LAND USE AND LAND COVER ANALYSIS USING 8- BAND DATA: A CASE STUDY OF BELGAUM CITY AND ITS SURROUNDING.

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ABSTRACT

Monitoring land-use change has become an important theme of research. Land-use has enormous effects through fragmentation of natural habits (Tuner et.al., 2003; Verburg at. Al 1999; Vitousek, 1994). A balanced and sustainable growth is often only conceptual in terms of urban land-use. 8 bands Digital Globe’s World View–2 with fine resolution of 0.5m (panchromatic) and 2m (multispectral) has enhanced the research by classifying the area of interest into three levels of classification. Using GIS and Remote Sensing, this case study for Belgaum clearly marks that with fine resolution of 8 bands has given a more accurate and detailed picture of Land use and Land Cover of study area. The resultant statistics also gives the scope for the future planning of land-use.

INTRODUCTION:

Land is the most important natural resource on which all human activities have taken place. While land cover and land use are often assumed to be identical, yet they are rather quite different. Land cover may be defined as the biophysical earth surface, while land use is often shaped by human, socio-economic and political influence on the land. Remote sensing integrated with Geographical Information System, provides an effective tool for analysis of land-use and land-cover changes at a micro level.

STUDY AREA:

Belgaum city is located at 15.87° N latitude and 74.5° E longitude, the north western part of the state of Karnataka, in the southern region of India. It is situated 2,500 ft above mean sea level. It lies near the

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borders of the Indian states of Maharashtra and Goa. It is 502 km from Bangalore, 500 Km Southeast of Mumbai and 125 Km southeast of Goa. The total area of the city is 94.08sq.km and the population is 3,99,653 (2001 Census). Physiographically the city is the foothills of Sayadhri range (Western Ghats).

**Fig-1: Belgaum City and Its Surrounding**

**METHODOLOGY:**

The present study has been carried out broadly in five stages – Literature and discussion, data collection of the study area by field survey, data processing, preparation of maps and presentation. 8-band image and Pan+Liss 3 images for comparative analysis are used. and ERDAS imagine 9.0 softwares have been used for classification and ArcGIS 9.2 is used to map the landuse of the city. The optical spectrum bands are used to classify the land use from 8-band data, with the assistance of knowledge-based system. It is feasible to integrate spectral information from remote sensing and established data from GIS to set as the reference material for land use classification. The classification procedure must relatively fit in with true land use condition, and also have a great effect on land use classification. Through integrated
database and parameters, the related uncertainty levels data has been classified.

**Land Use/ Land Cover of the City**

The total land of the city and its surrounding is classified based on regional characteristics and how it is put into use. Belgaum city land use/ land Cover is categorized into three levels of classification categories.

**Table-1: Land Use and Land Cover Classification**

<table>
<thead>
<tr>
<th>Level I</th>
<th>Level II</th>
<th>Level III</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Agricultural Land</td>
<td>1.1 Crop Land 1.2 Fallow land 1.3 Agricultural plantation</td>
<td>1.1.1 Kharif +Rabi (Double Crop) 1.1.2 Kharif Crop 1.1.3 Fallow Land 1.1.4 Rabi crop 1.1.5 Agricultural Plantation.</td>
</tr>
<tr>
<td>2. Built-Up land</td>
<td>2.1 Industrial Area 2.2 Towns/Cities</td>
<td>2.1.1 Industrial Area 2.2.1 Towns/Cities 2.2.2 Village</td>
</tr>
<tr>
<td>3. Forest</td>
<td>3.1 Scrub forest</td>
<td>3.1.1 Scrub Forest 3.1.2 Degraded Forest</td>
</tr>
<tr>
<td>4. Others</td>
<td>4.1 Tree Groves 4.2 Mixed Vegetation</td>
<td>4.1.1 Tree Groves 4.2.1 Mixed Vegetation 4.2.2 Habitation with vegetation</td>
</tr>
<tr>
<td>5. Wasteland</td>
<td>5.1 waste land with scrub 5.2 Barren Rocky/Stony waste /Sheet rock Area</td>
<td>5.1.1 Waste land with scrub 5.2.1 BarrenRocky/Stony waste/ Sheet rock Area</td>
</tr>
<tr>
<td>6. Water bodies</td>
<td>6.1 Lake/Tanks</td>
<td>6.1.1 Dry tanks 6.1.2 Perennial tanks</td>
</tr>
</tbody>
</table>

**Agricultural land:**

Agricultural lands are generally used for production of food crops and other crops. There is a marked absence of this land-use in the central part of the study area, mainly due to the dominance of urban built up. The First level of classification is sub – divided into three second level of classification and further into five sub categories as third level of classification. Most of the cropped land is karif which includes standing
crops during June to September months. It coincides with the south-west monsoon season. It is associated with dry land farming, limited irrigating and areas of rain fed paddy and other dry crops. Rabi crops are seen in few pockets in a scattered fashion. This includes standing crops from October to March. Double crops are seen along the margins of the study area and along the city boundaries. This includes standing crops during both karif and rabi seasons. The spectral signature of the crop land is distinct at its full growth from that of the scrub land with which it is often confused with. Using multi temporal data, a clear distinction was achieved. Next to crop land the agriculture is dominated by plantation lands. They are found more in the East, North and South East. Lands which are taken up for agriculture but temporarily allowed to rest, uncropped for one or more seasons, but less than one year, is termed as fallow lands. These lands are particularly those which are seen devoid of crops at the time when the imagery is taken of both the seasons. Thus these are seen only in few pockets in the East and South near the city. Less than one-fourth of the agricultural area is in the forms of plantation lands and very negligible spread of fallow land is seen.

1. Built-up land:

Areas of human habitation developed due to non-agricultural use and that which has a cover of buildings, transport and communication, utilities in association with water, vegetation and vacant lands are classified as built up. All man made constructions covering the land surface are included under this category. Their shape and high reflectivity differentiate them from other classes. Enhancement techniques and band combination helps in segregation of different parcels. The built up area is further divided into three divisions as second level and third level of classification. The built up appears in
greenish blue tint in the imagery. They were further classified as villages and towns according to the BUDA (Belgaum Urban Development Authority) declaration. Thus town or city is found in the centre of the study area covering most of the CBD (Central Business District) region. The important residential areas in the city are M. Vadagoan, angol, Majagoan, Shahpur, Hindwadi, Bhayanagar, Tilakwadi, R.C. Nagar, TV centre, Jadhav Nagar, hunaman Nagar, Sadashivnagar, Nehru nagar and M.M. Extension.

2. Forest:

The area which is within notified forest boundary under Department of Forestry, bearing an association predominantly of trees and other vegetation types capable of producing timber and other forest products is called forest land. Here the vegetation density which was 40 per cent or above is classified as forest. This also perfectly conceded with the notified forest boundaries. Degraded forest were discovered as within the notified forest boundary when the vegetative (crown) boundary lies between 10-40 per cent of canopy cover. In the progress of afforestation, Department of Forest raises trees of species of forestry importance on the notified forest lands. These are artificially planted with trees, either in open spaces or by clearing already existing forests of economically inferior species.

3. Others:

All other land-use/land-cover conditions not included in any of the classes described earlier that is either an area specific or with limited aerial extent in the overall context of total geographical area of the study unit is included in this category. This is further categorised into three
categories as second level of classification and further classified into three categories as third level of classification.

Here the mixture of scattered vegetation is included in this category. There are found in combination with the scrub land mostly in the Northern part of Belgaum.

5. Wastelands:

This category consists of barren/rocky/stony/sheet rock area and land with scrubs. The form of land which add up to waste lands are barren/rocky/stony/sheet rock area. These are lands characterized by exposed massive rocks, sheet rocks, stony pavements or lands with excessive surface accumulation of stones that render them unsuitable for producing any green biomass. Most of the Belgaum’s wasteland is this kind of land. Land with scrubs represent areas bearing association with vegetation but when the crowning cover is less 10 – 40 per cent.

6. Water bodies:

This class comprises surface waters either impound in the form of ponds, lakes and reservoirs or flowing as rivers, streams, canals etc. A stream is a natural course of water flowing on the land surface along a definite channel. It may be seasonal or perennial. The total Study unit is covered by tanks

RESULT AND DISCUSSION

With the help of 8-band image three levels of classification have been achieved. The first level is classified into six categories, second level is categorised into fourteen categories and third level of classification have sixteen categories (Fig:2,3,4).
Fig-2: Level I classification
Fig-3: Level II Classification
CONCLUSION:

Management and planning of urban space requires spatially accurate and timely information on land use and changing pattern. Monitoring provides the planners and decision-makers with information about the current state of development and the nature of changes that have occurred. Remote sensing and Geographical Information System (GIS) provides vital tools which can be applied in the analysis at the district and as well, as the town level. GIS and Remote sensing tools can give accurate results if we are provided with images like 8-band, which has made me reach the third level of classification of my study unit.

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