

SPATIAL ANALYSIS OF LAND USE LAND COVER CHANGE AT TAKHATPUR NAGAR PANCHAYAT OF BILASPUR DISTRICT IN CHHATTISGARH

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ABSTRACT

In the past, increasing population coupled with economic growth has resulted in large scale land cover and land use (LCLU) changes such as deforestation, agricultural expansion, and urbanization in India. Land use is a primary indicator of the extent and degree to which man has modified the land resources. Remote sensing and Geographic Information System (GIS) is an information technology that has been used in public policy-making for environmental and forest planning and decision-making over the past two decades. For the present study Takhatpurnagarpanchayat of Bilaspur district of Chhattisgarh state was selected randomly. The Google earth images and GIS software (QGIS /SAGA) were used for the development of land use and land cover classes and subsequently for change detection analysis of the study area. From the findings, it was observed that the agricultural land of Takhatpurnagarpanchayat was decreased upto 27.883 hectare. The total 4.283 hectare rural buildup and total 23.30 hectare urban buildup area of Takhatpurnagarpanchayat was increased during last 10 years span of time.

KEY WORDS: LULC, Remote sensing, GIS, Buildup Area

INTRODUCTION

Since independence the population has increased by 284 per cent (363 to 1033 Million) and food grain production by 386 per cent (51 to 196 Million Ton). Today, India ranks second worldwide in agriculture based output. The economic contribution of agriculture to India's GDP is steadily declining with the country's broad-based economic growth. When we talk about Chhattisgarh state, more than 80 per cent of the population's livelihood depends on the agriculture and its allied sectors. In the past, increasing population coupled with economic growth has resulted in large scale land cover and land use (LCLU) changes such as deforestation, agricultural expansion, and urbanization in India (DES, 2010). The term land use is used to describe the use of an area of land of a certain time. It is related to the human activity associated with a specific piece of land. Land use is defined as the use of land, usually with emphasis upon its functional role with respect to economic activities. Land use refers to "Man's activities and the various uses which are carried on land" (Clawson and Steward, 1965). Land use is a primary indicator of the extent and degree to which man has modified the land resources (Vink, 1975).

Land cover is the physical aspects at the surface of the earth. Land cover refers to the material present such as natural vegetation, water bodies and rock or soil, artificial cover and other features resulting due to land transformation. Land use/land cover change is widely recognized as an important aspect of global environmental change, which plays a pivotal role in regional socio-economic development (Chen *et al.*, 2001).

Land use and land cover changes, apart from changing the physical dimension of the spatial extent of the land use and land cover classes, also influence many of the secondary processes which lead to the eventual degradation of the ecosystems of the earth (Dregne and Chow, 1992). First and foremost, the impact of land use and land cover changes is the reduction of vegetation cover that leads to many other deleterious effects on the environment, namely, loss of biodiversity, climate change, changes in radiative forcing, pollution of other natural ecosystems with a reduction in their quality, changes in hydrological regimes, and the list continues (Niyogiet *al.*, 2009). The secondary impact of land use and land cover changes initiates a cascade of effects on the environment and this works in a loop to further influence land use and land cover changes. Remote sensing and Geographic Information System (GIS) is an information technology that has been used in public policy-making for environmental and forest planning and decision-making over the past two decades (Bassolet *al.*, 2001). GIS and related technologies provide foresters with powerful tools for record keeping, analysis and decision making.

On above context the present study was formulated with following specific objectives:

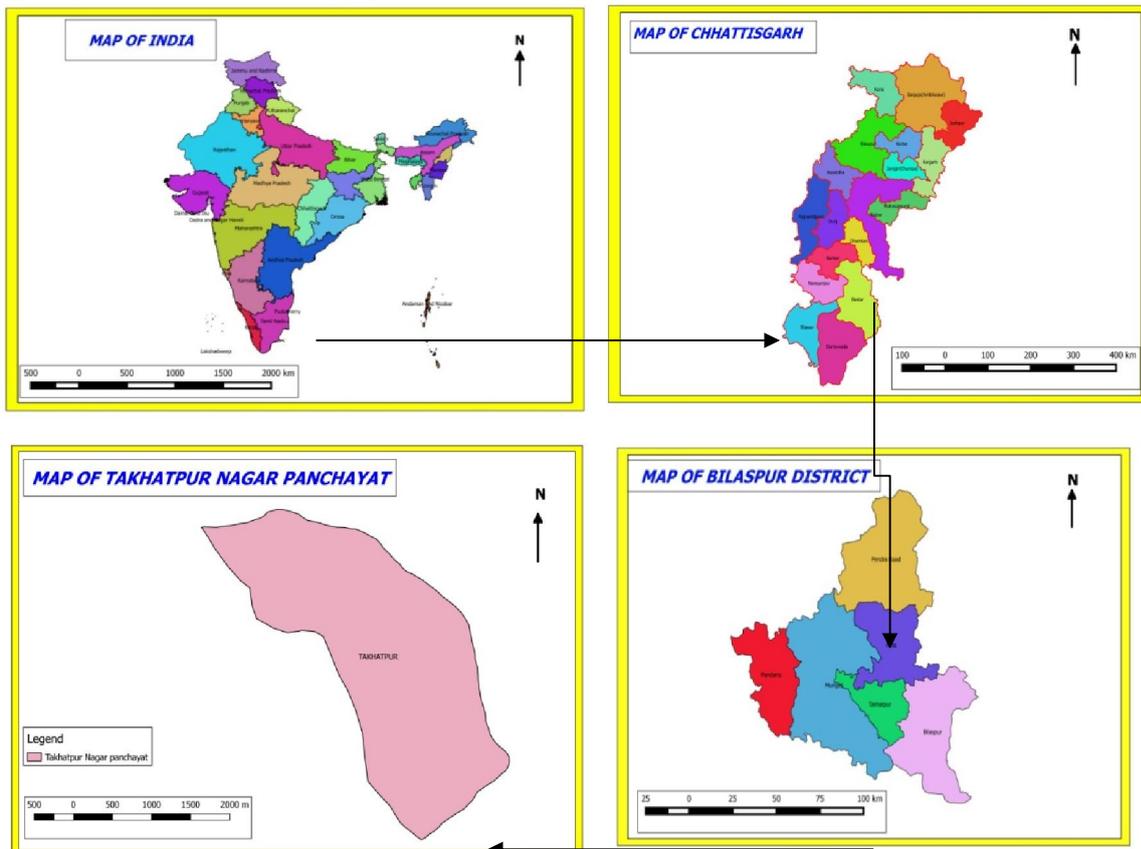
- To analysis of the land use land cover of selected area through the satellite imagery of temporal data of year 2005 and 2015.
- To analysis of temporal changes in selected area between the year 2005 and 2015.
- To determine the urban land use change of selected areaduring 2005 to 2015.

MATERIAL AND METHODS

For the present study Takhatpurnagarpanchayat of Bilaspur district of Chhattisgarh state was selected randomly. The Google earth images and GIS software (QGIS /SAGA) were used for the development of land use and land cover classes and subsequently for change detection analysis of the study area. The following satellite data are used in this analysis.

1. Digital data of Landsat Tm of Path 142 and Row 45 acquired on 2005.
2. Digital data of Landsat Etm+ of Path 142 and Row 45 acquired on 16th February 2015.

One Landsat image and one Google earth image were used for change detection in this study. The Landsat image taken in the study was acquired in 2005 and the Google earth image taken in the study was acquired in 2015. The Landsat images had a spatial resolution of 30 by 30 meters, while the Google earth image had a spatial resolution of 10 by 10 meters. The AOI was sorted from maps through the help of QGIS and SAGA imagines software.



RESULTS AND DISCUSSION

Location map of study area

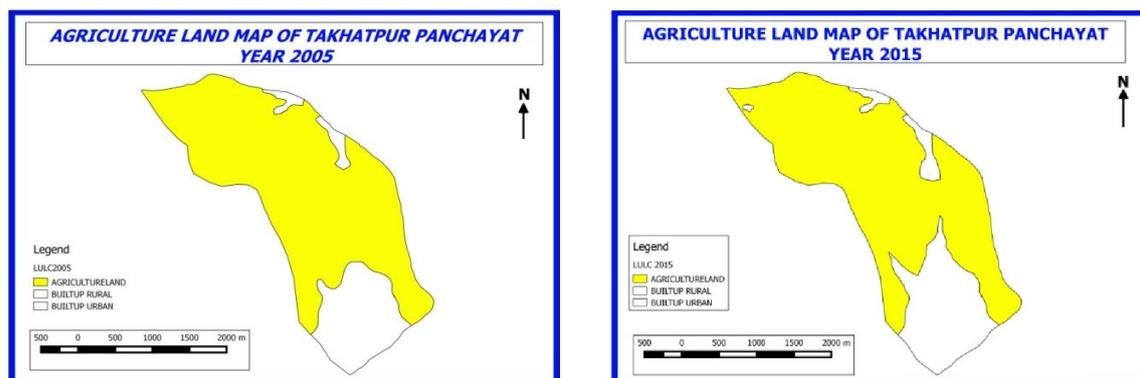


Figure 1: Change detection LULC map of Agricultural land during 2005-15

Table 1: Agricultural land changes of Takhatpur village during 2005-15

Class	2005 (Area in ha.)	2015 (Area in ha.)	Changes (Area in ha.)
Agriculture Land	555.32	527.437	-27.883 hectare

The data illustrated in the Figure 1 and Table 1 indicates that the total agricultural land area of Takhatpur nagar panchayat in year of 2005 was 555.32 hectare and in the year of 2015 the area was 527.437 hectare.

From the above results it was observed that the agricultural land of Takhatpur nagar panchayat was decreased upto 27.883 hectare.

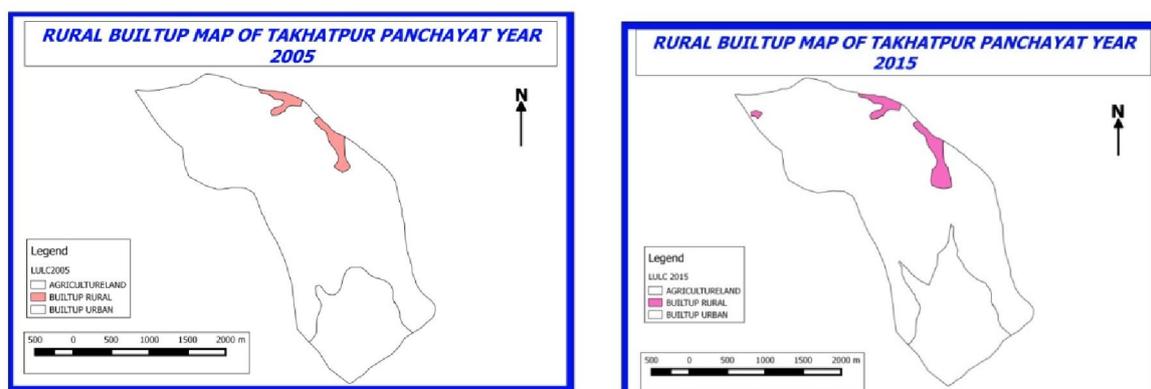


Figure 2: Change detection LULC map of rural built-up area during 2005 - 2015

Table 2: Rural built-up area of Takhatpur nagar panchayat during 2005-2015

Class	2005 (Area in ha.)	2015 (Area in ha.)	Changes (Area in ha.)
Rural built-up Area	18.98	23.263	+4.283 hectare

The data depicted in the Figure 2 and Table 2 related to change in rural built-up area of Takhatpur nagar panchayat during 2005-2015. The data indicate that in the year 2005, the total rural built-up area of Takhatpur nagar panchayat was 18.98 hectare and in the year 2015 total area was 23.263 hectare. On the above result, it was noted that the total 4.283 hectare rural build up area was increased during last 10 years span of time.

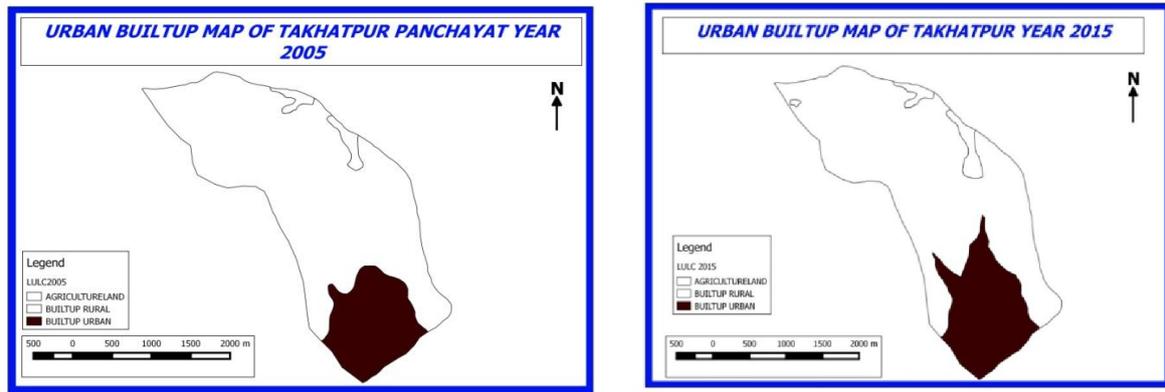


Figure 3: Change detection LULC map of Urban built-up area during 2005-2015

Table 3: Urban built-up Area of Takhatpurnagarpanchayat during 2005-2015

Class	2005 (Area in ha.)	2015 (Area in ha.)	Changes (Area in ha.)
Urban built-up Area	125.10	148.40	+ 23.30 hect

The data demonstrated in the Figure 3 and Table 3 indicates that the total urban built-up area in the year of 2005 was 125.10 hectare and in 2015 was 148.40 hectare. It was notable that the total urban build up area of Takhatpurnagarpanchayat was increased up to 23.30 hectare during last 10 years.

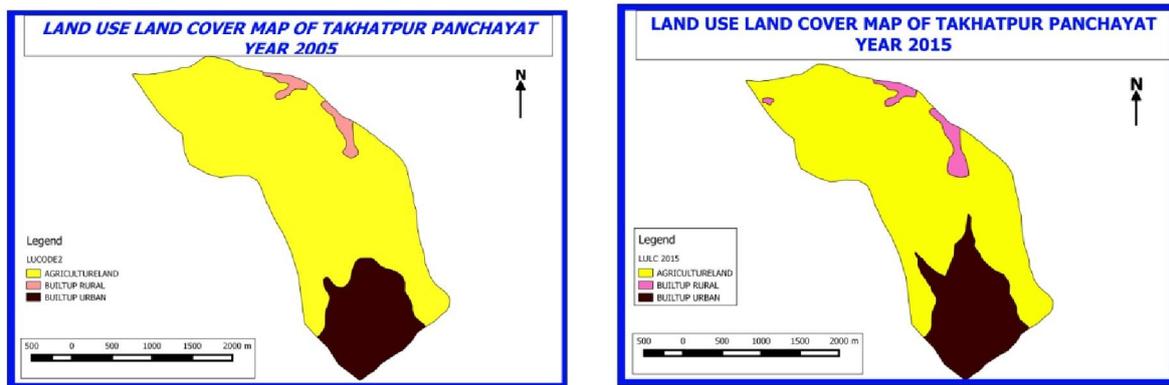


Figure 4: Land Use Land Change classification during 2005-2015

Table 4: Land covers Land Use changes of agriculture, rural and urban built-up area during 2005-2015

S.No.	Class	2005		2015		Change	
		Area in ha.	%	Area in ha.	%	Area in ha.	%
1	Agricultural land	555.32	79.3995	527.437	75.4128	27.883	3.9867
2	Rural built-up Area	18.98	2.7138	23.263	3.3262	4.283	0.6124
3	Urban built-up Area	125.10	17.8868	148.70	21.2611	23.30	3.3743
	Total	699.40	100	699.40	100	55.466	7.9734

The data given in the Figure 4 and Table 4 related to LULC changes of agriculture, rural and urban built-up area during 2005-2015 in the Takhatpurnagarpanchayat, reveal that the agriculture land had decreased up to 3.99 per cent during last 10 years. Whereas, the Rural built up area were increased up 0.61 per cent same as urban built-up area were also increased up to 3.37 per cent during 2005 to 2015.

The rural built up area increased due to construction of new households and other activities. Urban built up area increased in place of agriculture land due to industrialization and human activities. These data show a rapid growth of land use change in Takhatpur nagar panchayat in Takhatpur Block of Bilaspur district, Chhattisgarh.

CONCLUSIONS

The results of the present research work clearly show that LULC changes were observed significant during the period from 2005 to 2015. The study was witnessed that large amount of agricultural land were converted into urban built up area and other development activities. Urban buildup was increased due to rapid industrialization and urbanization. The quantification of LULC changes of Takhatpur area is very useful for environmental management groups, policy makers and for public to better understand the surrounding environment.

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