Spatio-Temporal Changes in Land Use / Land Cover of Latur Tahsil

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Abstract :

The aim of this paper is spatio-temporal changes of land use and land cover pattern in Latur Tahsil. Land use and land cover is an important aspect of geographical studies particularly relevant to Agricultural Geography. In the light of physio-socio-economic environment, man determines the uses of land. The Land use and land cover change has become a central component in current strategies in managing natural resources and monitoring environmental changes. It also has brought serious losses of arable land, forest land and water bodies. Land cover change is a major concern of global environment change. Land use and land cover pattern of a region is an outcome of natural and socio-economic factors and their utilization by man in time and space. Urban expansion has increased the exploitation of natural resources and has changed land use and land cover patterns. Rapid urbanization, therefore, brings opportunities for new urban development, however. The modeling and projecting of land cover change is essential to the assessment of consequent environmental impacts.

Mumbai, the capital city of Maharashtra, has been experiencing a lot of land use and land cover changes due to both socio-economic and natural factors. Remote sensing becomes useful because it provides synoptic view and multi-temporal Land use Land cover data that are often required. Geographical information system (GIS) and Remote sensing provide fundamental tools which can be useful in the investigation at the village, district as well as the city levels. In study, Markov chain model has been applied to predict future changes which are based on the rates of past change using IDRISI GIS. The land use information for the year 2017 is predicated in Latur City. The past, current and possible future land use dynamics of the study area has been described and analyzed.

Introduction :

In this paper combined the remotely sensed data to investigate urban growth dynamics of Latur area from 1989 to 2009. Land use is the surface utilization of all developed and vacant land on a specific point, at a given time and space. It will change with time and space. The importance of land use studies is increasing with the continuous increase in population, because to get the best of land, the diversity of topography and soils should be studied carefully in order to put land to the most efficient use and the development programmed should e properly used and implemented. Markov process models are a class of probability models used to study the evolution of a system over time. Transition probabilities are used to identify how a system evolves from one time period to the next. A Markov chain is the behavior of the system over time, as described by the transition probabilities and the probability of the system being in various states.

The change is land cover occurs even in the absence of human activities through natural processes where as land use change is the manipulation of land cover by human being for multiple purposes. So many socio-economic and environmental factors are involved for the change in land use and land cover. Land use and land cover change has been reviewed from different perspectives in order to identify the drivers of land use and land cover change, their process and consequences. Land use and land cover changes have impacts on a wide range of environmental and landscape attributes including the quality of water, land and air resources, ecosystem processes and function, and the climate system itself through greenhouse gas fluxes and surface Aledo effects. Land use and land cover change is scalar dynamic.

Objectives :

1. To analyze the changing land use and land cover pattern from 1989 to 2009.
2. To analyze land use and land cover change in suitable figures.

Materials and Methods :

All data were used in this study were projected to the Universal Transverse Mercator projection system. Topographical map, first, 1989 data are obtained from land use maps compiled from ground-verified aerial photographs by the land Resources Mapping project, collaboration between his Govt. of Maharashtra and an external consultant. The topographic map compiled from the ground-verified 1999 aerial photograph, which was prepared by Land Resource Mapping Project, Maharashtra and land references map was taken as the topographical map and used of land use map prepared by Survey Department of Maharashtra from

2000/2001 based on Aerial photography taken in 1999 at the scale of 1:25,000. The IDRISI GIS Andes version has been used for the analysis of images.

Four pairs of, cloud-free land sat images have been used to classify the study area, Land sat Image 2, Multi Spectral Scanner satellite image October 28, 1989, Land sat Image 5, Thematic Mapper satellite image October 31, 1999 and Land sat 7 Enhanced Thematic Mapper December 21, 2001 and Land sat 7 Enhanced Thematic Mapper January 10, 2009.

Markov Chain model applied to find out the future change of LUCC in study area. The land-use information for the year 2017 is predicated in Latur. According to the land use classification scheme supervised approach with the maximum likelihood parameter system was applied to improve the accuracy of the land use classification for the images for all four dates (1989, 1999, 2001 & 2009).

Discussions :

Land Use / Land Cover Change Pattern in Latur :

The entire eco-system of the land, which comprises of soil, water and plant, meets the community demand for food, energy and other needs livelihood. The land-use and land cover pattern of a region is and outcome of natural socio-economic factors and their utilization by man in time and space. There is no doubt that human activities have profoundly changed land cover in the City area during the last half centuries. Land is one of the most important natural resources. All agricultural, animal and forestry productions depend of the productivity of the land.

Land use statistics and transition matrices are important information to analyze the change of land use. The change analysis presented in this paper is based on the statistics extracted from the four land use/land cover maps of the Latur city with using GIS. Viewing the Earth from space is now crucial to the understanding of the influence of man's activities on his natural resource base over time. In situations of rapid and often undocumented and unrecorded land use change, observations of the earth from space provide objective information of human activities and utilization of the landscape. The urban / built-up areas in the Latur had a noticeable increase, from the table 1 we observed that the urban development change is very high in the city area, from 25.25% (68.74 hect.) of the total land in 1989 to 27.16 (112.72 hect.) in 2009, statistic mentioned that 10% urban growth in between 1989 to 2009, population migration in city area is the causes of increase the urban area.

On the other hand study observed the dramatic decrease of the Water Body area in the years between 1989 and 2009. It seems1.44% in 1989, 0.29 in 1999, 0.00 in 2001 and 0.00 in 2009. But the decrease of the Water Body area seems constant in 2001 and 2009. Analysis shows that Vacant and Barren land area seems 5.55%, 17.27%, 19.92% and 33.55% in 1989, 1999, 2001 and 2009 respectively which signifies the fluctuating ratio of Vacant and Barren land area. Cultivated land represents 67.73% in 1989 but this area has been decreased 1% and reached 47.30% in 1999 due to the rapid decline of vacant land. Cultivated land covers 67.63%, 47.30%, 44.76% and 39.29% in the year 1989, 1999, 2001 and 2009 respectively. Open Land has been largely decreased between 1989 and 2009. This area has been changed for urban and agriculture purpose.

Table 1 : Land Use Statistic of Latur City, 1989-2009

Landuse Type	1989		1999		2001		2009	
	Hect.	Percentage	Hect.	Percentage	Hect.	Percentage	Hect.	Percentage
Urban/Builtup	68.74	25.25	74.06	34.03	97.22	34.82	112.72	27.16
Water Body	3.93	1.44	0.63	0.29	Nil	0.00	Nil	0.00
Vacant & Barren Land	15.11	5.55	37.57	17.27	55.62	19.92	139.22	33.55
Open Land	0.06	0.02	2.42	1.11	1.36	0.49	Nil	0.00
Cultivated Land	184.38	67.73	102.92	47.30	124.97	44.76	163.08	39.29
Total	272.22	100.00	217.6	100.00	279.17	100.00	415.02	100.00

Source : Socio-Economic Abstract of Latur District, 2001. District Census Handbook of Latur District, 2001.

Future Change of Land Use and Land Cover in Latur :

Markov Chain Analysis :

Markov chain models are particularly useful to geographers concerned with problems of movement, both in terms of movement from one location to another and in terms of movement from one "state" to another "State", in this context refers to the size class of a town, income classes, type of agricultural productivity, land use, or to some other variables. Land use change transition probability Markov analysis indicates the probability of making a transition from one land use class to other one within two discrete times. The Markov transition probabilities of the observed landscape changes from 2001 and 2009. From using this two classified image of 2001-2009, I found out the future land use change of Latur. The transition probability matrix records the probability that each land cover category will change to the other category. This matrix is produced by the multiplication of each column in the transition probability matrix be the number of cells of corresponding land use in the later image. For the 5 by 5 matrix table presented below, the rows represent the older land cover categories and the column represents the newer categories. Although this matrix can be used as a direct input for specification of the prior probabilities in maximum likelihood classification of the remotely sensed imagery, it was however used in predicting land use/land cover of 2017.

Table 2 : Transitional Probability table derived from the land use/land cover map of 2009-2017

Classes	Urban/Builtup	Water	Vacant Land	Open Land	Cultivated
Urban/Builtup	0.9561	0.0507	0.1568	0.0045	0.2566
Water	0.0578	0.0058	0.2566	0.0048	0.3456
Vacant Land	0.2107	0.0058	0.3248	0.1465	0.4751
Open Land	0.1819	0.0087	0.5453	0.0068	0.6541
Cultivated	0.4898	0.0879	0.6879	0.0216	0.7368

Source : Compiled by Author.

In the probability transition matrix table 2 of Latur row categories represent land use land cover classes in 2009 whilst column categories represent 2017 classes. We can observed from the matrix, urban built up land has a 0.9561 probability of remaining urban land and a 0.00507 of changing to water body in 2017 and 0.2566 urban land transformed in cultivated in same year. The calculation mentioned that in 2017 urban built up area will increase than 2009 and must of the land use classes will be converted into urban area in 2017. Mean while 0.0058 water body remaining in same position but 0.0578 areas changed into in urban area in 2017. On the other hand, the 0.2107 and 0.0058probability of change from vacant land transformed in urban built-up and water body respectively. In the transition matrix 0.4898 cultivated lands changed into urban built up in 2017 and 0.0879 in water 0.6879 in vacant and 0.0216 in open land and 0.7368 is remaining in cultivated land in same period.

According to the analysis of Table 3 land use change will reach in extreme point of Latur. In 2017 Urban area will increase and it cover 94.74% to the total land of Latur by the contract cultivated land will remain only 0.18% from Table it can be noted that urban land, water body, open land will increase respectively by 201.59 hect. (94.74%), 1.76 hect. (0.83%), 8.27 hect. (3.89%) between years 2009 and 2017 whereas vacant land and cultivated land will decrease respectively by 0.78 hect. (0.37%) and 0.38 hect. (0.18%).

Table 3 : Statistic and Magnitude of Land Use/Land Cover Change 2009-2017

Landuse Type	2009		2017	
	Hect.	Percentage	Hect.	Percentage
Urban/Builtup	112.72	27.16	201.59	94.74
Water Body	Nil	0.00	1.76	0.83
Vacant & Barren Land	139.22	33.55	0.78	0.37
Open Land	Nil	0.00	8.27	3.89
Cultivated Land	163.08	39.29	0.38	0.18
Total	415.02	100.00	212.78	100.00

Source : Compiled by Author.

Conclusions :

Accurate and updated land cover change information is necessary for understanding main factors causes and environmental consequences of such changes. The classification achieved in this study produces an overall accuracy that fulfils the minimum accuracy threshold. Land cover is a critical element in change studies, affecting many aspects of the environmental system. While remote sensing has the capability of monitoring such changes, extracting the change information from satellite data relies on effective and accurate change detection techniques. The urban/built-up areas in the Latur had a noticeable enlarge, from the analysis we can see that the urban development amend is very high in the city area, from 1989-2009. I am finding the future land use change of Latur in 2017. The Markov transition probabilities of the observed landscape changes from 2001 and 2009. From using this two classified image of 2001-2009. It is assumed that this application of the techniques of remote sensing and GIS in urban research as demonstrated in this study can open up new area of comparative research so that a broad and full picture can ultimately be outspread to shed light over the pattern and processes of land use change in global context.

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