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Status of Land Use/ Land Cover in the Southern Aravali Ranges: A Geographic Study of Udaipur District (Rajasthan)

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Abstract

Land use and land cover change has become a central component in current strategies for managing natural resources and monitoring environmental changes. Land is becoming a scarce resource due to immense agricultural and demographic pressure. Hence, information on land use/land cover and possibilities for their optimal use is essential for the selection, planning and implementation of land use schemes to meet the increasing demands for basic human needs and welfare. The present paper deals with fact that human beings are the major contributors to land use/land cover changes, and are the ones experiencing the consequences of these changes, it is a paramount importance to understand the interaction between man and its environment. This need becomes more imperative as changes in land use become more rapid affecting the livelihoods of societies.

Keywords: Land Use and Land Cover, Human Needs, Interaction between Man and Its Environment.

Introduction

Land use is defined in terms of syndromes of human activities such as agriculture, forestry and building construction that alter land surface processes including biogeochemistry, hydrology and biodiversity. Social scientists and land managers define land use more broadly to include the social and economic purposes and contexts for which lands are used. While, land cover refers to the physical and biological cover over the surface of land, including water, vegetation, bare soil and artificial structures. Land cover implies the physical or natural state of the Earth's surface. It refers to the surface cover on the ground, whether vegetation, urban infrastructure, water, bare soil or other; it does not describe the use of land, and the use of land may be different for lands with the same cover type. For instance, a land cover type of forest may be used for timber production, wildlife management or recreation; it might be private land, a protected watershed or a popular state park.

Objective of the Study

The study is aimed to analyze the present status of land use/land cover changes in the study area.

Hypothesis

The expansion of agricultural activities is the main factor of land use/ land cover change.

Methodology

For primary data, mainly toposheets, survey data and satellite imageries have been used, while among secondary data, annual rainfall, crop-wise land cover, livestock and population data have been obtained from various sources such as internet, Department of Agriculture and Land Records, Regional Remote Sensing Application Centre, Jodhpur; District Statistical Outline and Meteorological Department, Udaipur. The collected data and information have been analysed and presented through tables, and diagrammatic and land use/land cover maps.

Review of Literature

The basis of using remote sensing data for change detection is that changes in land cover result in changes in radiance values which can be remotely sensed. Techniques to perform change detection with satellite imagery have become numerous as a result of increasing versatility in manipulating digital data and increasing computer power.

In some instances, land use/land cover change may result in environmental, social and economic impacts of greater damage than benefit to the area (Moshen, 1999). Therefore, data on land use change are of great importance to planners in monitoring the consequences of land use change in the area. Such data are of value to resources management and agencies that plan and assess land use patterns and in modeling and predicting future changes.

Shosheng and Kutiel (1994) investigated the advantages of remote sensing techniques in relation to field surveys in providing a regional description of vegetation cover. The results of their research were used to produce four vegetation cover maps that provided new information on spatial and temporal distributions of vegetation in this area and allowed regional quantitative assessment of the vegetation cover.

Pandey and Nathawat (2006) carried out a study on land use/land cover mapping of Panchkula, Ambala and Yamunanger districts of Haryana state in India. They observed that the heterogeneous climate and physiographic conditions have resulted in the development of different land use/land cover in these districts. An evaluation by digital analysis of satellite data indicates that majority of areas are used for agricultural purpose. The hilly regions exhibit fair development of reserved forests. It is inferred that land use/land cover pattern in the area are generally controlled by agro-climatic conditions, groundwater potential and a host of other factors.

It has been noted over time through series of studies that Landsat Thematic Mapper (sensor) is adequate for general extensive synoptic coverage of large areas. As a result, this reduces the need for expensive and time consuming ground surveys conducted for validation of data. Generally, satellite imagery is able to provide more frequent data collection on a regular basis unlike aerial photographs which although may provide more geometrically accurate maps, is limited in respect to its extent of coverage and expensive; which means, it is not often used. In 1985, the US Geological Survey carried out a research programme to produce 1:250,000 scale land cover maps for Alaska using Landsat MSS data (Fitz Patrick *et al.,* 1987).

The growing population ultimately requires some form of land use change, be it to provide for the expansion of food production through forest clearing, to intensify production on already cultivated land, or to develop the infrastructure necessary to support increasing human numbers. As such, it is clear that population is associated with changes in landscape, although political forces, cultural values, institutional histories, and other mediating factors ultimately shape the association within any particular geographic context. A burgeoning literature examines these human dimensions of land use change, specifying the factors involved and modeling the processes of demographic and environmental interactions.

Choices about land use and land management affect the amount of greenhouse gases entering and leaving the atmosphere and, therefore, provide opportunities to reduce climate change Such choices can affect the balance of these gases directly, through decisions to preserve or restore carbon in standing vegetation and soils, and indirectly, in the form of land use policies that affect fossil-fuel emissions by influencing energy consumption for transportation and in buildings. Additionally, as crops are increasingly used to make fuel, the potential for reducing net carbon emissions through replacement of fossil fuels represents a possible land-based carbon emissions reduction strategy, albeit one that is complicated by many natural and economic interactions that will determine the ultimate effect of these strategies on emissions.

The impact of irrigation on agricultural productivity and evaluation of the aspects of irrigation in Belgaum district was carried out by Angadi and Rayamane. They found that if constant supply of water is ensured, transformation and expansion of agriculture can take place (Angadi and Rayamane, 2012).

One another study was undertaken to evaluate the suitability of the land for agricultural crops by using GIS. The evaluation of land in terms of suitability classes was based on the method described in FAO guideline for land evaluation in region of Ampara district, Sri Lanka (Zahir, Kaleel and Kumaran, 2013). It was found that water is the main factor of climate change. Various forms of water depend on precipitation and temperature. The negative impact of climate change is on food, water, energy, health and public safety. Rainfall, among all the weather elements has greater and wider, as well as immediate effect on various facets of human life. An attempt to analyze the trend and rhythm of rainfall in Mysore City during the last four decades has been made (Ranganatha, 2014).

Torkashvand and Shivaligappa (2010) have undertaken a study to generate the map of land use classification and to analyze its classes along with consideration of influential factors on it by using the Landsat ETM images in western Iraq. Kanth and Hassan (2010) have attempted to determine the spatio-temporal land use/land cover change in Wular Catchment and to find out the major factors causing the change by the help of SOI toposheets, and LISS III imagery. The result of the study shows the drastic decrease in forest area and increase in agriculture and built-up area.

Addisu and Rao (2011) investigate the factors shaping the contemporary patterns in the development of spatial (land use) structures of the peripheral areas in Adama City. This work is done with the help of primary data collection in 2010. Suryawanshi and Pagar (2010) have explained changes in crop diversification patterns in Nashik district from 1970-71 to 2004-05. According to it, crop diversification was not constant all over the area and a pattern was discovered. The new culture of farm houses has led to decrement in the agricultural area around Delhi. This has changed the size of land holdings, spatial shifts in agricultural practices and changes in land values. The study is based on field survey conducted in 1996 using the sampling method

(Kaushik, 2006). The changes caused by the land use/land cover pattern in Varanasi district examined by using two time frame dataset (LISS 3rd and Standard FCC) of three cropping seasons. The study shows decline in agricultural land and a prolific growth in built-up area (Jaiswal and Verma, 2013).

Outcomes of the Study

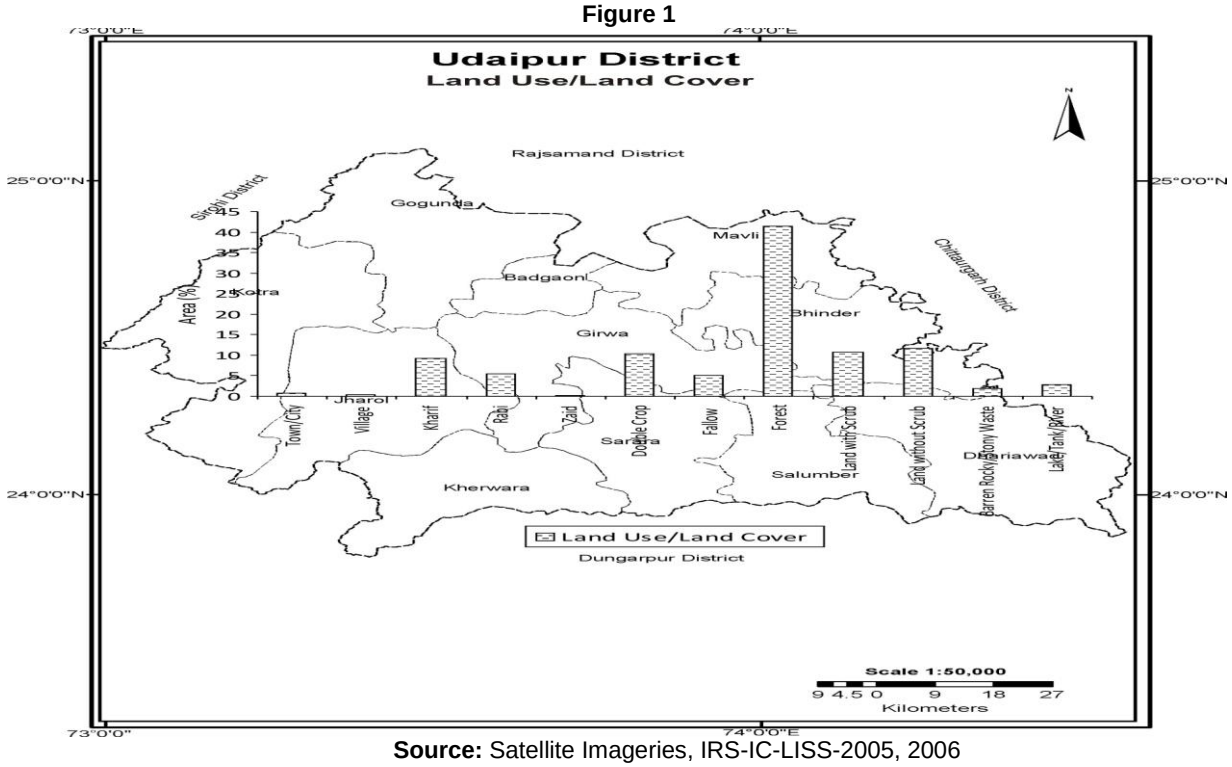
The land use/land cover maps of Udaipur district is prepared by visual interpretation of IRS-LISS-III FCC of three seasons in combination with the existing information derived from the Survey of India topsheets and limited field check. The data are classified into five major groups viz. Built-up land, Agricultural land, Forest land, Waste land and Water bodies. The study area has the maximum area (5232.9 sq km) under forests contributing 39.0 per cent followed by agriculture land 4135.54 sq km (30.82 per cent), waste land 3191.83 sq km (25.07 per cent), water bodies 458.52 sq km (3.41 per cent) and the minimum is under built up area out of the total geographical area. Out of the total agricultural area, double cropped area ranks first (10.47 per cent) followed by Kharif 9.43 per cent, fallow land 5.58 per cent, Rabi 5.13 per cent and Zaid 0.21 per cent of the total geographical area. While land without scrub is 11.71 per cent which is highest among wastelands followed by the land with scrub (10.77 per cent) and barren rocky/stoney waste is 2.59 per cent. It is important to note here that area under urban settlement (0.71 per cent) is more than area under rural settlement (0.48 per cent) in the study area. The details of land use/land cover classes are given in the following table.

Table 1: Udaipur District- Land Use/ Land Cover Classification

Level –I	Level –II	Level –III	Symbol	Area(km^2)	%
Built-up Land	Town/City		01	95.46	0.71
	Villages		02	64.56	0.48
Agriculture Land	Crop Land	Kharif	03	1266.4	9.43
		Rabi	04	688.56	5.13
		Zaid	05	27.81	0.21
		Double	06	1404.6	10.47
		Fallow	07	748.17	5.58
Forest	Forest		08	5232.9	39.00
Waste Land	Land with scrub		09	1362.6	10.77
	Land without scrub		10	1481.6	11.71
	Barren rocky/ Stony waste		11	347.63	2.59
Water bodies	Lake / Tanks/ River		12	458.52	3.41
Total Area				**3419.1**	**100.0**

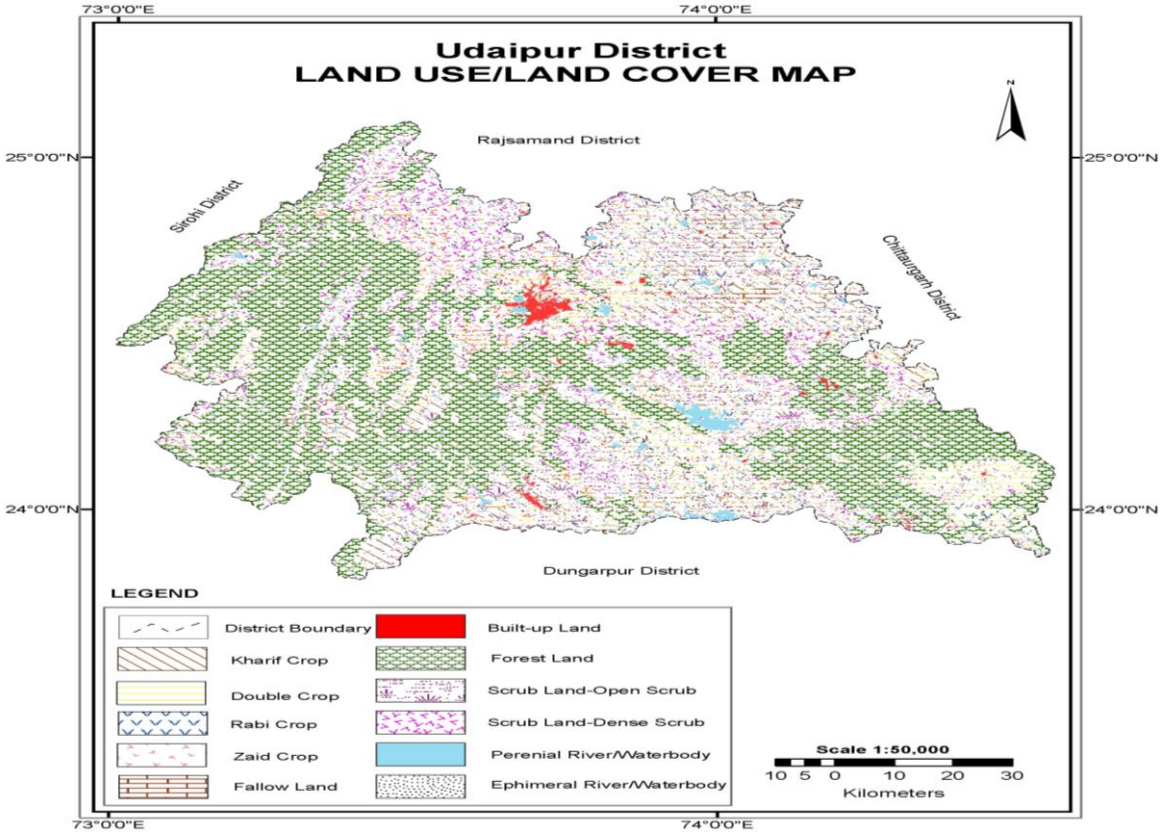
Source: Satellite Imageries, IRS-IC-LISS-2005, 2006

Figure 1



Source: Satellite Imageries, IRS-IC-LISS-2005, 2006

Figure 2



Source: Map is drawn on the basis of interpretation of satellite imageries (IRS-1C-LISS-III-2005,2006)

Conclusion

One of the most pressing problems faced by the society is to feed and house the existing and ever increasing population. This could partly be achieved, provided the available land used to its optimum and best potential. The necessity therefore, is to have up-to-date information about the exiting land use, so that it can be utilized for planning for the coming years according to the needs of the time.

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