Eco. Env. & Cons. 30 (4) : 2024; pp. (1522-1525)
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ISSN 0971–765X

DOI No.: http://doi.org/10.53550/EEC.2024.v30i04.008

A GIS Approach Study on the Importance of Land Use Cover Patterns with Special Reference to Peringammala Region, Thiruvananthapuram, Kerala, India

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(Received 23 March, 2024; Accepted 12 June, 2024)

ABSTRACT

The term "urbanization" describes the concentration of people in specific places. This concentration results from land transformation for residential, commercial, industrial, and transportation reasons. The building of additional residences, schools, hospitals, transit, and other services, as well as the conversion of more land to urban use, are required due to the rapid expansion in population. In this context, we can understand how urbanization affects the rural area with special reference to the rural area of Peringammala. In this research, we collected both the Landsat 7 (2001) (2011) and Landsat 8 (2021) images used in the classification of Land use Cover changes. Supervised classification was done to classify the images in different land use categories like Forest, agriculture, barren land, built upland water bodies. From this study, we can understand the gradual penetration of urbanization in rural areas.

Key words: *Urbanization, Population, Land use cover changes, Landsat, GIS*

Introduction

Urbanization impacts the physical environment through its effects on people, their activities, and the increased demands on resources. Several researchers have recently focused on higher perceived driving factors in dynamic native and regional climates due to phylogenesis activities such as land use changes (Choudhury *et al*., 2019; Karakus *et al.,* 2019; Ogunjobi *et al.,* 2018). The LULC change is influenced by humans trying to meet various needs such as residential, industrial, agricultural, mining and other infrastructural facilities. It is a major concern associated with an area's economic and sustainable growth. Changes in urban land use have a significant impact on regional climate (Jahan, *et al.,* 2021; Nagarajan and Basil, 2014; Grimm, *et al.,* 2008).

Materials and Methods

Study Area

Fig. 1. Location map of the Peringammala region
Peringamala village is located in Nedumangad taluka of Thiruvananthapuram district in Kerala, India. It is situated 13km from sub-district headquarters Nedumangad (tehsildar office) and 44km from district headquarters Thiruvananthapuram. The latitude and longitude of Peringammala are 8.5559^0 N and 76.9789^0 E. The total geographical area of the village is 14004 hectares. Peringamala has a

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total population of 19,164 people.

Data collection

Downloaded cloud-free Landsat satellite data of 2001, 2011 and 2021 for the study area has been downloaded from the USGS Earth Explorer website. Then all the data are pre-processed and projected to the Universal Transverse Mercator (UTM) projection system. The details of the images are given in the following Table.

Table 1. Details of Landsat data collected

Date of image	Satellite/Sensor	Reference system Path/Row
2001-11-30	Landsat 7 /ETM+	144/054
2011-11-10	Landsat 7 /ETM+	144/054
2021-03-02	Landsat 8 OLI	144/54

Generation of land use/land cover maps

A supervised classification was performed in ERDAS imagine 2014 using the maximum likelihood classification. The five classes were identified through ERDAS. The identified classes included forest, agriculture, water bodies, built-ups and barren land. The classified images were converted to shapefile with the help of ArcGIS 10.3.1 software.

Results and Discussion

Land use/ land cover changes

The Peringammala region's changes in land use and land cover over 2001, 2011, and 2021 are depicted in the following figures. The tables also display the Peringammala region's annual percentage calculations for the various years. The findings show that the effects of urbanization are not as great as those in metropolitan areas. Due to the three years of results, the cumulative percentage did not rise quickly between 2001 and 2021. The percentage of built-up area has not changed in 20 years. The built-up area percentages are as follows: 2001–6.14%, 2011–7.45%, and 2021–8.77%. However, in contrast to prior years, there was a minor uptick in 2021. When three years' worth of data are compared, the Peringammala region's primary class is forest. Compared to metropolitan areas, rural areas saw less urbanization. In three distinct years, the percentage of people in the forest class is greater than 50%. We could tell that the area was given more consideration for greenery.

Fig. 1. Location map of the Peringammala region

To maintain the water cycle for humans and other creatures, the earth's forests rip apart a variety of plant species. This stops soil erosion, slowing down the entire climate change process. As we compare all these three years, we can see that water bodies are decreasing. Water bodies places change into barren lands. An important change occurred in these years for barren land. In 2001 the percentage of barren land was 8.33%. in 2021 the percentage was 20.61%. We can understand that in some places it can be said that there is no activity at all. Urbanization is rampant energy changes, such as energy changes, heat waves and contribution to climate change, and so on from a plan of action that can be a good quality of life for the population, in addition, to promoting sustainable development (Bharath *et al*., 2018).

Conclusion

One of the most important factors in our environment is sustainable development. To protect our environment, we must always seek out sustainable activities. In conjunction with GIS, remote sensing has proven to be a powerful tool in assessing land-

Table 2(a). Spatial distribution of Land use class in Peringammala region (2001) (b) Spatial distribution of Land use class in Peringammala region (c) Spatial distribution of Land use class in Peringammala region (2021)

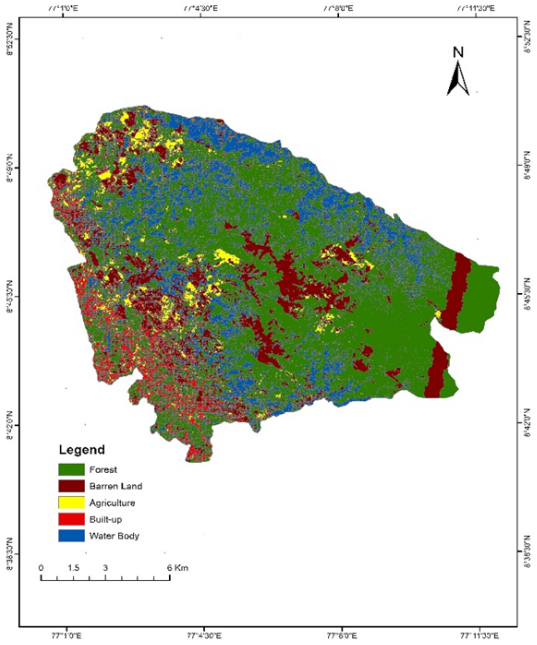
Sl. No.	Name	Area (km)	Percentage (%)
1	Forest	115	50.43
2	Agriculture	40	18.88
3	Built-up	17	6.14
4	Barren Land	19	8.33
5	Waterbody	37	16.22

(a)

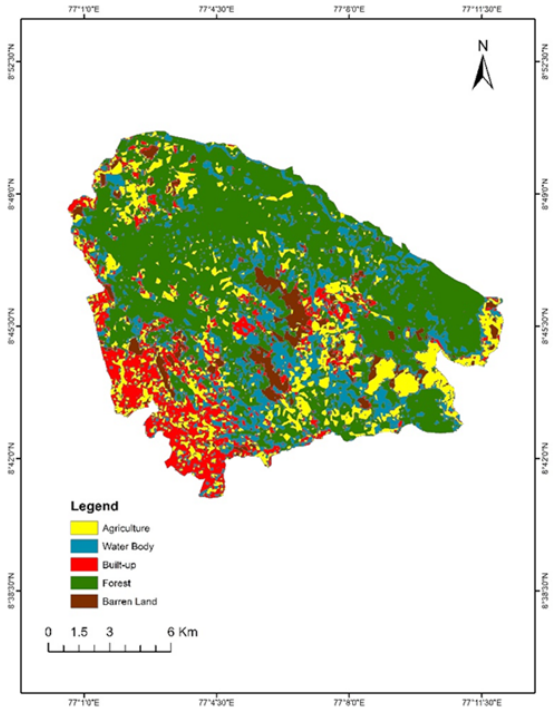
Sl. No.	Name	Area (km)	Percentage (%)
1	Forest	104	45.61
2	Agriculture	31	13.59
3	Built-up	14	7.45
4	Barren Land	41	17.98
5	Water Body	38	16.66

(b)

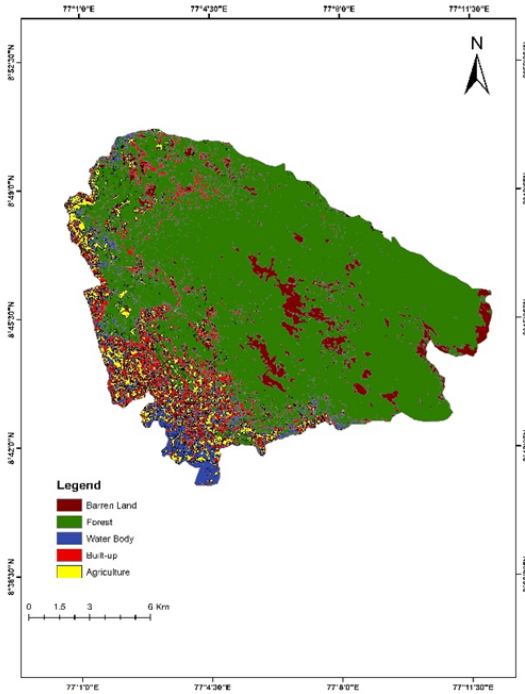
Sl. No.	Name	Area (km)	Percentage (%)
1	Forest	116	50.87%
2	Agriculture	34	14.91%
3	Built-up	20	8.77%
4	Barren Land	47	20.61%
5	Water Body	11	4.82%



(a)



(b)



(c)

Fig. 2. (a) Land use/ land cover map of 2001 (b) Land use/ land cover map of 2011 (c) Land use/ land cover map of 2021

scape patterns because it is cost-effective and time-consuming. The current study seeks to investigate the land use patterns in Peringammala region. The result was discovered using images from Landsat 7 and Landsat 8. In three years (2001, 2011 and 2021). Comparing the landuse data of these three years shows that urbanization has not affected much. From this, we can say that development is the main cause of change in landuse patterns. So, we can refer to sustainable development for our future ecology.

Acknowledgement

The authors gratefully acknowledge the help and support extended by the Management of All Saints', College, Thiruvananthapuram, Kerala, for completing this research article.
Source of funding: None

Conflict of Interest

The authors declare no conflict of interest.

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