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RESEARCH ARTICLE

LAND USE/LAND COVER CHANGE DETECTION THROUGH REMOTE SENSING APPROACH: A CASE STUDY OF SOUTH KASHMIR ANANTNAG DISTRICT

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ABSTRACT

Land use and land cover is an important component in understanding the interactions ofthe human activities with the environment and thus it is necessary to be able to simulate changes. Empirical observation revealed a change in land use land cover classification in Anantnag district, of Jammu and Kashmir State. In this paper an attempt is made to study the changes in land use and land cover in Anantnag district, over 18 years period (1992-2010). The study has been done through remote sensing approach using SOI toposheets of Anantnag1971. The land use land cover classification was performed based on the Survey of India Anantnag map and Satellite imageries. GIS software is used to prepare the thematic maps. Ground truth observations were also performed to check the accuracy of the classification. The study reveals that the highest change has occurred in the dense forest which is 652.98 Sq. kms in 1992 that is decreased to 579.09 Sq. kms that is 25.08 to 22.23 percent respectively. Agricultural land, Built up area, scrub land and Wasteland also have experienced change. Built-up lands settlement have increased from 1992-2010. Proper land use planning is essential for a sustainable development of Anantnag district.

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INTRODUCTION

Land use and land cover (LULC) change is a major issue of global environment change. Scientific research community called for substantive study of land use changes during the 1972Stockholm Conference on the Human Environment, and again 20 years later, at the 1992 United Nations Conference on Environment and Development (UNCED). At the same time, International Geosphere and Biosphere Programme (IGBP) and International Human Dimension Programme (IHDP) co-organized a working group to set up research agenda and promote research activity for LULC changes. Land use/ land cover mapping is essential component where in other parameters are integrated on the requirement basis to drive various developmental index for land and water resource. Land use refers to man's activities and the varied uses which are carried on over land and land cover refers to natural vegetation, water bodies, rock/soil, artificial cover and others noticed on the land (NRSA, 1989). Land Cover, defined as the assemblage of biotic and a biotic components on the earth's surface is one of the most crucial properties of the earth system. Land cover is that which covers the surface of the earth and land use describes how the land cover is modified. Land cover includes: water, snow, grassland, forest, and bare Soil. Land Use includes agricultural land, built up land, recreation area, wildlife management area etc. The Land cover reflects the biophysical state of the earth's surface and immediate subsurface, thus embracing the soil material, vegetation, and water. Land use refers to man's activities on land which are directly related to the land. Land use and land cover are dynamic. Changes may involve the nature or intensity of change but may also include spatial (forest abatement at village level, or for a large-scale agro industrial plant), and time aspects. Land use/ Land cover changes also involve the modification, either direct or indirect, of natural resources of the area. Application of remotely sensed data made possible to study the changes in land cover in less time, at low cost and with better accuracy (Kachhwaha, 1985) in association with Geographical Information System (GIS) that provide suitable platform for data analysis, update and retrieval (Star *et al.,* 1997; McCracker *et al.,* 1998; Chilar 2000). Space borne remotely sensed data may be particularly useful in developing countries where recent and reliable spatial information is lacking (Prakasam 2010). Remote sensing technology and geographic information system (GIS) provide efficient methods for analysis of land use issues and tools for land use planning and modeling. By understanding the driving

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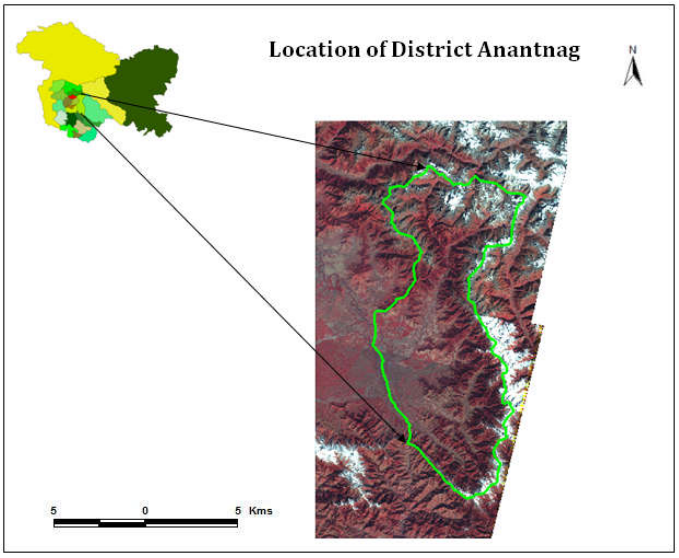
forces of land use development inthe past, managing the current situation with modern GIS tools, and modeling the future, one is able to develop plans for multiple uses of natural resources and nature conservation Shibasaki, (2000). The change in any form of land use is largely related either with the external forces and the pressure built up within the system (Bisht and Kothyari, 2001). In this study area major natural resource is forest. Because of human activities the extent of the land under forest is getting reduced. In the same way land used for cultivation is also decreasing. But at the same time land under built up area is increasing. In this context studies on land use land cover change detection are essential to understand the existing situation and plan for the future.

Study area

Anantnag district is in southern sector of Jhelum Valley. It is because of its rejuvenating climate, the inspiring majesty, its lofty mountains, the melodious flow of sweet waters of its springs and screams, fertile soil, fragrant flowers and delicious fruits that the district has come to be synonymous with greatness. Anantnag district is situated in the southern region of the Kashmir valley between geographical coordinates of 74°-30′ to 75°- 35′ East longitude and 33°-20′ to 34°-15′ North latitude, at an altitude of 5,300 feet (16,00mts) above mean sea level, at a distance of 33 miles (53kms) from main city Srinagar.



Objectives of the study

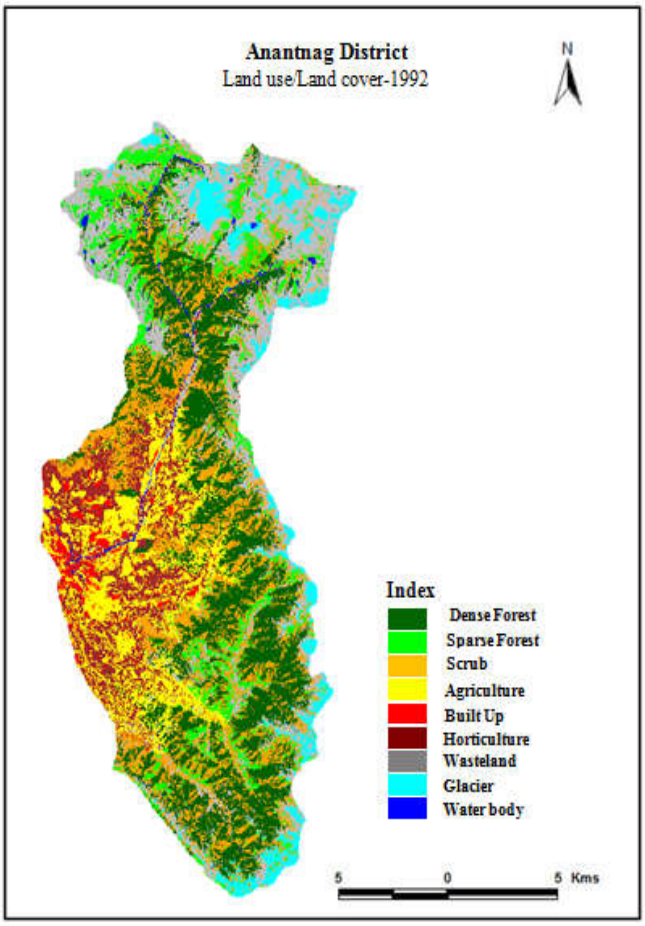
The study has been out carried to fulfil the following objectives:

- To prepare the Land use/Land cover of the study area.
- To analyze the spatio-temporal change in the different categories of landuse.

METHODOLOGY

The Study was covered in the SOI toposheets in the year 1971 on 1:50,000 scales were used to delineate and to demarcate different landuse in the study area. Fifteen toposheets (43 O/1; 43/O2 43 O/3; 43O/5; 43 O/6; 43 O/7; 43 O/10; 43 N/3; 43 N/4; 43 N/7; 43 N/8; 43 N/11; 43 N/12)were used. The toposheets of 1971 and IRS LISS III with 23.5 meter resolution in October to derive land use/land cover maps. The study area was divided into nine classes namely, Dense forest, Sparse forest, Scrub, Agriculture, Built up, Horticulture, Wasteland, Glacier, water body. These top sheets were geo-referenced and a mosaic of top sheets was prepared. Pentium IV processor and aided by Erdas Imagine 8.4 and Arc view 3.2a were used to carry out the tasks of digital processing and analysis. The top sheets and imagery were registered to UTM WGS 84, by map to map and map to image geo-referencing. On screen digitization and supervised classification.

Land use/Land Cover of Anantnag district (1992)



Source: Generated from Land Sat TM, 1992

The total area of Anantnag is 2604.92 Sq. kms. The Dense forest is the dominant category with an area of 652.98 Sq. kms. It comprised of 25.08 percent of the study area. Scrub was the other major landuse class total area is about 506.57 Sq. kms with 19.45 percent. Wasteland occupied 441.97 Sq. kms area constituted with 16.97 percent. Another category is Agriculture covers 315.6 Sq. kms which was only 12.10 of study area. Other category is Horticulture which is spread in 248.02 Sq. kms with 9.52 percent of study area. Then there is sparse forest it is an area of 228.43 Sq. kms which constitutes 8.77 percent. Glacier occupied 146.28 Sq. kms area which constitutes 5.62 percent. Built up were extended in the area of 45.25 Sq. kms it constitutes 1.74 percent. Water body occupies 20.35 Sq. kms with 0.78 percent of the study area.

Table 1. Land use/Land Cover of Anantnag district (1992)

Land use land cover category	Area in Sq.kms	Percentage of total area %
Sparse Forest	228.43	8.77
Built Up	45.25	1.74
Water body	20.35	0.78
Glacier	146.28	5.62
Horticulture	248.02	9.52
Scrub	506.57	19.45
Dense Forest	652.98	25.08
Agriculture	315.06	12.10
Wasteland	441.97	16.97
Total	2604.92	

Source: Generated from Land Sat TM, 5 1992.

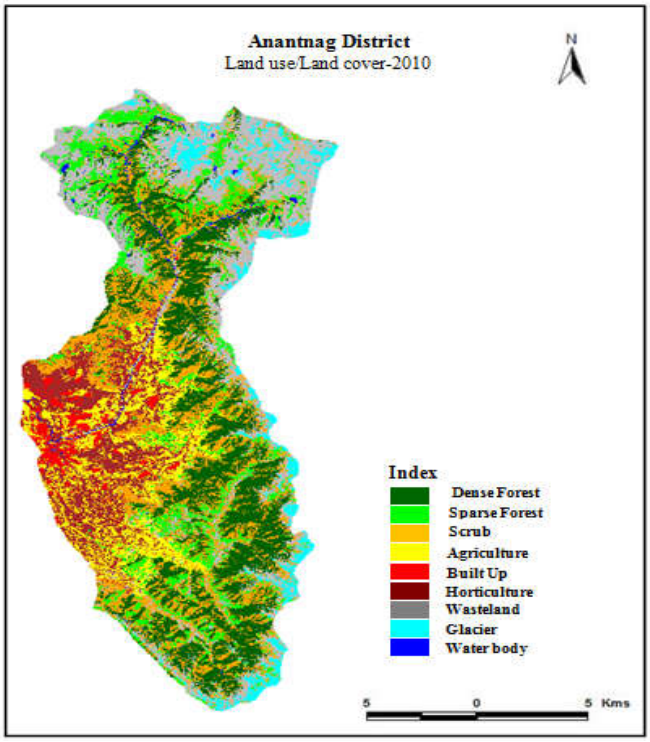
Table 2. Land use Land Cover of Anantnag district (2010)

Land use land cover category	Area in Sq.kms	Percentage of total area %
Sparse Forest	290.68	11.16
Built Up	60.58	2.32
Water body	18.84	0.72
Glacier	118.08	4.53
Horticulture	284.26	10.91
Scrub	518.21	19.90
Dense Forest	579.09	22.23
Agriculture	263.50	10.11
Wasteland	471.68	18.11
Total	2604.92	

Source: Generated from IRS P6 LISS III satellite data, 2010

Land use land cover of Anantnag district (2010)

The land use/ land cover map of 2010 has been generated from the satellite data and is presented in the Table 2. The table revels that the dense forest is the dominant land use with the total area of 579.09 Sq. kms which constitutes 22.23 percent of the study area followed by scrub 518.21 Sq. kms which is 19.90 percent of the total area. Wasteland is another category with the total area of 471.68 Sq. kms and constitutes 18.11 percent of the study area. Horticulture covers 284.26 Sq. kms which constitutes 10.91 percent of the study area. The total area of 290.68 Sq. kms is occupied by sparse forest which is only 11.16 percent of the study area. Area under Glacier is 118.08 Sq. kms that occupy 4.53 percent of the study area. Built up covers 60.58 Sq. kms followed water body 18.84 Sq. kms constituting 2.32 and 0.72 percent of the study area respectively.



Land use land cover change of anantnag district, 1992-2010

The land use land/ cover change that has occurred in the study area from 1992 to 2010 is shown in the Table 1 and 3.

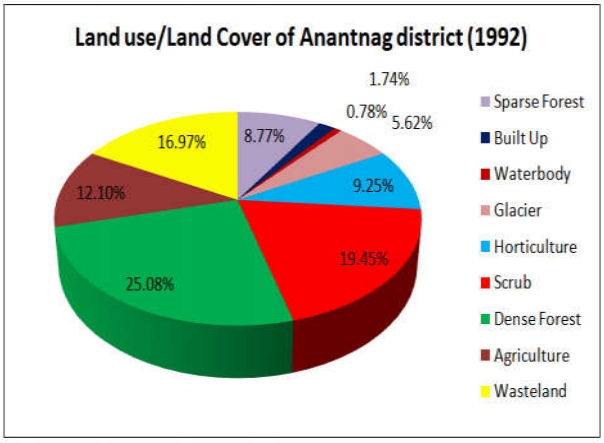


Fig 1. Land use/Land Cover of Anantnag district (1992)

The figures given in the table reveals that the highest change has occurred in the Dense forest which is 652.98 Sq. kms in 1992 that is decreased to 579.09 Sq. kms that is 25.08 to 22.23 percent respectively. Scrub is second category increase not that extent which is 506.57 Sq. kms in 1992 it is increased 518.21 Sq. kms in 2010 that is 19.45 to 19.90 percent. Then there is wasteland which is increased, that is 441.97 Sq. kms 1992, in 2010 it is 471.68 Sq. kms. Agriculture occupied 315.06 Sq. kms in 1992 which is come down to 263.50 Sq. kms in 2010. Horticulture witnessing increasing trend which is 248.02 in 1992, 248.26 Sq. kms in 2010.

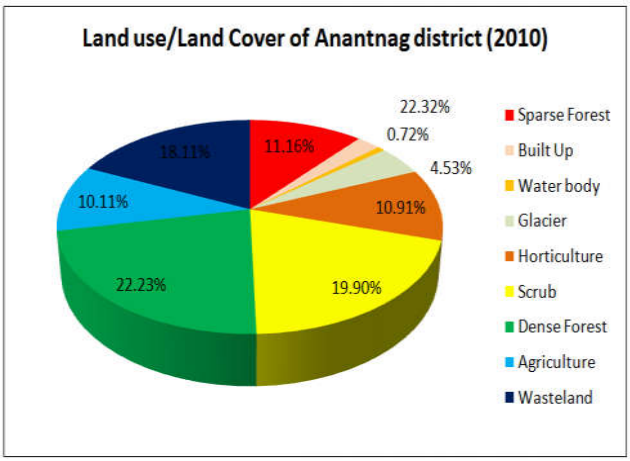


Fig 2. Land use/Land Cover of Anantnag district (2010)

Table 3. Land use/land Cover change of Anantnag district 1992-2010

Land use land cover category	Area in Sq. kms (1992)	Percentage of total area %	Area in Sq. kms (2010)	Percentage of total area %	Area in sq. kms	Change %	Average Annual Growth 1992-2010
Dense forest	652.98	25.08	579.09	22.23	-73.89	-2.83	-0.15
Scrub	506.57	19.45	518.51	19.9	11.65	0.447	0.025
Wasteland	441.97	16.97	471.68	18.11	29.71	1.14	0.06
Agriculture	315.06	12.1	263.5	10.11	-51.56	-1.98	-0.11
Horticulture	248.02	9.52	284.26	10.91	36.24	1.39	0.07
Sparse forest	228.43	8.77	290.68	11.16	62.25	2.39	0.133
Glacier	146.28	5.62	118.08	4.53	-28.20	-1.08	-0.06
Built up	45.25	1.74	60.58	2.32	15.32	0.58	0.03
Water body	20.35	0.78	18.84	0.72	-1.51	-0.05	-0.003
Total	2604.92		2604.92				

Source: Generated from IRS P6 LISS III satellite data, 2010

Spares forest witnessed an increase of 2.39 percent in its total area coverage with a 62.25 Sq. kms of change. It covers an area of 228.43 Sq. kms and 290.68 Sq. kms in 1992 and 2010 respectively. Built up shows increasing trend which is 15.32 Sq. kms. It covers an area of 45.25 Sq. kms in 1992 that is 60.58 Sq. kms in 2010. It shows 0.58 percent change. Glaciers are showing a fast decreased trend all over the world. The figures related to the area of glaciers in the study area have gone down from 146.28 sq. kms to 118.08 sq. kms between 1992 to 2010 respectively with a total decrease of 28.20 sq. kms. 1.08 percent decrease was recorded by glaciers with an average annual decrease of 0.06 percent. A net decrease of 1.51 sq. kms has occurred in the water bodies located in the study area. Water bodies have decreased from 20.35 Sq. kms in 1992 to 18.84 Sq. kms in 2010 with an average annual decrease of 0.003 percent.

Conclusion

The changes in land cover and the way people use the land have become recognised over the last few decades as an important global and environment issue in the world. Land is an important resource it supports can vary over time according to management conditions and uses. Expanding human requirements and economic activities in the study area are placing ever increasing pressure on land resources, creating condition and conflicts resulting in sub optimal use of land resources.But the land under forest cover has experienced a declining trend in the past eighteen years. Here forest land converted to Agricultural land, Built-up, and Harvested land due to this changes we lost our natural ecosystem and biodiversity also. Hence there is a risk of decline in the extent of land under agriculture in the near future. The increase in the area under built up lands may lead to a lot of environmental and ecological problems.

To sum up it could be stated that land is a under the threat of environmental and ecological problems due to improper management of land, the free gift of nature. Hence government should come forward to take effective measures to protect the land under forest and agriculture in Anantnag. Here proper land use planning is needed otherwise we lost our natural resources i.e. forest, water bodies.

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