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RESEARCH ARTICLE

Spatio-Temporal Analysis of Land Use Pattern in Bagalkot City: Using GIS Techniques

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Abstract

This paper examines the use of GIS and Remote Sensing in mapping Land Use Land Cover in Bagalkot district. The land use/land cover (LULC) pattern of a region in time and space is an outcome of natural and socio-economic factors and their utilization by man after construction Upper Krishna Project in Bagalkot city change in the land use land cover in Bagalkot city Karnataka, land use system is not a homogeneous process. Hence, land use manipulation by human beings is widespread and has become a serious threat to watershed services including stream flow regulation, soil erosion control, and low-flow augmentation at both micro-and macro-level catchments. The Understanding of Land Use through supervised and unsupervised classification of Land use by using RS and GIS technology helps in understanding the driving mechanism that causes land-use change. Therefore, an attempt will make to prepare LULC map of Bagalkot city, Karnataka by using Supervised and unsupervised classification. The classification will be developing through an unsupervised classification approach that will find prominent features of the area. However, analysis of supervised classification from multi-temporal satellite imageries estimated 10 land use/ land cover. With respect to the rate of changes in the Bagalkot city. Bagalkot city is in the northern part of Karnataka state, situated in the interior of the Deccan Plateau or Bailusime region. The introduction of planning to Indian cities has been the most recent phenomena. The creation of linguistic states necessitated the construction of planned cities, some of them completely fresh. This included Chandigarh, the most notable example, Bhubaneshwar, Gandhinagar, Dispur and Bokaro, for administrative purposes and Navi Mumbai, New Bangalore, Noida for catering further expansion of the city. Navanagar Resettlement plan consists of acquisition of lands for locating the new Bagalkot town and making all arrangements to provide basic infrastructure in the new town. The plan of new township provides adequate and reasonable resettlement for the project displaced families and also allows sufficient scope for further development of the town for additional population. Hence, The Understanding of Land Use through supervised and unsupervised classification of Land use by using RS and GIS technology help in understanding the driving mechanism that causes land use change. Therefore, an attempt is made to prepare since this study is time-bound, the researcher has selected an area that is geographically small and easily manageable from the

point of investigation and analysis.

Keywords: GIS technology; supervised; unsupervised classification; LnadUse Landcover

Introduction

The terms land use and land cover are often used interchangeably, but each term has its own unique meaning. Land cover refers to the surface cover on the ground like vegetation, urban infrastructure, water, bare soil, etc. Identification of land cover establishes the baseline information for activities like thematic mapping and change detection analysis. Land use refers to the purpose the land serves, for example, recreation, wildlife habitat, or agriculture. When used together with the phrase Land Use / Land Cover (LULC) generally refers to the categorization or classification of human activities and natural elements on the landscape within a specific time frame based on established scientific and statistical methods of analysis of appropriate source materials. Land cover is the physical material at the surface of the earth. Land use is the description of how people utilize the land for their socio-economic activities.

Significance of LULC Maps

The growth of a society totally depends on its social and economical development. This is the basic reason why socio-economic surveys are carried out. This type of survey includes both spatial and non-spatial datasets. LULC maps play a significant and prime role in planning, management, and monitoring programs at local, regional, and national levels. This type of information, on one hand, provides a better understanding of land utilization aspects and on the other hand, it plays an important role in the formation of policies and programs required for development planning. For ensuring sustainable development, it is necessary to monitor the ongoing process on land use/land cover patterns over a period of time. To achieve sustainable urban development and to check the haphazard development of towns and cities, authorities associated with urban development must generate such planning models so that every bit of available land can be used most rationally and optimally. This requires the present and past land use/land cover information of the area. LULC maps also help us to study the changes that are happening in our ecosystem and environment. If we have an inch by inch information about Land Use/Land Cover of the study unit we can make policies and launch programs to save our environment.

Geospatial data and LULC

With the advancements in remote sensing, monitoring networks, and geographic information systems (GIS), the availability of spatial data is rapidly increasing. These geospatial data include maps and locations of land use and land cover (LULC) and multiple attributes of data, such as socioeconomic data from the census. Improvements in the use and accessibility of multi-temporal, satellite-derived environmental data or other thematic raster data have contributed to the growing use in environmental modeling. Remote sensing provides synoptic information on vegetation growth conditions over a large geographic area in near real-time.

Bagalkot the city is in the northern part of Karnataka state, situated in the interior of the

Deccan Plateau or Bailusime region. The introduction of planning to Indian cities have been the most recent phenomena. The creation of linguistic states necessitated the construction of planned cities, some of them completely fresh. This included Chandigarh, the most notable example, Bhubaneshwar, Gandhinagar, Dispur, and

Bokaro, for administrative purposes, and Navi Mumbai, New Bangalore, Noida for catering further expansion of the city. Navanagar Resettlement plan consists of the acquisition of lands for locating the new Bagalkot town and making all arrangements to provide basic infrastructure in the new town. The plan of the new township provides adequate and reasonable resettlement for the project displaced families and also allows sufficient scope for further development of the town for the additional population. Hence, The Understanding of Land Use through supervised and unsupervised classification of Land use by using RS and GIS technology helps in understanding the driving mechanism that causes land-use change. Therefore, an attempt is made to prepare LULC map of Bagalkot city, Karnataka by using Supervised and unsupervised classification. The classification developed through unsupervised classification approach found prominent features of the area together occupies 66.28% Resveor followed by agriculture land 20.51% and minimum 0.01% undermining area. However, analysis of supervised classification from satellite imageries estimated 14 land use/ land cover. Since this study is time-bound, the researcher has selected an area that is geographically small and easily manageable from the point of investigation and analysis.

Location of study Region

Bagalkot is a city in the state of Karnataka, India, which is also the headquarters of Bagalkot district. It is situated on a branch of River Ghataprabha about 481 km (299 mi) northwest of the state capital Bangalore, 410 km (255 mi) southwest of Hyderabad, and about 570 km (354 mi) southeast of Mumbai. The population of the urban agglomeration was 111,933[2] according to the provisional results of the 2011 national census of India, and the city is spread over an area of 49.06 square kilometers (18.94 sq mi) with an average elevation of 532 m (1,745 ft) above MSL. Bagalkot is located at 16.18°N 75.7°E.[4] It has an average elevation of 533 metres (1,749 ft). It is situated on the bank of the river Ghataprabha.

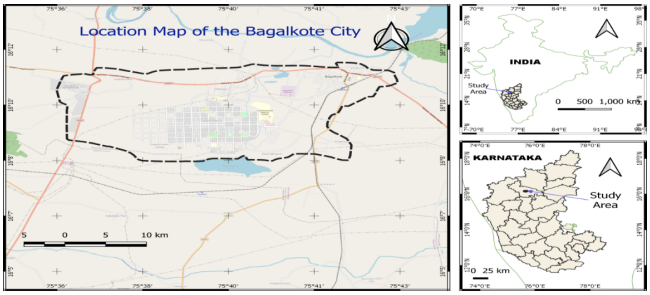


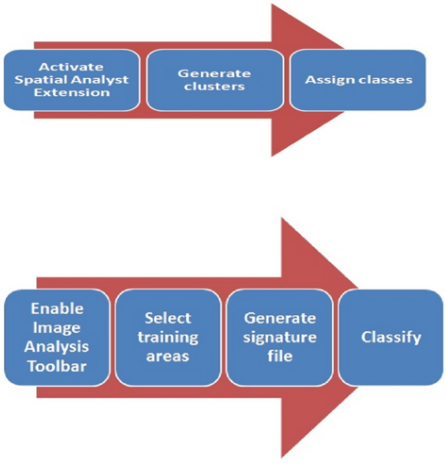
Fig. 1. Location of Bagalkot city

Objectives

- To prepare land use/ land cover map of Bagalkot district by using Remote Sensing and GIS applications
- To compare the volume of change land use land cover in Bagalkot City
- To compare the results of supervised and unsupervised classification maps

Methodology

LULC classification is one of the most widely used applications in remote sensing. The most commonly used approaches include



This is based on the idea that a user can select sample pixels in an image that are representative of specific classes and then direct the image processing software to use these training sites as references for the classification of all other pixels in the image. Training sites (also known as testing sets or input classes) are selected based on the knowledge of the user. The user also sets the bounds for how similar other pixels must be to group them together. These bounds are often set based on the spectral characteristics of the training area, plus or minus a certain increment (often based on ”brightness” or strength of reflection in specific spectral bands.

Land Use land cover of Study Region

Land use classification is a systematic arrangement of various class of land-based on certain similar characteristics, mainly to identify and understand their fundamental utilities intelligently and effectively in satisfying the needs of the people.

Broadly, the researcher classified 10 different groups mentioned table1 taking Bagalkot city.

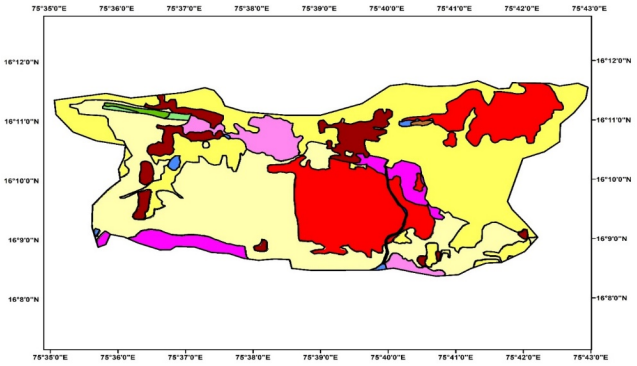


Fig. 2. Land use and land cover map of Bagalkot City

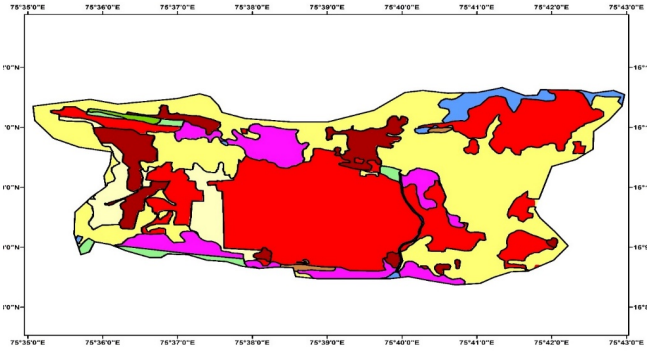


Fig. 3. Land use map, 2005

Table 1. Land Use and Land Cover in Bagalkot city

SL.NO	LULC	2005		2015	
		AREA	%	AREA	%
1	Agricul-ture,Cropland	20.07912	33.56%	21.88461	36.58%
2	Agricul-ture,Fallow	18.55006	31.01%	3.235537	5.41%
3	Barren	4.942409	8.26%	4.882792	8.16%
4	Builtup, Mining	0.068166	0.11%	0.251696	0.42%
5	Builtup, Rural	3.371855	5.64%	4.21	7.04%
6	Builtup, Urban	12.00825	20.07%	22.66835	37.89%
7	Forest Plantation	0.227133	0.38%	0.229734	0.38%
8	Forest, Srub Forest	0.199935	0.33%	0.902428	1.51%
9	River	0.126178	0.21%	0.132107	0.22%
10	Water Bodies	0.25082	0.42%	1.424788	2.38%

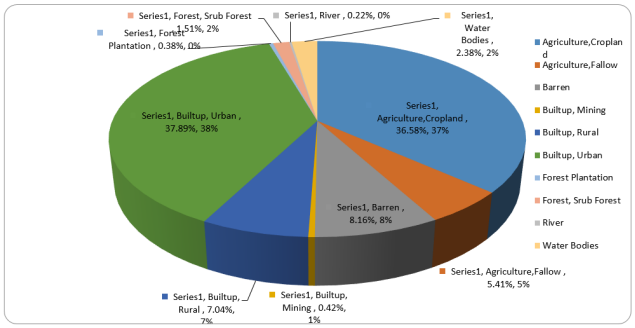


Fig. 4. Land Use pie diagram 2005

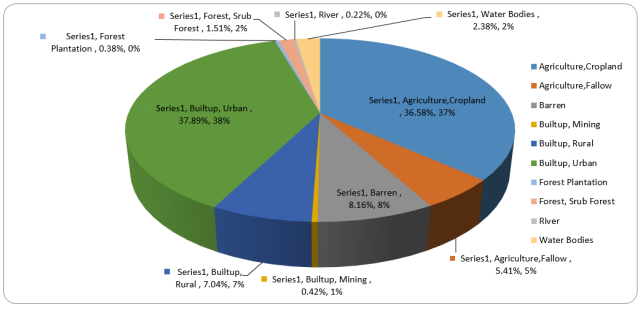


Fig. 5. Land Use Pie Diagram 2015

Agriculture and Cropland

Agriculture and cropland area in a fringe area of the study region20.07 sq kms (33.56%) in 2005 and within 10 years increased area i.e.,21.88 sq kms (36.58 percent) agriculture fallow land is decreed and increased cropland area.

Agriculture and Fallow

Agriculture and fallow land is 18.55 sq. kms (31.01 percent) land found in 2005.In 2015 fallow land decreased i.e., 3.23 sq. km. (5.41 percent) 15 percent of land deviated to other land use.

Barren Land

This type of land is 4.94 sq. kms (8.26 percent) in 2005.the same amount of land found in 2015 i.e., 4.88 sq. kms (8.16 percent)

Built up and Mining

The study region cement raw material available hence, 0.06 sq. kms (0.11 percent) in 2005 and a slight increase in 2015 in 0.25 sq. kms (0.42 percent) are observed in an image.

Builtup Rural Area

Due to submerged villages due to Krishna Project Built-up area in rural area 3.37 sq. kms(5.64 percent) in 2005 and 4.21 sq. kms (7.04 percent) observed in a slight increase in Built-up area.

Builtup, Urban area

The study area built up urban area is 12.00 sq.kms(20.07 percent) during 2005.The Built-up area treamoundlosly increased within one decade in 2015, The Built-up area urban Centre 22.65 sq. kms (37.89 percent).due to migration of rural area to urban centers and Establishment of the horticultural university.

Remaining land use less in forest area, River and water bodies are less amount land use and land cover observed in both the images.

Conclusion

The Understanding of Land Use through supervised and unsupervised classification of Land use by using RS and GIS technology helps in understanding the driving mechanism that causes land-use change. Therefore, an attempt will make to prepare the LULC map of Bagalkot city, Karnataka, using Supervised and unsupervised classification. The classification will be developing through an unsupervised classification approach that will find prominent features of the area. However, analysis of supervised classification from multi-temporal satellite imageries estimated 10 land use/ land cover. Concerning the rate of changes in Bagalkot city. Bagalkot city is in the northern part of Karnataka state, situated in the interior of the Deccan Plateau or Bailusime region. The introduction of planning to Indian cities has been the most recent phenomenon. The creation of linguistic states necessitated the construction of planned cities, some of them completely fresh. This included Chandigarh, the most notable example, Bhubaneshwar, Gandhinagar, Dispur, and Bokaro, for administrative purposes, and Navi Mumbai, New Bangalore, Noida for catering further expansion of the city. Navanagar Resettlement plan consists of the acquisition of lands for locating the new Bagalkot town and making all arrangements to provide basic infrastructure in the new town. The plan of the new township provides adequate and reasonable resettlement for the project displaced families and also allows sufficient scope for further development of the town for the additional population. Hence, The Understanding of Land Use through supervised and unsupervised classification of Land use by using RS and GIS technology helps in understanding the driving mechanism that causes land-use change. Agriculture and cropland area in the fringe area of the study region20.07 sq kms (33.56%) in 2005 and within 10 years increased area i.e.,21.88 sq kms (36.58 percent) agriculture fallow land is decreed and increased cropland area. The study area built-up urban area is 12.00 sq. kms (20.07 percent) during 2005. The Built-up area treamoundlosly increased within one decade in 2015, The Built-up area urban Centre 22.65 sq. kms (37.89 percent), due to migration of rural area to urban centers and Establishment of the horticultural university.

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