Urban Sprawl Mapping and Land use Change Analysis Using Remote Sensing and GIS
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Abstract — This paper examines the use of Remote Sensing and GIS in mapping of urban sprawl variation of different years and landuse /landcover change detection So as to detect major changes that has been taken place between two different periods. Subsequently, an attempt was made at projecting the observed urban built-up due to increase in population. For advanced ecosystem management Remote sensing and GIS are now providing new tools. The data which is collected remotely facilitates the synoptic analysis of earth’s system functioning and change at local, regional and global scales.

In order to use the land optimally and to provide as input data in modeling studies, it is not only necessary to have information on existing land use/landcover but also the capability to monitor the dynamics of land use resulting out of changing demands. Toposheets is used for reference but are generally outdated and too coarse for detailed analysis. With the advances in software technology and availability of imagery, satellite remote sensing is being used for higher studies particularly at the landscape level. The input data used in this work is satellite image (Resource Sat 2) with LISS 4 Sensor, and SOI toposheet. The methodology adopted for this thesis is total enumerated through digital analysis which was carried out with the help of Erdas Imagine and GIS software.


1 INTRODUCTION
Land use refers to “man’s activities and various uses, which are carried on land such as settlements, industry, agriculture, etc”. Land cover refers to the material present e.g. vegetation, water bodies, rocks/soils and other resulting from land transformations. Although land use is generally inferred based on the cover, yet both the terms land use and land cover being closely related are interchangeable [1]. Change detection shows the various changes occurred at certain areas ie one of the landscape ecological aims. Preparing landscape maps which shows the comparison of two decades maps can help to identify the change. Land is the most important natural resources on which all activities are based. Land use unlike geology, is seasonally dynamic and indeed is more changing [2]. All forestry productions and agricultural animals depend on productivity of the land [3].

For efficient planning and management, the classified data in a timely manner, in order to get the classified data of the ground; satellites are the best resources to provide the data in a timely manner [4]. Therefore at attempt will be made in this study to map out the status of land use/land cover of the Hyderabad between 2005 and 2015 with a view to detecting the land consumption rate and the changes that has taken place in this status.

Spatial patterns of land use/cover over different time periods in particular can be systematically mapped, monitored and accurately assessed from Satellite data accompanied with conventional ground data [5] Particularly in their built-up land. So as to predict possible changes that might take place in this status in the next 10 years using both Geographic Information System and Remote Sensing data

2 STUDY AREA & DATA USED
2.1 Objective of the Project: The aims of the this study is to produce a land use/land cover map of Hyderabad at different year in order to detect changes that have taken place particularly in the built-up land to analyze the urban sprawl of the different time period.
   ➢ The objectives of the study is to analyze the urban sprawl of Hyderabad city.
   ➢ To monitor urban land use land cover change between 2005-2010-2015.

2.2 Study Area
The study area is located in Hyderabad with Coordinates of Hyderabad in degrees and decimal minutes

• The Study area is located in near Yemnampet Central Part of the Deccan Plateau and lies between 17° 24’ and 17° 27’ of North Latitude and 78° 38’ and 78° 41’ of East Longitude and is shown in meta data

• AOI:- 10.369 Sq mi as shown in Fig-1 Metadata

2.3 Input Data Used
• Satellite Image ie (Resource Sat 2) with LISS 4 Sensor,
• SOI toposheet

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3 METHODOLOGY

Toposheets of scale 1:50,000 are scanned for identifying the features in the study area. The topo sheet is geo-referenced based on longitudinal & latitudinal co-ordinates. It was superimposed on the original georeferenced image for cross-check and to the Visual image analysis technology by selecting the training sets and creating the signature files as shown in the figure below. Respective class is given with color code. Input and output options are filled with other parameters and classified file is generated. **Flow chart 1 & 2** as shown above.
RESULT ANALYSIS

The results obtained from the classified as shown in the figure. The comparison between the identified features gives the changes. Here we compared statics 10 years difference ie 2005 and 2015.

<table>
<thead>
<tr>
<th>Class</th>
<th>Year-2005</th>
<th>Year-2015</th>
<th>Variation</th>
<th>% Inc/Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barren Land</td>
<td>1.699302</td>
<td>1.921359</td>
<td>0.22205691</td>
<td>2.149631</td>
</tr>
<tr>
<td>Scrub land</td>
<td>4.195056</td>
<td>2.471959</td>
<td>-1.7230973</td>
<td>-16.6805</td>
</tr>
<tr>
<td>Built_Up_Land</td>
<td>1.684911</td>
<td>3.282158</td>
<td>1.59724735</td>
<td>15.46222</td>
</tr>
<tr>
<td>Agriculture Land</td>
<td>2.135965</td>
<td>2.041458</td>
<td>-0.0945064</td>
<td>-0.91487</td>
</tr>
<tr>
<td>Water Bodies</td>
<td>0.052027</td>
<td>0.037713</td>
<td>-0.0143147</td>
<td>-0.13857</td>
</tr>
<tr>
<td>Forest Land</td>
<td>0.394336</td>
<td>0.13778</td>
<td>-0.2565511</td>
<td>-2.48359</td>
</tr>
<tr>
<td>Transportation</td>
<td>0.168736</td>
<td>0.446458</td>
<td>0.2777215</td>
<td>2.688495</td>
</tr>
</tbody>
</table>

Table-1: Result Analysis shown in Percentage (%)

ACCURACY ASSESSMENT

The accuracy assessment is calculated by taking a hard copy of classified print out which contains GCP coordinates which gives the x, y locations of the particular features. These sheets are taken to the field survey and checked with a particular feature is existing wrt the same lat/long values. If it is matches then true class value is give as demarcated in the classified file if not other class value is given as seen in the field. Thus field verification is done.

Table-2: GCP of accuracy assessment
6 CONCLUSION

By analyzing the results of a decade there is a decrease in scrub land, water bodies, forest lands and agriculture. The important point it was observed is that there is a drastic increment in the builtup lands, around the outer ring road lot of settlements are increased. Based on the above results there is a variation of in the urban sprawl, due to development of industrials, transportation is increased for the facilities management. The above study provides a methodology for better estimation of urban growth and population using various land uses with time. Geographical information system (GIS) and satellite images have been used in this study to provide spatial inputs and test the statistical model describing growth. The model developed in this study can be used for predicting the future land uses even when not much of old land use data is available. This is useful for the urban planning authorities in developing countries where land use data is not available regularly. GIS and Remote sensing can help a lot in monitoring urban sprawl compared to conventional techniques.

ACKNOWLEDGMENT

The authors wish to thank A, B, C. This work was supported in part by a grant from XYZ.

REFERENCES

[5] V. Rahdary et al., Land Use And Land Cover Change Detection Of

BIOGRAPHIES

Mr. Chikatimalla Vijay Kumar, Student of GNITC, Final year B.Tech Civil Engineering. He is a Class representative (CR). He participated in Institute of Engineers, International Geospatial Form and also achieved Prize in paper/project presentations in various colleges.

Dr. SS Manugula has B.Tech Civil Engineering (1994), M.Tech Remote Sensing, and Ph.D. in Civil Engineering; He worked as a Research Assistant (projects) in IIT Mumbai in the department of CSRE. He has 23 years of experience (As a Civil Engg, GIS Photogrammetry-Remote Sensing) worked with National & International Clients in various multinational companies. He worked as a Dy. General Manager & Head of GIS department and also holds the credit of gaining global exposure by working in Abu-Dhabi (UAE) as a client side support, international project work.

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