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Analysis of Deforestation and Land Use Changes in Kotagiri Taluk of Nilgiris District

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Abstract

The optimized method clearly explains about the consequences of deforestation and the land usage by human beings in Kotagiri Taluk of Nilgiris district. Deforestation is one of the main purposes for global warming and contributor of greenhouse effect. In recent years, Remote Sensing and Geographical Information System have the prospective to deliver precise information regarding terrestrial use and forest surface changes. The current analysis assesses the usefulness of high resolution satellite data and GIS techniques for analyzing the change of terrestrial use and forest surface change of Kotagiri Taluk of Nilgiris district for 2013-2016. The Landsat imageries of 2013 and 2016 were analyzed using software. A total of twelve land use regions were identified. The comprehensive study has revealed that the region under forest has increased from 973.34 km^2 and 996.45 km^2 and settlement from 44.29 km^2 to 50.28 km^2. The analysis shows that there was major alteration in the pattern of terrestrial use and deforestation of trees for urbanization. There has been a vast change in the strategy of forest surface and terrestrial usage throughout the region of Kotagiri which eventually results in loss of natural ecosystem.

Keywords: Deforestation, Kotagiri, Land use and Land Cover Modification, Remote Sensing and GIS Technique

1. Introduction

Terrestrial use and forest cover is dynamic in nature and need regular observance to grasp areas of speedy modification. Land use/ Land cover modification include a number of the foremost vital human alteration poignant the surface of planet[1]. Modifications in terrestrial cover through cropping, biological science and urbanization represent the foremost substantial various through their interaction with most elements of world environmental changes. Terrestrial use and forest cover information are vital for designing and administration activities involved with the exterior of the planet as a result of it establishes vital ecological information for several technical, resource administration and strategy functions and a variety of human activities. Associate degree correct information of terrestrial use and forest cover options characterizes the muse for terrestrial sorting and administration. So a large vary of scientists and practitioners, terrestrial and water managers still as built-up developers obtain data on the placement, dissemination, sort and extent of terrestrial use and forest surface modification.

2. Materials and Methods

2.1 Study Area

Nilgiris district, that is situated in Tamilnadu state, extended over the east - west ,by 11°30' and 11°15' Northern latitudes and spreads over 76°45' and 77° 00' Eastern longitudes[2] . The Nilgiris district is thus associated with the ancient terrestrial mass shove and the interruption with two key peak ranges close to the southern finish of an Asian nation and such nearly seventy million years

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ago. Over Fifty seven of the exterior the Nilgiris upsurges over a thousand meters higher than their Mean Sea Level and forty seventh of that fortifications around thousand eight hundred meter by the top fashioned with the large mountain at two thousand six hundred meter. The full region range of district is about two thousand five hundred square kilometer and is one amongst the littlest districts within the state. The Nilgiris district includes four Taluks viz., Udhagamandalam (one thousand one hundred square kilometer), Gudalur (seven hundred and seventy seven square kilometer), Coonoor (two hundred and twenty nine square kilometer) and Kotagiri (three hundred and ninety seven square kilometer). These square measure fifty five revenue villages and 640 hamlets within the district. In the proposed work Kotagiri Taluk has been identified as study region.

Kotagiri is usually mountainous, set on the delicate atmosphere of Western Ghats. It is located at 11.43°N 76.88°E latitude and has an average elevation of 1793 meters (5882 ft). Foremost portion of the panchayat is underneath forest surface (56%), concerning two hundredth of the Taluk underneath plantation crops like coffee, tea, vegetables and coconut, out of that tea estate leads and is found in the least slopes. Typical almanac downfall is 1900 millimeter. Since this is placed at an altitude of nine hundred to two thousand meter higher than MSL.

2.2 Landuse/Land Cover Modification

Landuse is usually deal with the human activity related with some piece of land. Landcover is the accumulation of biotic and abiotic components on the surface. The problem of landuse and landcover is to identify the various types of remotely sensed images and maps. Land use and land cover data are vital role for several arrangement and dealing activities disturbed with the surface of the earth because it contains many environmental information for technical, resource management of human activities. A specific grasp of land use and land cover attribute represents the base for land classification and management[3]. Therefore a vast extent of scientists and art, coast and water managers as well as land protection pursue information on the position, dispensation, type and magnitude of land use and land cover change. The three stages to generate land cover are feature extraction, selection of training data and selection of suitable classification approaches. Maximum likelihood classification technique are used for extract the spectral bands in each satellite images. GIS technique is used to analyze the spectral bands of data. The map is done by collected data of spectral band for satellite images.

These dramatic landuse and landcover changes are mainly obtain a few decades to evident. The increasing quality of natural resources in recent times has been lead to its associated man-made activities; it leads to serious disaster in environment. These disaster are avoided in upcoming years of generation to developing the countries. However, humans are accepted their mistakes of these disaster, the environment will arise the changes of agricultural lands, various landuse and landcover problems. In Nilgiri district, the main purpose is to avoid destroys of trees and lands. Because in some of the areas the trees and field are giving shelters to our future generation.

2.3 Deforestation

As in several different stifling expanses all over the planet, deforestation and jungle deprivation because of varied features like addition of civilized terrestrial, foraging of farm animal, taking out of timberland product, industrial manors, boulevard and railway construction and poaching continue intense within the Nilgiris. There are varied appraisals and conjectures concerning the forfeiture of timberland surface within the Nilgiri district[4]. A contemporary assessment states that the Western Ghats, one in all India's utmost esteemed "natural spot" has gone astray quarter of its timberland cover within the last twenty years. The assessment that calculable modifications in jungle cover in southern elements of the Western Ghats victimization satellite information reveals a loss of twenty five proportion in that age. The deterioration in forestry is indorsed predominantly to extend in manors and farming regions because of progression of district observant the foremost speedy alterations.

The assessment conjointly recommences the controversy that regardless of protection processes approved by varied interventions, the speed of deforestation has hastened in current era. The information displays a large upturn in woodland forfeiture. The threat looks even larger if one contemplates the very statistic that assessment doesn't embody woodland deprivation and surround destruction that conjointly ultimately subsidize to woodland forfeiture. As anthropological and farm animal inhabitants increases and forestry contract, the link between countryside societies and woodland has turn out to be more and more unjustifiable.

Deforestation results in many changes within the land scenario[5]. The deprivation and disintegration of forestry, that usually pave the way for deforestation, significantly have an effect on the diversity of the county. Within the Western Ghats, low altitude classic woodlands controlled by timber and wood which represent the foremost vulnerable environment. The sequence on the Nilgiris, which has been interrupted because of the taken work, upgraded in the settlement areas, and the enriched rubber plantations as well. Many typical moderate and low-elevation species have nearly become extinct, many became rare, and a few species have taken refuge within the sacred groves.

2.4 Data Source

Through sequences of assessment, it has been determined that Landsat Thematic clerk is acceptable on behalf of intensive concise exposure of giant expanses. By way of outcome, this diminishes the necessity for lavish and period over whelming earth examinations directed for verification of documents[6]. The United States Geological Survey (USGS) is one of the primary source of Landsat image, from which the imageries of Kotagiri panchayat are taken for the years 2013 and 2016. The landcover surface wise applied math knowledge been gathered from the Tamilnadu government applied math analysis of Kotagiri Taluk. The standard ways of visual interpretation techniques are utilized for the evaluation of landuse classes of Kotagiri Taluk. The modifications were calculated for every landuse category in several duration. The recognition of modifications from preliminary status of 2013 to concluding scenario of 2016 was conjointly conveyed to urge an explicit plan concerning what quantity alteration has taken place in several landuse modifications in Kotagiri panchayat. The landuse and terrestrial surface measurements calculation sustained in characteristic proportion of modification, almanac level of modification between 2013 and 2016 were analyzed. The data's are collected from the satellite imagery and it is used to identify the changes in consider years[7]. The changes are becoming more in destroying of trees and lands. In which, the satellite image shows the difference between the images for both different years. With the help of these data's, the results are discussed based on the deforestation and land coverage problems.

Percentage of change was determined based on the following formula:

$$\text{Percentage change (\%)} = \frac{\text{Observed change}}{\text{Sum of change}} \text{X } 100$$

Types of environmental related issues been considered in the change detection assortment analysis. From Table 1, dense forest, open forest are increased over a period of 3 years. Decreased in industrial /mining areas and agro-horticulture plantation.

3. Results and Discussion

The contemporary assessment, an effort has been created for holding on view of terrestrial use modification recognition scrutiny for Kotagiri Taluk in Nilgiri district. Modification recognition comprises the employment of various time-based statistics to descend terrestrial use and terrestrial surface modifications for various amount of satellite imagery[8]. The NDVI images of 2013 and 2016 are given below as Figure 1 and 2 respectively. From the figures, in 2013 green color represents the forest area, red color represents the land. In 2016, forest area becomes vanished due to deforestation and the lands are occupied by the peoples (indicates yellow in color).

Table 1. Landuse and landcover distribution between 2013-2016 in Nilgiris district

Sl. No.	Landuse class	Area (km²)		Percentage (%)	
		2013	2016	2013	2016
1.	Dense forest	973.34	996.45	38.93	40.25
2.	Open forest	116.03	121.18	4.55	6.24
3.	Forest plantation	305.41	308.52	11.97	14.50
4.	Settlement	44.29	50.28	1.74	2.62
5.	Waterbody/Lake/ Reservoir	29.26	40.58	1.15	3.25
6.	Tea plantation	437.72	481.67	17.15	21.56
7.	Forest blank	24.43	30.56	0.96	2.49
8.	Mixed forest	239.65	328.75	9.39	12.88
9.	Land with scrub	47.85	52.64	1.87	3.24
10.	Barren rock/Stony waste	3.52	2.54	0.14	0.05
11.	Industrial/Mining area	1.48	1.12	0.26	0.06
12.	Agro-Horticulture plantation	288.63	126.65	11.31	9.08

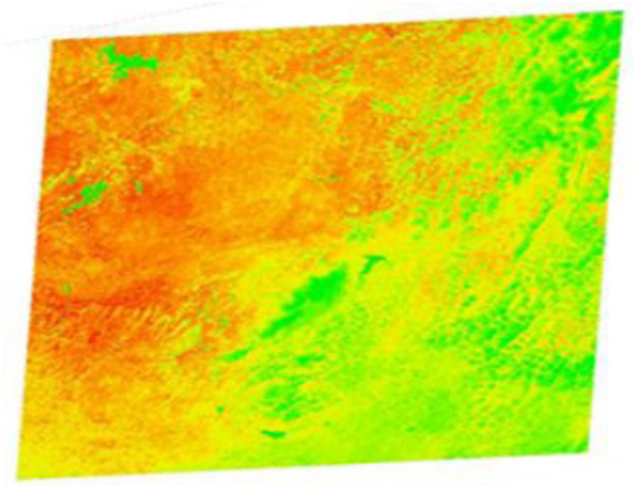

Figure 1. NDVI image of landsat 5 in 2013

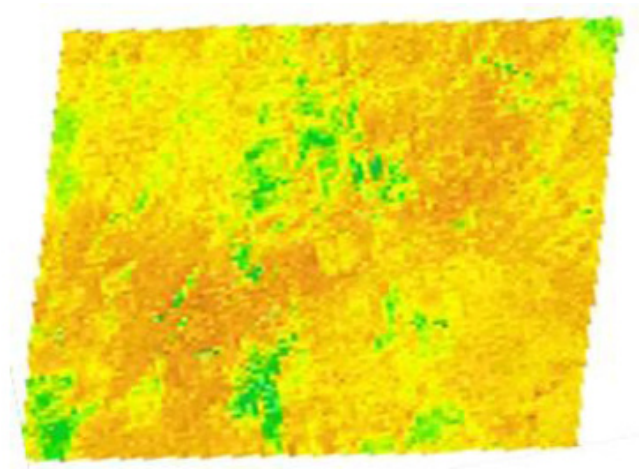

Figure 2. NDVI image of landsat 7 in 2016

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