects into classes according to some system or principle.

- i) The classification system should be applicable over a large area covering both city core and its surroundings.
- ii) Classification should be suitable for using remotely sensed data obtained at different time periods.
- iii) The minimum interpretation accuracy and reliability in the identification of land use should be about 85 percent subject to level of classification of different land uses.
- iv) The nomenclature, definition and framework to the extent possible should be compatible with existing terminologies adopted in planning agencies.
- v) Classification should be easier to understand and flexible.
- vi) Aggregation of similar or multiple land use classes should be possible at different levels of requirement.
- vii) The classes must be mutually exclusive, i.e. any geographical individual can only fall into one class.
- viii) Wherever possible, it must be based upon quantitative criteria. Comprehensive Urban Land Use Classification (Gautam and Narayan 1982)

URBAN LAND USE DELINEATION

There are different perspectives in the classification process, and the process itself tends to be subjective, even when an objective numerical approach is used.

PROBLEMS WHILE URBAN PLANNING

When remote sensing is used data many problems arise during interpretation of different urban land use/land cover features, in which cloud patches on satellite data is important one. Another problem in remote sensing data depending upon urban building size and spectral contrast with the surrounding area is that some buildings in urban area may be identified, while others may not.

The following urban issues are analyzed by using this technology:

- Urban Land Use Inventory.
- Study of Urban Sprawl and Growth Trends
- Space Use in the Core Area
- Travel Route Pattern
- Urban Environment Analysis
- Site Suitability Analysis
- Social Infrastructure

CONCLUSION

In Urban and Regional planning field, IRS products are widely used for urban sprawl and land use/land cover mapping, Utility planning and management, Infrastructure planning and location of major industrial, recreational, institutional facility in context to the Region. Satellite remote sensing with repetitive and synoptic viewing capabilities, as well as multispectral capabilities, is a powerful tool for mapping and monitoring the ecological changes in

the urban core and in the peripheral land use planning, will help to reduce unplanned urban sprawl and the associated loss of natural surrounding and biodiversity. Rapid development in city poses several challenges including problems associated with urbanization for urban managers and policy makers. Meeting these challenges requires access to timely and reliable information.

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