

## Geographical Analysis of Land Use Pattern in Hamirpur District of Uttar Pradesh

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### Abstract:

Land use involves the management and modification of natural environment or wilderness into built environment such as settlements and semi-natural habitats such as arable fields, pastures, and managed woods. the purposes and activities through which people interact with land and terrestrial ecosystems and as the total of arrangements, activities, and inputs that people undertake in a certain land type. Land use by humans has a long history, first emerging more than 10,000 years ago. Land use is one of the most important drivers of global environmental change. It is very difficult to study land use on primary data. Because these data are close to impurity, hence it is appropriate to study on secondary data which is accurate, that is why Landsat data has been used in this study paper and ArcMap version 10.8 has been used to analyze it. This is the study year. This paper has been done between 2008 and 2022. Based on the LULC data of 2008 and 2022, predictions for 2023 and further years have been made. After this analysis, it has been found that with the increasing population and climate change. There is a change in the land use pattern, and decrease in agricultural land and an increase in the built-up area.

**Keywords:** LULC, Geographical Feature, land use pattern change, sustainable.

### Introduction:

Geography, as a physical and social science, studies the mutual functional interrelationships between humans and the surface, hence the analysis of human and land relations is important in its study subject. Humans have a central place in geographical studies and it is a functional element which interacts with the land and the earth. Affects the changing patterns of other natural and cultural elements. The word land denotes a land devoid of human beings, but when words like use, use etc. are used along with it, it becomes clear as a land resource, hence it is said that the resourcefulness of the land also changes as a result of human beings and their identification. has been changing (Arvind Yadav, 2003, Land use in Budhanpur tehsil).

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Land can be defined in the three-dimensional form of surface, atmosphere and sea. This broad meaning of land not only expresses surface, water and snow etc. but it also includes the qualities of emotions, fields, mineral resources, water resources, air resources. Contains such as air, solar light, wind, rain, temperature, evaporation etc. (R. C. Tiwari, B. N. Singh, 2016). Land use is the actual and specific use of the land surface within the underlying land use context (Fox, 1956). Land cover reflects the current phenomena on the surface of a particular area, whether natural or man-made. Application of satellite photographs and aerial photographs has simplified the study of land cover and promoted its application. Currently, land use is changing rapidly. Its main factors are increasing climate change, population growth and development of mechanical engineering mentioned above. The impact of factors can also be seen on the study area in which there has been change in land use and land cover. This change can be assessed through land survey, in which remote and GIS are used, through which actual information about land cover and land use is obtained, how much area is occupied by residential land, forest, agriculture, barren land, hilly and There are reservoirs. The need of human beings has changed their cover in which they carry out various types of economic activities.

### **Review of Literature:**

LULC is an analysis is an important measurement of land use dynamics. Remote sensing and GIS effective tools for spatio-temporal analysis of LULC change is an important measurement of land use dynamics. Surrounding area. where the water bodies area and the bare land area are largely dominated by rainfall, while forested areas are controlled by hills. Therefore, the forested area does not go under a big change and its spatial distribution also remained very much same over the time. (alok kumar dubey, 2022). Spatial land use and land cover change is a reflection of the impact of biotic drivers as well as abiotic drivers on the prevalent land use and land cover of the region. The force of the drivers as well as the changes in driver composition leads to changes in the prevalent land use and land cover of a region. Both the terrain and climatic factors also play a major role in influencing the intensity as well as the rate of land use and land cover change (Roy, 2010).

Earlier, when there were no remotely sensed data and the assistance of computers, land use/land cover change was detected with the help of tracing paper and topographic sheet. But then this method was tedious and studying large areas required lot of effort and time. Conventional ground methods of land use mapping are labor intensive, time consuming and are done less frequently. Thus, with the advent of satellite remote sensing techniques, preparing accurate land use land cover maps and monitoring changes at regular intervals of time is relatively simpler. In case of inaccessible region, the only method of obtaining required data is by applying this technique. (Majumdar, 2011)

With the advent of the first remote sensing satellite (Landsat 1) in 1972 many land cover land use study have been undertaken. These studies were conducted in various areas including urban areas, agricultural area, mining area. For example, Singh et al (1997) has done detail study on the impact of coal mining and thermal power industry on land use pattern in and around Singrauli coalfields using Remote Sensing data and GIS. Database for land use was prepared for multispectral, multi-temporal data of years 1975, 1986 and 1991 of Landsat MSS and TM using PAMAP GIS software. The study revealed that areas mining and build up land increased

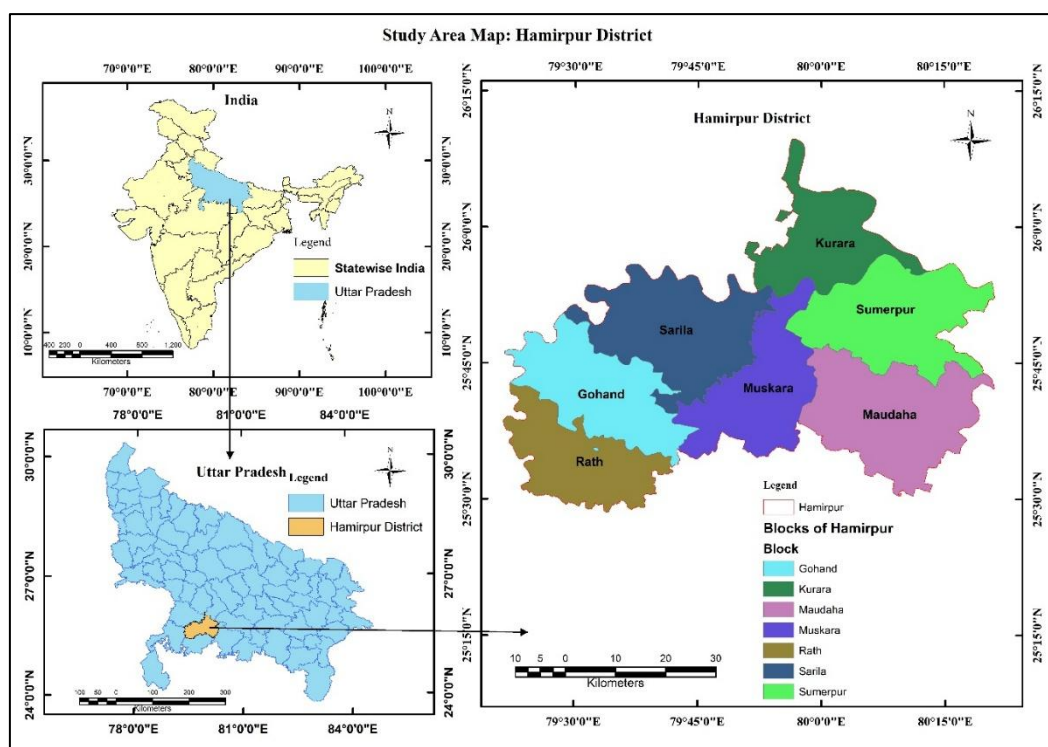
from 1975 to 1991. There was substantial loss in agricultural and forest land which was due to rapid industrialization of the area.

Modeling LULC is the best alternative for predicting future urban trends and growth. These models are crucial tools for sustainable LULC planning and management. If performed spatially explicitly, modeling provides a platform to understand its underlying processes. Over the past several decades, many LULC models have been developed that effectively serve in land management and urban planning. These models are based-on two paradigms commonly used in LULC modeling: the top-down and bottom-up approaches. The top-down approaches rely on the data obtained from satellite imagery, census-based data, and the maps of explanatory variables. These approaches rely on predicting future LULC changes based on historical LULC changes. The drivers, also called explanatory variables, range from bio-physical, institutional, socio-economic, and proximity variables. However, bottom-up approaches to LULC changes are based on actual processes (e.g., household surveys), and are gaining in popularity nowadays (Dr. Srishti Gaur, 2023).

### Study Area:

Hamirpur district is a part of Chitrakoot Dham division of Uttar Pradesh state of India. Hamirpur city is the district headquarters. It includes four tehsils Hamirpur, Maudaha, Rath, Sarila and seven blocks Gohand, Kurara, Maudaha, Muskara, Rath, Sarila, Sumerpur.

**Fig No. 1: Study Area Map**



Source: Prepared By Author Using ArcMap

Hamirpur district is called the gateway to Bundelkhand. The latitudinal extension of Hamirpur district is between 25°27'00" to 25°57'00" North latitude and the longitudinal extension is

between 79°11'00" to 80°19'00" East longitude. Hamirpur is bounded by Jalaun (Orai), Kanpur and Fatehpur districts in the north, Banda in the east, Mahoba in the south and Jhansi and Jalaun districts in the west. The average altitude of the district is 80 meters above sea level. The area of Hamirpur district is 4282 km<sup>2</sup>. According to 2011 census, the population of the district is 1104021. Out of which 5.94 lakh are men and 5.11 lakh are women. 8.94 lakh (2011) population is rural and 2.11 lakh population is urban. According to the 2011 census, 653.29 thousand population is literate, out of which 408.13 thousand males and 245.14 females fall in the literate category, 70.16% is literate and density is the 268 km<sup>2</sup>.

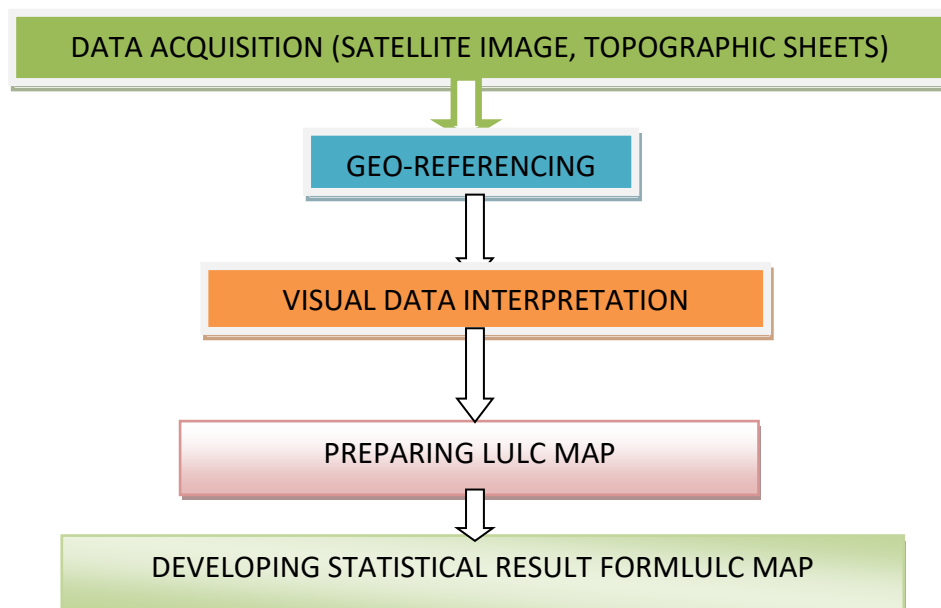
**Objectives:**

1. To study the existing general feature of the study area.
2. To analyze the land use and land cover (LULC) of the study area.
3. To compare the LULC change during 2008 to 2022.

**Methodology:**

This research paper is based on secondary data. Secondary data has been prepared using LANDSAT data. Comparative analysis of the data has been done with the help of various statistical tools. ArcGIS version 10.8.2 has mainly played a role in this work. Before preparing the LULC maps, after accessing the raw data from Survey of India, Study area and LULC map of year 2008 and year 2022 has been created with the help of ARCMAP. Table and graph have been created using MS word-7. Comparison and analysis of LULC area of year 2008 and year 2022 by ARCMAP and MS word. The LULC maps has been classified into five classes which are shown on the bottom right side of the map. World 1984 co-ordinates with the help of ARCGIS, Latitude and longitude along with scale have been depicted in the map using the system. the map has been finalized by supervised classification. The step of research process are given below on the flow chart fig No.2.

**Fig No. 2: Flow chart of the methodology**

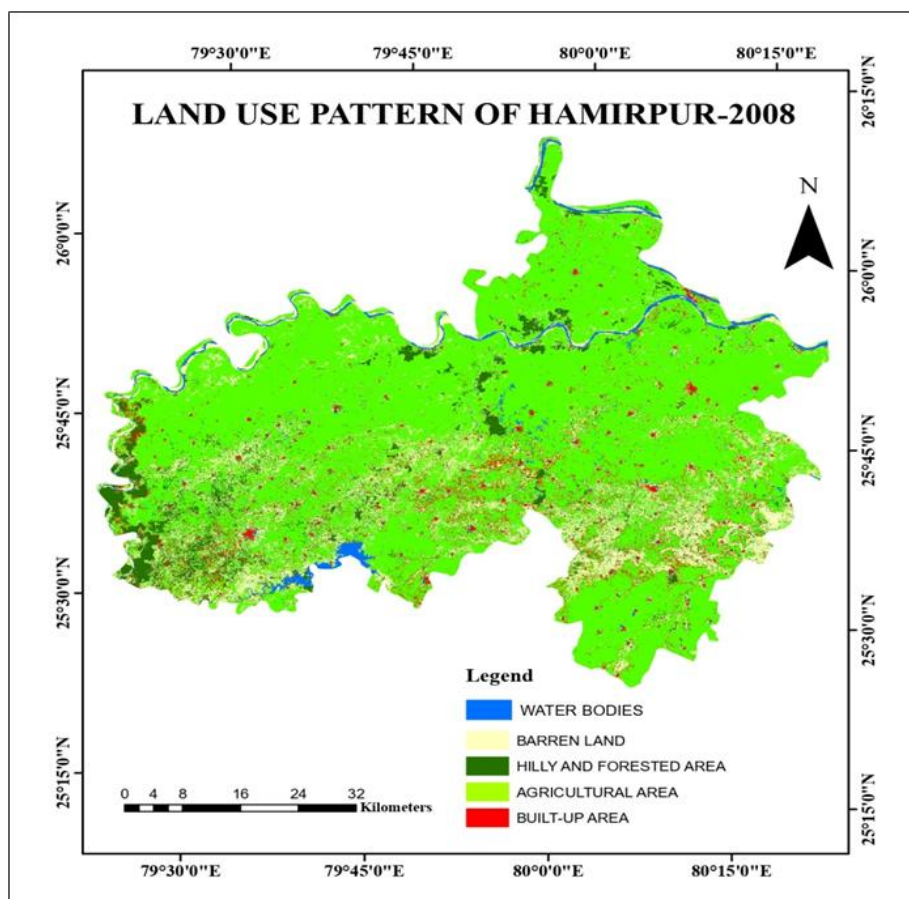


## Result and Discussion:

### Water Bodies:

In the year 2008, the water bodies covered 99.909 km<sup>2</sup> (2.344%) of the total land area (4260 km<sup>2</sup>). And in the year 2022, the water bodies left is 58.154 km<sup>2</sup> (1.364%). If the data of both the years is comparatively analyzed, there has been a loss of 41.755 km<sup>2</sup> area. This change has happened due to climate change and over-exploitation by humans. Due to excessive mining the water level in the rivers has gone down and at the same time many canals have been constructed for irrigation, due to which the water level is continuously decreasing. If such human activities continue in the future, there is a possibility of further depletion of the water bodies. In the year 2022, the total water area is 58.54 km<sup>2</sup> mainly covered by major rivers (Yamuna, Betwa, Ken, Dhasan, Verma and canals and ponds). Conservation of water bodies is very important because the study area belongs to Bundelkhand region which is a plateau region, with its conservation a sustainable policy can be made and water supply can be completed in Hamirpur district.

**Fig. No. 3: LULC Map 2008**



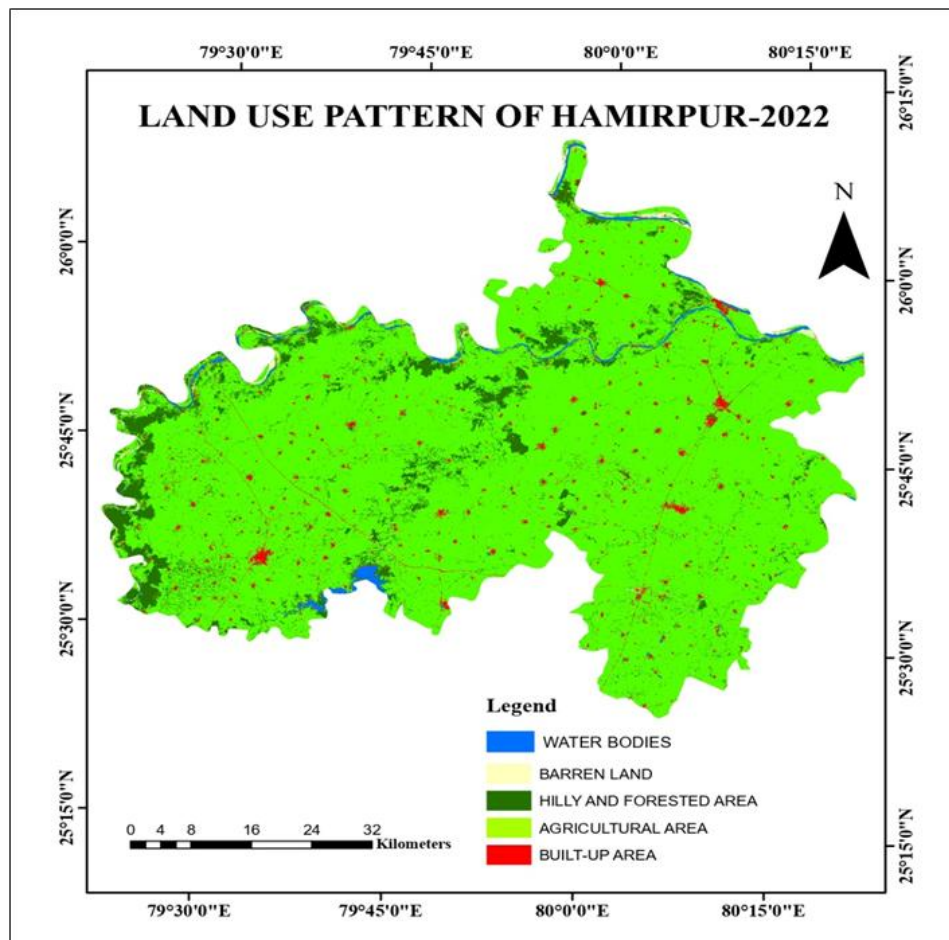
**Source:** Prepared by Author using USGS, Landsat Data.

### Barren Land:

In the year 2008, the water bodies covered 99.909 km<sup>2</sup> (2.344%) of the total land area (4260 km<sup>2</sup>). And in the year 2022, the water bodies left is 58.154 km<sup>2</sup> (1.364%). If the data of both

the years is comparatively analyzed, there has been a loss of 41.755 km<sup>2</sup> area. This change has happened due to climate change and over-exploitation by humans. Due to excessive mining the water level in the rivers has gone down and at the same time many canals have been constructed for irrigation, due to which the water level is continuously decreasing. If such human activities continue in the future, there is a possibility of further depletion of the water bodies. In the year 2022, the total water area is 58.54 km<sup>2</sup> mainly covered by major rivers (Yamuna, Betwa, Ken, Dhasan, Verma and canals and ponds). Conservation of water bodies is very important because the study area belongs to Bundelkhand region which is a plateau region, with its conservation a sustainable policy can be made and water supply can be completed in Hamirpur district.

**Fig. No. 4: LULC Map 2022**



**Source:** Prepared by Author using USGS, Landsat Data.

### Hill and Forrest Area:

According to the 1952 policy of the Forest Department of the Government of India, an area should have forest land on 33% of its total area. The study area has hilly and forest land on an area of 285.576 m<sup>2</sup> (6.502%) in the year 2008 which when compared with the Forest Department Policy 1952 of Government of India shows that very less area is covered by hilly and forest land. In the supervised classification map prepared with the help of ArcMap, there is 344.779 km<sup>2</sup> (8.202 percent) of hill and forest land in the study area in the year 2022. Here

too, it is less as per the National Forest Policy. With the increase of 59.203 km<sup>2</sup> area from 2008 to 344.779 km<sup>2</sup> area in 2022, this change is very important for the environment. The main reason for this increase is the change in forest land through the planning done in the Forest Policy. There has been a lot of improvement in the forest area due to the increase in the forest area. There is full possibility of increase in this area in the future also. Another major reason is the conservation of the forest area. At present, there is less exploitation of forests in the study area and more plantation. Due to large area of forest area and gully erosion, rugged areas can be seen and small hills can also be seen. In the year 2022, Peepal Bilayati, Acacia, Karonda, Karil and various types of thorny bushes are found in the study area. In the year 2022, special attention is being given to sustainable environmental development by reducing human activities along with improvement in hill and forested areas.

Table No. 01

<b>LULC Table 2008 (Total Area 4260 Km<sup>2</sup>)</b>			
Sr. No.	Legends	Area (km <sup>2</sup> )	Area (Percentage)
1	Water Bodies	99.909	1.344
2	Barren Land	421.026	9.881
3	Hilly and Forested Area	285.576	6.702
4	Agricultural Land	3370.855	79.117
5	Built-Up Area	83.193	1.952

**Agricultural Area:**

Agricultural land area, Various types of human activities take place in agricultural land in which priority is given to agricultural work. In the year 2008, the total area of agricultural land is 3370.855 km<sup>2</sup> (79.117 percent). In the year 2008, most of the land was used in agricultural work. This area has increased to 3737.601 km<sup>2</sup> (87.724%) in the year 2022. There has been an increase of 366.746 km<sup>2</sup> (area) in the last 14 years. This increase is due to the conversion of barren land into agricultural land. Due to the development of irrigation means, there has been a change in the agricultural pattern. In the year 2008, due to lack of development of irrigation means in the agriculture sector, agriculture work was done on less area. After the year 2008, there has also been a change in the agricultural pattern and crop combination. Before the year 2008, agriculture was based on rain, now this agriculture is irrigated by developing the means of tube wells and canals in which Rabi decisions play a major role. Year 2022 All three crops (Rabi, Kharif and Zaid are grown) in which wheat, gram, rice (very less), pulses, pigeon pea, maize, sorghum and oilseeds are mainly produced. Despite lack of rainfall and water resources in Bundelkhand state, many resources have now been developed and agricultural land is being improved so that food grains can be supplied in future. Hunger can be reduced and the focus is on sustainable development.

Table No. 02

LULC table 2022 (Total Area 4260 km <sup>2</sup> )			
Sr.no.	Legends	Area (km <sup>2</sup> )	Area (percentage)
1	Water Bodies	58.154	1.364
2	Barren Land	21.461	0.503
3	Hilly And Forested Area	344.779	8.092
4	Agricultural Land	3737.601	97.724
5	Built-Up Area	98.613	2.314

### Built-up area:

Roads and human habitation are included in the built-up area, where people make changes in the natural environment for their own benefit, that is also included in these legends. In the year 2008, this area was covered in 83.113 km<sup>2</sup> (1.952 percent) land. In the last one and a half decade, this land has changed to 98.613 km<sup>2</sup> (22.314 percent) in the year 2022. Due to population growth, this area has increased by 15.42 km<sup>2</sup> area. In which humans perform various types of activities. The barren land has been converted into built up area after the year 2008 because no human activity was carried out in the barren land. This will change with population growth but it will indicate a negative sign from the point of view of change because due to increase in built up area there can be full possibility of decline in agricultural land and hill and forested area. Built up area and agricultural land and hill and forested area. It has an inverse relationship with area. If there is a sudden increase in the built-up area then there is a possibility of reduction in the agricultural area which will give rise to various types of environmental problems, hence there is a need to make proper policy and equitable planning for development which can promote sustainable development. People living in built up areas play an important role in sustainable development.

### Conclusion:

Land use and land cover are important aspects for the study of a particular area. Through this, negative and positive changes in the study can be easily analyzed and displayed. The biggest change in the study area has happened in barren land, barren land, hilly and forest land and agricultural land have been transformed. Time Period: Studies of the last decade and a half have shown that good planning can bring positive changes. In this study, apart from agriculture and forest land, there has been an increase in built up area. In this study, it has been found that there has been a decrease in aquatic area and barren land. Reduction in barren land is a good sign for the environment, but decrease in aquatic area gives a negative signal for sustainable development, therefore, good planning should be done to improve the aquatic area. Need to increase. The biggest negative aspect of this study is that proper planning has not been done

for water conservation. There is a high possibility of water bodies decreasing in the future. There is a need to focus on sustainable development by conserving water.

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