"URBAN SPRAWL MAPPING AND LANDUSE CHANGE ANALYSING USING REMOTE SENSING AND G.I.S TECHNIQUES''

(Case Study of Dehradun City, Uttrakhand)

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Abstract : This papers examines the use of Remote Sensing and GIS in mapping of urban sprawl (2001&2014) and landuse / landcover change detection by using LANDSAT- 7(ETM) And LANDSAT- 8 (OLI) Satellite imageries of may, 2001 and January, 2014 were used respectively with Ground Resolution of 30 Meter. So as to detect changes that has been taken place in this status between these periods**.**

KEYWORDS

Urbanisation, Remote sensing, Temporal change, GIS, LULC

INTRODUCTION

Globally urban areas are growing at an alarming rate and this era is better known as era of urbanization. The percentage of the global population residing in urban areas has increased from 54% in 2014 .In India also situation is not any more different and the demographic shift has likewise led to an increasing proportion of Indians living in cities. The urban share of the Indian population jumped from 27.81% in 2001 to 31.16% in 2011. This urban population mostly concentrated in class I towns (towns having population more than 1 lakh). As per census 2011, there are 468 class I towns having population of 264.9 million persons, constituting 70% of total urban population.

It is important for an urban planner to monitor the growth patterns of a city over a period of time to understand its dynamics. City growth is an indicator of development and economic growth and generally has a negative impact on the environmental health of a region. The inventory of urban growth pattern does not only provides information regarding changes taken place between two time periods but it also helps in establishing a trend of changes in urban growth over a period of time. This type of the understanding of trends provides a very important tool in the hand of planners as they can manage urban areas in much better way .

Remote sensing technology can play an important role in studying the pattern of urban growth. With multi-temporal analyses, remote sensing gives a unique perspective of how cities have evolved and are the only solution for continuous monitoring of urban areas as it provides a repetitive coverage and synoptic view of the area. (4) Studied urban sprawl of Rajkot, Bhavnagar and Jamnagar employing digital techniques of multidate Landsat MSS data. They found that enhanced false colour composites prepared using linear stretched data are useful to delineate urban built-up land into classification of dense, moderate and sparse categories.
Using remote sensing images, there are various methods to analyze urban growth, most used are the rate of growth of urban area between two time periods and landscape metrics i.e. supervised classification.

Dehradun is a class-I city as per census of India, 2011 and the largest urban agglomeration in entire hill region at the gateway of Garhwal Himalayas. It has emerged as the premier business as well as service centre within the hilly region region after it was designated as intermittent capital of Uttrakhand state. population coupled with growth of urban area makes it mandatory to monitor the urban growth pattern in

The Dehradun urban agglomeration has experienced a high growth rate of population which has become almost double in one decade from 447,808 in 2001 to 714,223 in 2011(Census of India, 2011).

STUDY AREA-2

Study area Dehradun city lies at latitude 30°19′N and longitude 78°20′E.It is one of the most picturesque valley and important town of Uttrakhand state of India .The most striking physical feature of the valley is its natural physical features viz.The Himalayan range of mountainous in the North, the Shiwalik mountain range on the South, river Ganga on the east and river Yamuna on the West. The city is located at an altitude of 696m above sea level

Dehradun is the administrative centre and the interim capital of the state of uttrakhand.Dehradun is situated at the Himalayan foot hills in the fertile Doon velly.It is famous for agriculture products like Basmati rice as well as mango and litchi fruit trees. The valley is well known for its salubrious climate and natural beauty.

A cursory scan on the landscape of Dehradun city shows that the physical growth of city is governed by its topography.There has been growth and development of the city because of the establishment of many national institutes. Consequently the road network has been developed to match the growth in spite of many constrains including terrain condition presence of several plants of interest in and around the city attracted tourists from rest of the country.

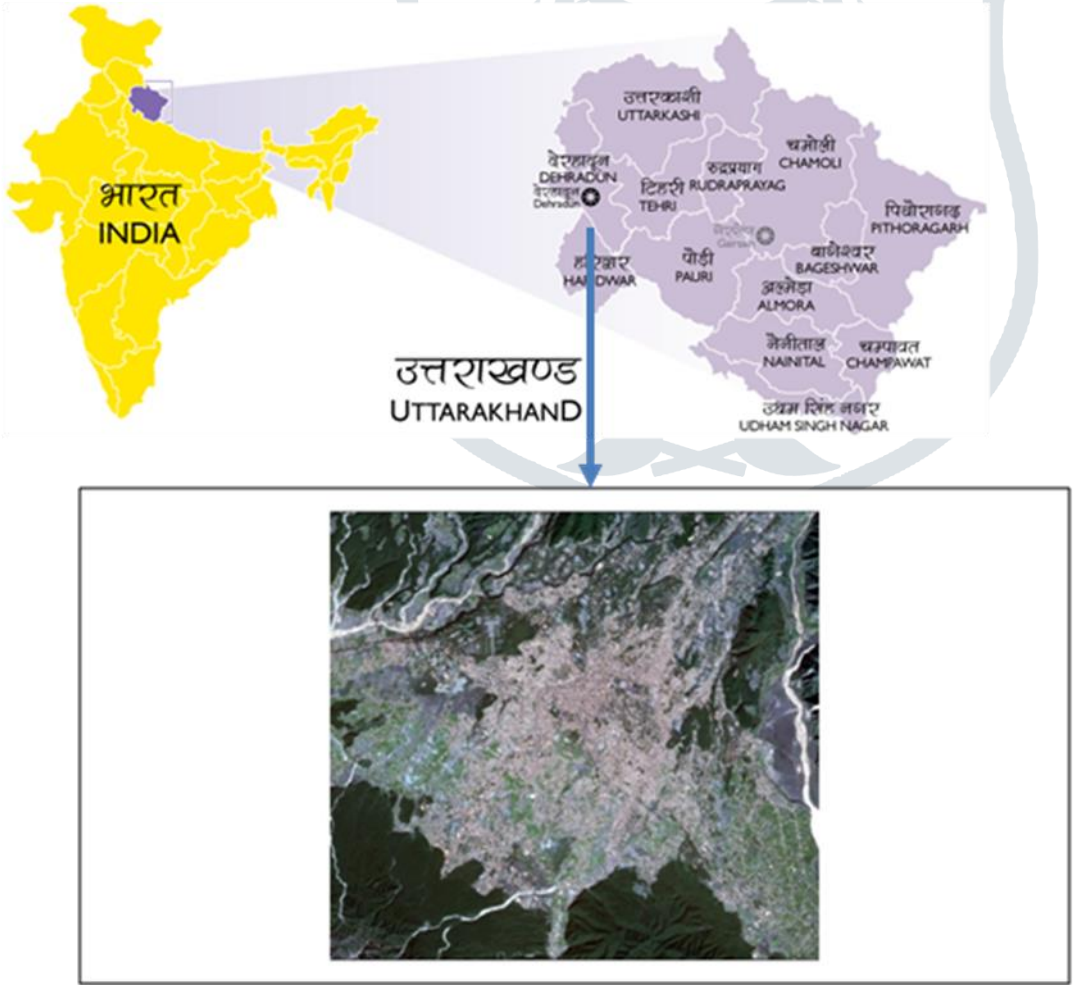


Fig No 1

OBJECTIVES

- The main objective of the study is to identify changes in the urban sprawl of Dehradun city and to determine the spatial pattern and trends of changes over the period of 13 years from 2001 to 2014.
- To create a change detection map of study area, which shows categoriwise changes to urban sprawl.
- To create a change detection map of urban sprawl of Dehradun city.

DATABASE

Based on the objective and content of the study requisite, the LANDSAT-7(ETM+) and LANDSAT-8(OLI) satellite imageries of May, 2001 and January, 2014 were used respectively with Ground Resolution of 30 Meter

SATELLITE	MONTH OF EQUISITION	RESOLUTION
Landsat-7(ETM)	**May ,2001**	**30 meter**
Landsat-8(OLI)	**January,2014**	**30 meter**

Table No 1

METHODOLOGY

The information contained in this study primarily generated using Remote Sensing data. The time series data of tw periods at the interval of 14 years were used to generate the change detection maps of urban sprawl of the study area.

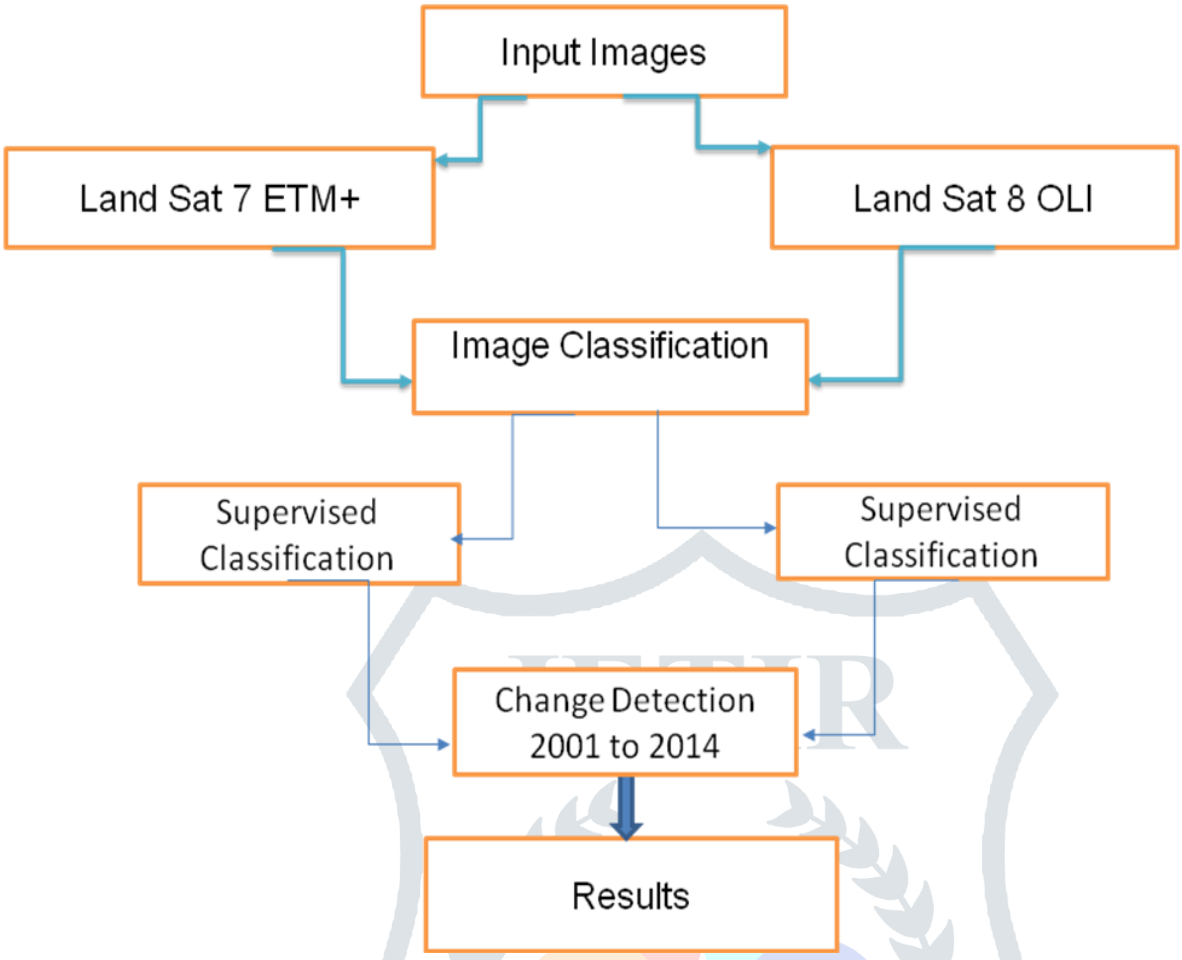
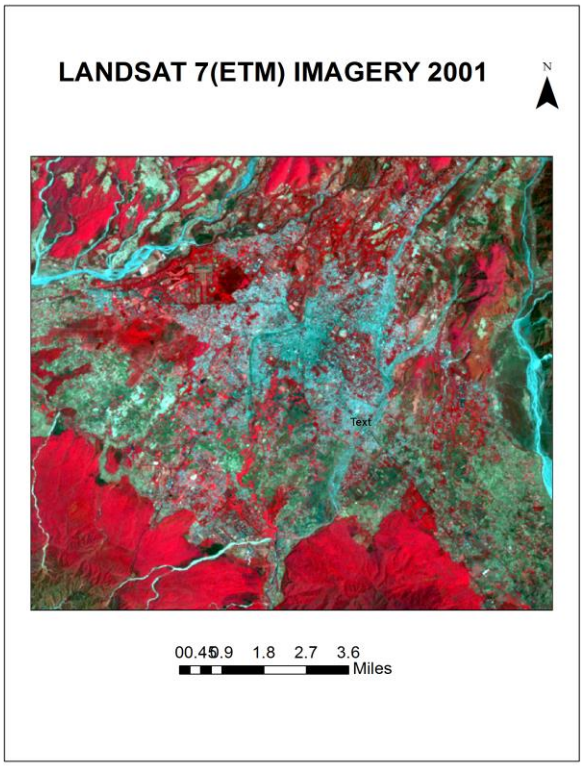

Input Images
Land Sat 7 ETM+
Land Sat 8 OLI
Image Classification
Supervised Classification
Supervised Classification
Change Detection 2001 to 2014
Results

Fig No 2


INPUT IMAGES



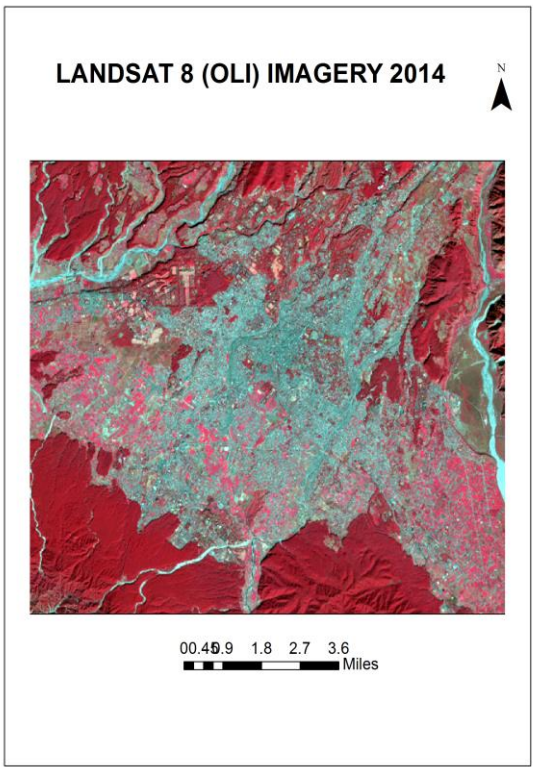


Fig No 3 Fig No 4

IMAGE CLASSIFICATION AND DETECTION

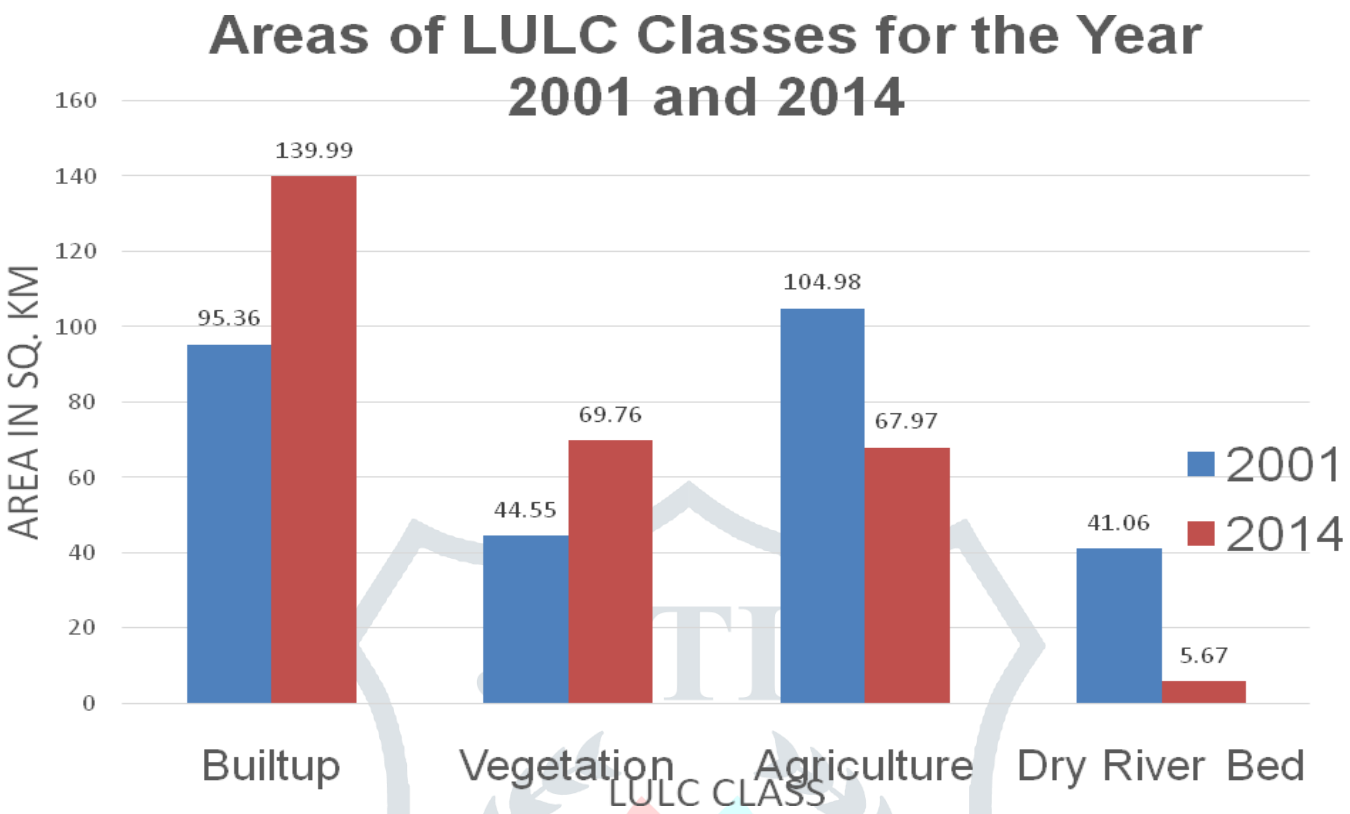
To derive the urban growth pattern in all the time periods, land use/ land cover maps from each georeferenced data set were produced by digital image classification

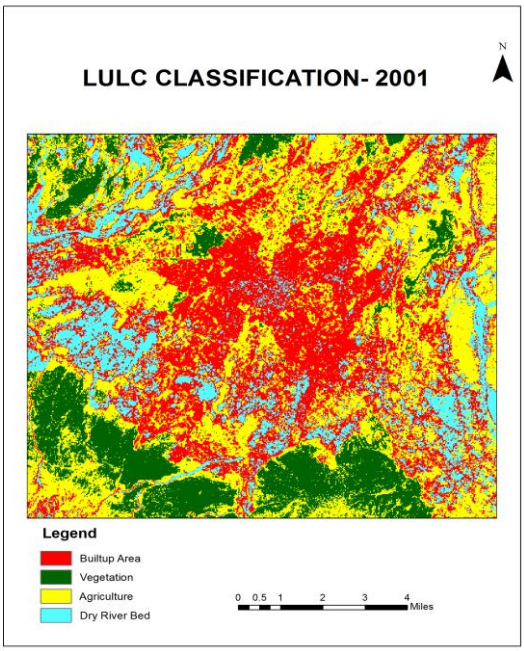
CLASSIFICATION SYSTEM:

Four LULC classes' i.e. built up,vegitation, agriculture, dry river bed were identified as target classes. Urban built up area are those areas which has building structures, has block like appearance and can be identified on false color composite(FCC) as areas of red color with very coarse texture. The vegetation is the area of natural vegetation with dense/open vegetation and can be identified on FCC due to their dark red tone. The agriculture class consists of those areas which are cultivated for growing the crops and identified on FCC as areas of light red or pinkish tone and relatively smooth texture. Dry river bed comprises of areas with surface water impounded in the form of river,

lake or pond, may be perennial or seasonal. These are clearly seen on satellite images (FCC) in light blue to dark blue or cyan color depending on the depth of water.

Supervised classification approach using parametric classification algorithm, Maximum Likelihood classifier was used for classification. All the four data sets were classified with the help of identified training data sets in defined four classes as described earlier.





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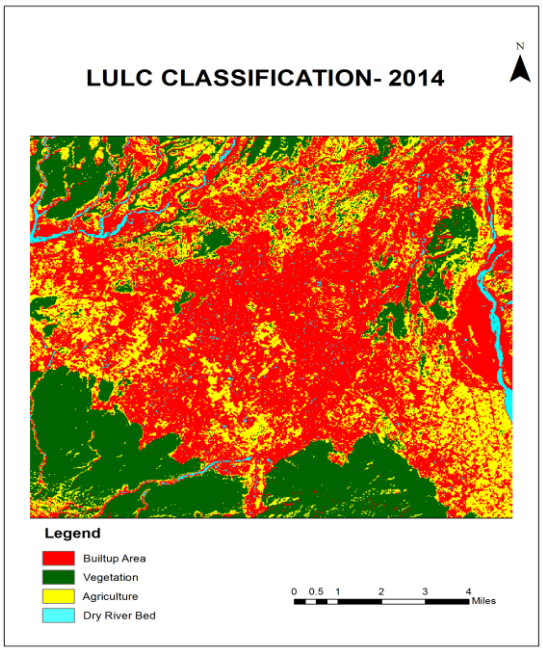


Fig No 7

By early 1980′s a team of different companies surfaced as GIS software sellers as they have successfully combined the CGIS features with their upgraded development into it. By the end of the 20th century, the growth of GIS platform and systems has been rapidly spread that many users are already viewing GIS data using the internet. Right now, there are available customized platforms of GIS that performs many different tasks making mapping applications and geospatial data are already available in the internet.

RESULT

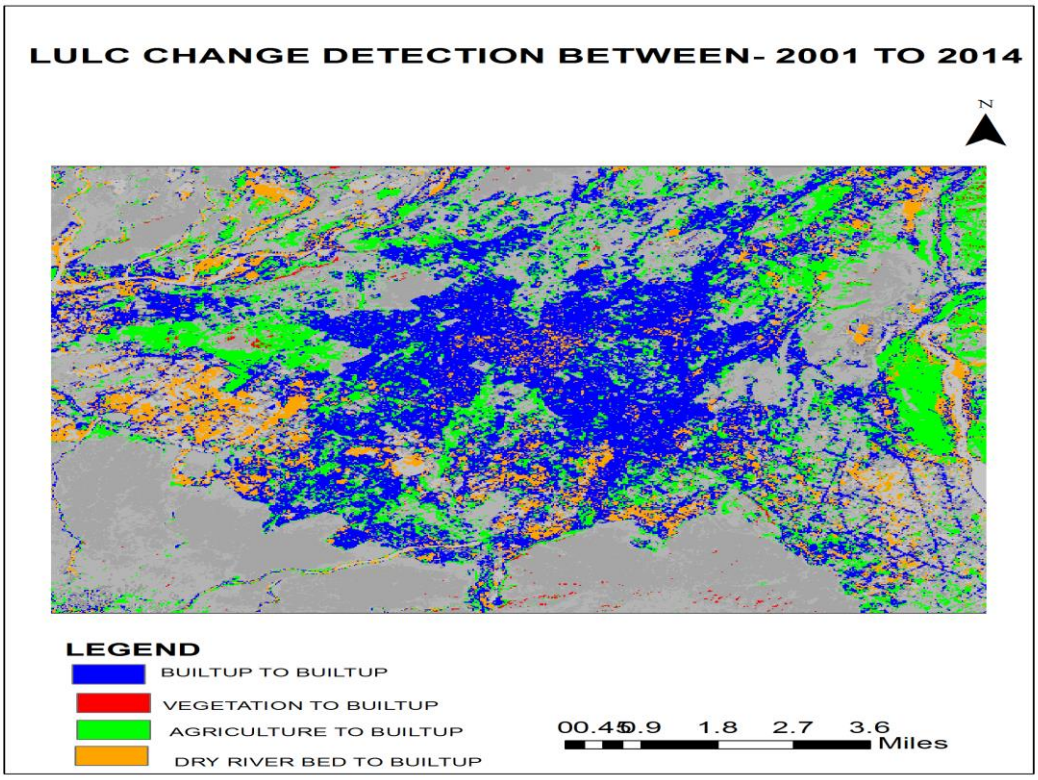
In 2001 the total built up area in Dehradun city was 95.36 /sq km It has
Increased to 139.99/ sq.km in 2014.we can find the major change in agriculture to builtup area that is 41.31 per sq. Km and also change in dry river bed to builtup area that is 23.41 per sq.km .The main reason for increasing builtup area is that Dehradun has become a regional service centre for entire region after becoming the capital of Uttrakhand state . the government's policy has attracted large amout of institutional and commercial activities to come up in Dehradun in last one decade.

This unprecedented growth of urban area has in a chaos ,traffic congestion overcrowding and mass encroachment in river bed can result of flood related disaster in the future. Vegetation to builtup area has increased only 1% this shows that government is conscious about natural vegetation and promoting green belt.

Category wise urban sprawl change in Dehradun city 2001-2014	
Category wise change	**Change in area in pr sq. Km**
Builtup to builtup	**74.28**
Vegetation to builtup	**1.00**
Agriculture to builtup	**41.31**
Dry river bed to builtup	**23.41**

Table No. 2

Percent Change in Area During 2001 to 2014



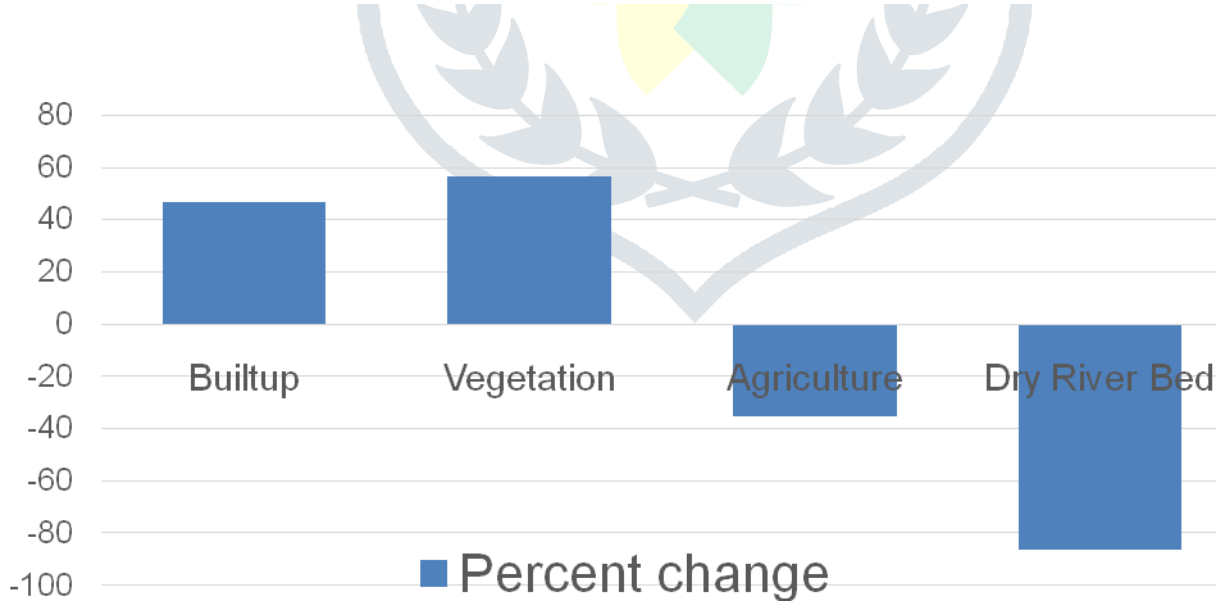


Fig No 9

CONCLUSION

Study highlights the pattern of sprawl of Dehradun city from 2001-2014. Change in landuse is other important issue .Remote sensing and GIS are proving helpful for estimating the direction of urban expansion and its effect on exitining LULC i.e.agriculture, vegetation, dry river bed.

Dehradun urban area is growing at a very high rate and may be in the list of matro cities in near future. The pressure on infrastructure and surrounding had has also increased manifold.

The need of hour is to properly manage and proactively plan the growing urban area and infrastructure for sustainable development. Old buildings can be repaired and green belt should be developed in the city.Use of technologies to ensure that water retention in this area is maintained to the current level . Care should be taken to restore the flow of river and adopt drainage infrastructure and watershed management.

There should be a large role of public for planning and designing the urban land use pattern and other associated activities in order to have a healthy urban environment for the good quality of life.

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