# REWARI TEHSIL LAND USE LAND COVER ANALYSIS FROM 1990 TO 2020 USING RS AND GIS

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**Abstract**
Land is a finite natural resource that cannot be expanded further. Furthermore, as the population grows, so does the strain on this resource. LULC study has been conducted for 40 years to detect the change in LULC of Rewari tehsil from 1990 to 2020. For this purpose, Landsat satellite images are acquired from USGS. The results of study reveal that area under agriculture is contracted and builtup area is expanded over the span of 40 years. Population increase and resultant industrialization, urbanization are some possible reasons.
**Keywords:** Land Cover Analysis, Rewari, Land.

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## Introduction

Land Cover deals with what cover the land surface and the term Land Use describe how the land is used (RS Roy et al., n.d.). Agricultural, commercial, and residential uses of a piece of land are examples of land use, whereas land cover is the type of material present on the ground, including water, plants, soil, and man-made materials such as asphalt are examples of land cover (John R. Jensen, 2005). In particular, human activities such as deforestation, building construction, demolition, and reconstruction of built-up areas such as infrastructure and urbanisation have resulted in alterations in the dynamics of land use and land cover (LULC) (La et al., 2020). In many countries across the world, Land Use and Land Cover (LU/LC) mapping is used to create a baseline inventory of land resources (Nagarajan & Poongothai, 2012). Land Use and Land Cover Mapping is extremely important in the fields of science, research, planning, and management, among other things. The regional land use pattern reveals the nature of the connection between man and the environment, as well as its influence on the fundamental economic activities of society. New technology provides the reliable and accurate results while dealing with LULC of an area.

Remote sensing and GIS have emerged as a critical technique for developing and comprehending the global, physical processes that affect the earth's surface (Hudak & A.Wessman, 1998). In the domains of agriculture (Yeh & Li, 1998), the environment (Fung & Ledrew, 1987), and integrated eco-environmental assessment, remote sensing and geographic information systems (GIS) have a wide range of applications (Hudak & A.Wessman, 1998). Land cover maps for multiple distinct years are required in order to assess changes over time, and the resulting analysis aids the individual administration in understanding the current landscape as well as altering trends over time (Chowdhury et al., 2020). It also aids in the understanding and evaluation of previous management decisions, as well as the prediction of the consequences of current management decisions prior to their implementation (NOAA, 2015). Since the close of the twentieth century, advances in geographic information systems (GIS) and information technologies have contributed to a significant increase in research studies focusing on patterns of urban growth and their implications on human life and natural resources (Terzi & Bolen, 2009). Large archives of satellite data (such as Landsat, Moderate Resolution Imaging Spectroradiometer (MODIS), and the SENTINELs) have been used to develop innovative methodologies and better techniques for the

classification, monitoring, and time-series analysis of land resources, all of which have been aided by this advanced technology (Viana et al., 2019). Thus RS and GIS are the instrument in the hand of researcher to generate fast, accurate, reliable, comparable and useful results.

## Study Area

The Rewari tehsil is located between 76° 18' 19" E to 76° 51' 33" E and 28° 06' 35" N to 28° 25' 46" N. It occupies the area of Southern Haryana and Surrounded by Gurgaon and Mohendragarh from east and west respectively. Rewari tehsil is the home of 110546 male and 96138 females resides in the 269 villages and 7 towns (Government of Haryana, 2021). The study area is dominated by monsoon winds in the month of July and receive some amount of rainfall from western disturbances. The study area is in semi-arid condition suitable for the growth of wheat and bajara. Currently study area is under the immense pressure of anthropogenic, industrial and other land use activities and hence selected for analysis.

Map 1: Map of Study Area
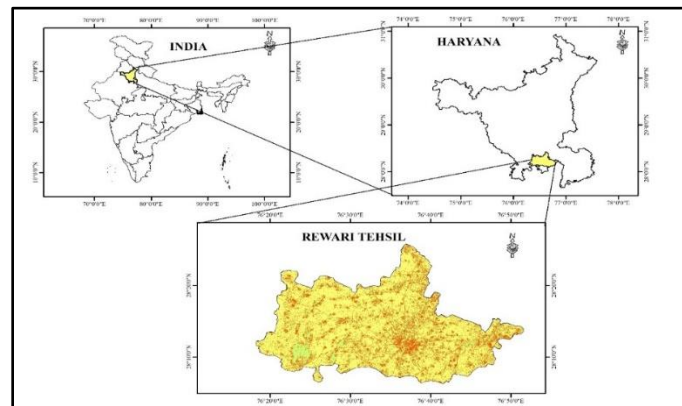


## Methodology

The present study is solely based on the secondary data extracted from the different satellite images. All the operations related with the GIS is completed using ArcGIS 10.8. Satellite images for 1990, 2000, 2010 and 2020 are acquired from the USGS. After making the composite of different bands of image the study area is extracted using the extraction by mask tool. LULC classifications are done using the iso cluster unsupervised classification tool in ArcGIS. Class is assigned to each cluster by closely examine the google earth images and toposheets of the study area. The study area is divided only into 3 classes i.e. Agriculture Land, Buildup area and Vegetation. Based on above procedure LULC maps are produces for four decades of study area. The main objective of current study is to analyse the change in buildup area and its effect on the other land uses.

## Database

1. Landsat images (https://earthexplorer.usgs.gov/)

Table 1: Landsat image details.

|        | Date (yyyy) | Spatial Resolution (m) | Cloud Cover |
|--------|-------------|------------------------|-------------|
| TM     | 1990        | 30                     | 0%          |
| ETM+   | 2000        | 30                     | 0%          |

| TM | 2010 | 30 | 0% |
| OLI | 2020 | 30 | 0% |

2. SOI Toposheets (https://onlinemaps.surveyofindia.gov.in/Digital_Product_Show.aspx)
3. Google Earth Images.

**Results and Discussion:**

Natural resources like land are widely accepted. LU/LC classification is essential to the planning of natural resources [A218]. Rewari district is divided into three tehsils namely Rewari, Bawal and Kosli out of these Rewari is the centre of social, cultural and economic activities. In 1990 area of Rewari is dominated by agriculture which cover around 84 percent of total area and builtup and vegetation covers 12.17 and 4.02 percent of total area respectively. Year of 2000 witness that the study area has 798 $Km^2$,131 $Km^2$, 64 $Km^2$ of agricultural field, builtup area and vegetation respectively. In 2010 only 5 percent of total area is under vegetation while in 2020, 692 $Km^2$ of area is covered by agriculture, 204 $Km^2$ is under builtup area and only 97 $Km^2$ of area is covered by vegetation.

Table 2: Land use and Land cover types from 1990 to 2020.

| Land Use Type | 1990 | | 2000 | | 2010 | | 2020 | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Area in $Km^2$ | Percent Area | Area in $Km^2$ | Percent Area | Area in $Km^2$ | Percent Area | Area in $Km^2$ | Percent Area |
| Agriculture Land | 833 | 83.80 | 798.00 | 80.36 | 782 | 78.75 | 692 | 69.69 |
| Builtup Area | 121 | 12.17 | 131.00 | 13.19 | 158 | 15.91 | 204 | 20.54 |
| Vegetation | 40 | 4.02 | 64.00 | 6.44 | 53 | 5.34 | 97 | 9.77 |
| Total | 994 | 100 | 993.00 | 100 | 993 | 100 | 993 | 100.00 |

Graph 1: Comparison between Land use types from 1990 to 2020.
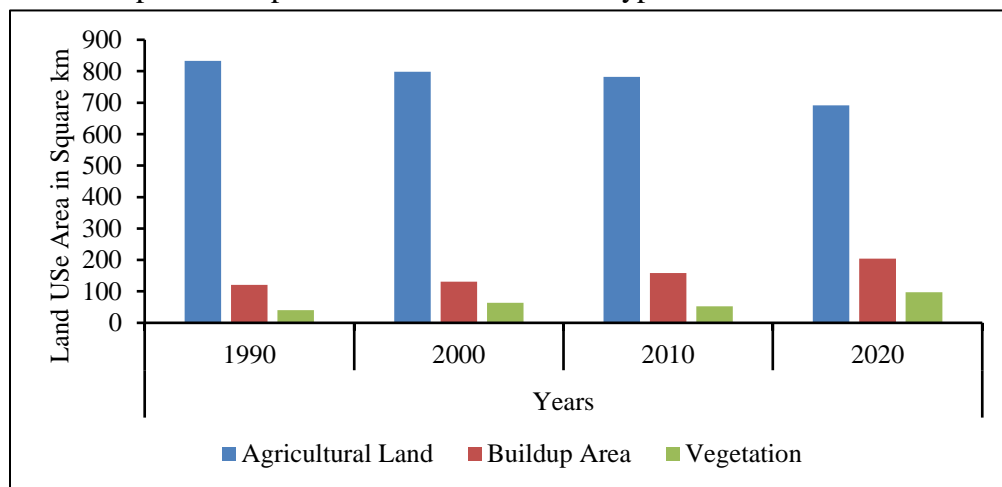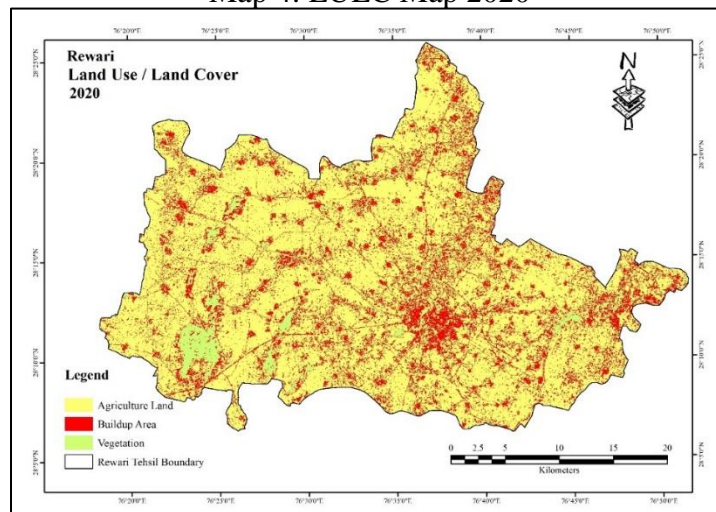
Map 2: LULC Map 1990
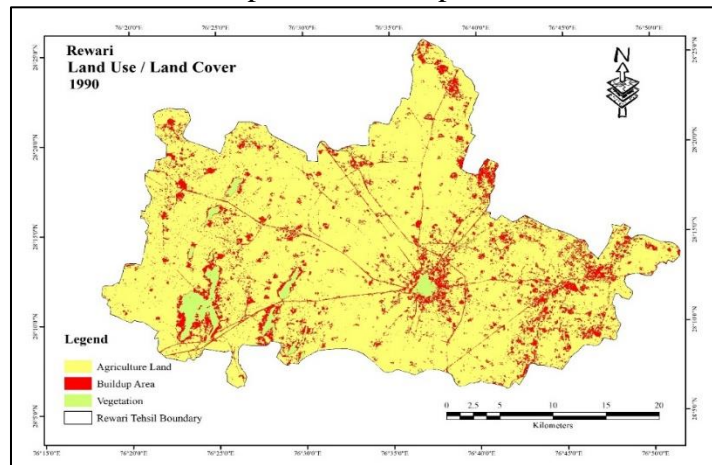


Map 3: LULC Map 2010
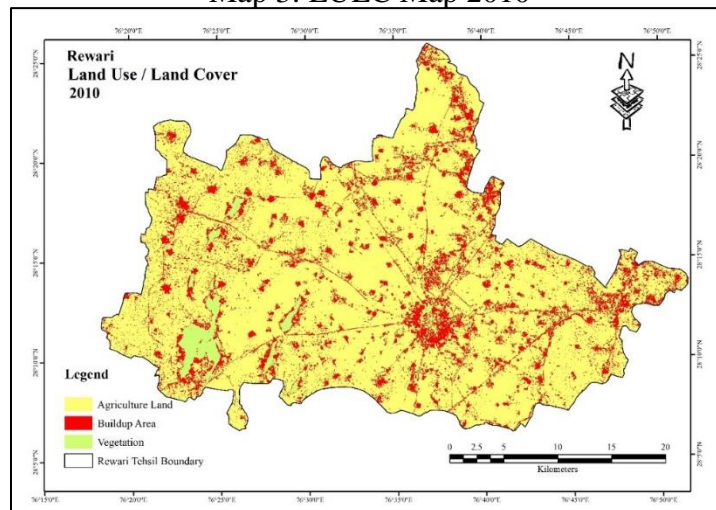


Map 4: LULC Map 2020

**Change in LULC from 1990 to 2020**

In the year of 1990 is 883 $Km^2$ of land is under agriculture and hence the Rewari tehsil is dominated by agricultural activities followed by builtup and vegetation. There is decrease of -3.44 percent in agricultural land use and increase of 1.02 and 2.42 percent of observed in builtup area and vegetation respectively. There is 16 percent reduction in agricultural land from 2000 to 2010. Builtup area is continuously increased from 121 $Km^2$ in 1990 to 204 $Km^2$ in 2020 and the same trend is followed by vegetation cover but at very small scale. Vegetation cover is increased from 40 $Km^2$ in 1990 to 97 $Km^2$ in 2020. The largest increase of 83 $Km^2$ is observed in the builtup area from 1990 to 2020 because of increase in human population and resultant need for infrastructure. The smallest change is observed in vegetation cover and the negative change in observed in agricultural area which is the sign of worry about future food safety and requirements.

Table 3: Change in Land use type.

| Land Use Type | 1990-2000 | | 2000-2010 | | 2010-2020 | |
|---|---|---|---|---|---|---|
| | Area in $Km^2$ | Percent Area | Area in $Km^2$ | Percent Area | Area in $Km^2$ | Percent Area |
| Agriculture Land | -35.00 | -3.44 | -16.00 | -1.61 | -90 | -9.06 |
| Builtup Area | 10.00 | 1.02 | 27.00 | 2.72 | 46 | 4.63 |
| Vegetation | 24.00 | 2.42 | -11.00 | -1.10 | 44 | 4.43 |

Graph 2: Change in Land use types from 1990 to 2020.
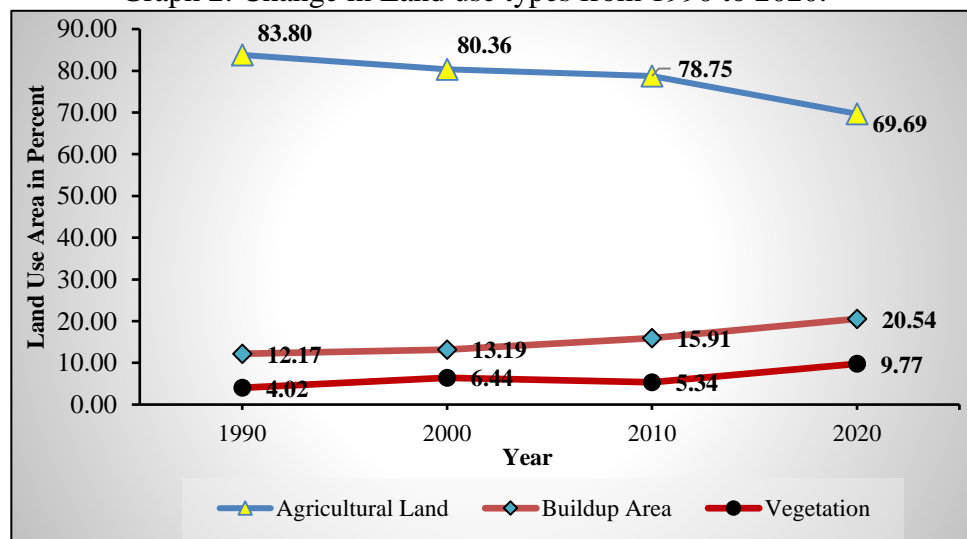


**Conclusion**

Using a combination of multi-spectral, multi-temporal remote sensing image interpretation and GIS spatial analysis, this work shows how Rewari's land use/land cover change dynamics can be statistically depicted over the period from 1990 to 2020. The study reveals that major land use change occurs in the agriculture followed by builtup area i.e. from 121 $Km^2$ in 1990 to 204 $Km^2$ in 2020. Different activities construction of houses, industries, roads and railways for better connectivity, school, hospitals etc. are responsible for this increase in the builtup area. As the builtup area is increased its affect is clear visible on the land under agriculture which is reduce from 833 $Km^2$ in 1990 to 692 $Km^2$ in 2020. This reduction also posses the serious threats to food

security and availability in near future. The results of the research will aid in the formulation of better management strategies for economic and sustainable development by providing decision makers with a better understanding of the growth pattern of distinct Land use classes.

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