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SPATIAL ANALYSIS OF LAND USE CHANGE AND ITS IMPLICATIONS FOR SUSTAINABLE DEVELOPMENT IN HARYANA, INDIA

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ABSTRACT

This theoretical is a consolidated synopsis of a more top to bottom review that was done to research the geological examples of land use change in the Indian province of Haryana, as well as to assess the ramifications these examples have for the possibility of sustainable development. Because of the huge urbanization and industrialization that has occurred in Haryana throughout recent many years, the state's examples of land use have been essentially changed. Haryana is perhaps of the most monetarily wealthy state in India. The motivation behind this study is to plan and inspect the changing examples of land use over a particular timeframe by utilizing a mix of remote detecting, procedures from Geographic Data Frameworks (GIS), and financial information. The study uncovers major changes in land use, such as the conversion of agricultural land into urban and industrial regions, along with a simultaneous loss in natural and rural landscapes. These changes are characterised by the conversion of agricultural land into urban and industrial sectors. The long-term viability of development in the state is called into question as a result of these developments. The implications of the proposed land use changes were evaluated through the use of a multi-disciplinary technique that took into account both ecological and economic factors. The results of this study shed light on the intricate relationship that exists between alterations to land use and the promotion of sustainable development in Haryana. They stress the importance of having well-informed and well-balanced land use regulations that put an emphasis on the protection of agricultural land, green spaces, and natural resources while also encouraging expansion in urban and industrial areas. In addition, the research highlights the significance of incorporating sustainability concepts into urban and regional planning as a means of mitigating unfavourable effects and ensuring the harmonious cohabitation of economic growth and environmental preservation.

KEYWORDS: *Land Use Change, Spatial Analysis, Sustainable Development, Haryana, India, Urbanization*

1. INTRODUCTION

In this time of motorization, the capacity to change the land's use and cover is very huge for both the climate and the points of development. The expression "land use" alludes to areas of land that are used for social pursuits, while "land cover" portrays areas of land that are involved by regular elements. Humans, the planet's expert exterminators, alter the planet's land use and land cover on a regular basis. Since the dawn of time, humans have altered their environment in pursuit of affluence and long-term survival. This has taken the form of industrialization, urban planning, the establishment of towns, and the advancement of horticulture. Remote sensing data collected over time and space allows researchers to zero in on shifting patterns of land use and land cover. Alterations in land use and land cover are reflected in the form, location, and quantity of built landscapes. When it comes to analysing land usage and land cover, geospatial application is the most useful tool.There has been a lot of research done on a global scale to monitor the shift in land use and land cover. Recognising and adapting to change requires a deep understanding of the interplay between human activities, natural resources, and the climate. Throughout the nineteenth century, traditional methods were used to track shifts in land usage and land cover. However, remote sensing and developments in geospatial technology have made monitoring land use/land cover change more cost-effective, efficient, reliable, and state-of-the-art. Satellite images provide valuable insight into land use and land cover changes due to the time-varying geospatial information they include. Since 1990, land use and land cover planning have been subject to a variety of methodologies and strategies. Recent research has shown that land usage and land cover are rapidly shifting around the world.

Several studies have been conducted to identify land use and land cover change in Haryana, and similar studies have been conducted in other parts of India and other non-industrial countries the land cover of the Fatehabad area of Haryana was mapped using geospatial techniques. Land use and land cover change in the Faridabad area were studied between 2002 and 2020, revealing a decline in the agricultural region but an increase in metropolitan land usage.In today's era of rapid progress, anthropogenic activities, especially urbanisation, population growth, and industry, are the primary causes of asymmetrical features in the natural environment. There are positive and negative aspects to the current state of the LULC. The positive view of change holds that once unusable land is being transformed into

usable land using modern techniques, while the negative view holds that useful land is deteriorating. Small-scale growth and organic transitions are best understood via the lens of LC change analysis. Numerous studies focusing on land use and land cover change have been conducted so far using a wide range of research techniques and satellite data. Another study looked into the use of remote detection technology to track shifts in land use and land cover for the sake of long-term sustainability. This study found that the more populous Dhaka region of Bangladesh has been experiencing a steady increase in its built area at the expense of water bodies, vegetative cover, wetland, and trimmed land. Rapid urbanisation in the area has contributed to this fragmentation. Planning land use and land cover has proven effective in this approach in making decisions about the sustainable development of metropolitan regions.

Human-caused shifts in land use and land cover have emerged as a major concern in central Haryana over the course of the past few decades. Land use and land cover change in the Focal Haryana region have been identified from a regional and global perspective. This was completed while keeping these factors in mind. The primary objective of this study is to determine how the Focal Haryana district's long-term sustainable development will be affected by the shift in land use and land cover that will occur between 1975 and 2020, both before and after the occurrence of significant rainfall. The year 1975 has been selected as the baseline for the impact of change evaluation. Data from Landsat 2, 3, 5, 7, and 8 were used to guide the LULC change study. Changes in land use and land cover are examined in light of their effect on the region's potential for sustainable development, and this assessment zeroes in on the topical shift that has occurred in Focal Haryana as a result.

2. LITERATURE REVIEW

According to Paul and Das Gupta (2013) the process by which an existing town or city experiences an increased concentration of its resident population is referred to as urban expansion. It begins in a somewhat contained area and then quickly expands out in a number of different directions. The pattern of growth varies from one urban place to another, and in order to carry out suitable urban planning, it is required to understand such phenomena.Singh and AL Singh, (2012) the amazing and lightning-fast expansion and development of metropolitan areas has been something that planners all over the world have been concerned about. India is going through a period of tremendous urbanisation and industrialization, both

of which are having an effect on the country's landscape, particularly in the form of land conversion. There are a number of factors that contribute to urbanisation, including population growth, economic development, migration, and advances in infrastructure. These variables bring about the change of country regions into towns, towns into urban communities, and urban areas into cities (Singh et al., 2008). Sangwan et al. (2012) theunsystematic and random development of urban communities is a consequence of quick urbanization welcomed on by the ascent of industry. The strain applied by a quick rising metropolitan populace in the city has an immediate effect (both positive and negative) on the provincial region that is promptly encompassing the city. The development of metropolitan regions prompts various issues, including messy ghettos, a climate filled with illness, a decrease in how much land created for private, modern, and business purposes, which causes traffic bottlenecks, and numerous different issues.

Singh and Kumar, (2012)Directing an examination of the spatial and global changes in land use and land cover around there is one of the viable strategies to deal with comprehending the on-going ecological status of a place and the changes that are occurring. The main supporter of adjustments in land use and transformations of land is urbanization. It adjusts the landscape in manners that are difficult to predict and have an impact that is enduring.J. Kumar and others (2012) The time period that will be analysed is from 1983 to 2010. The flow research used both essential and auxiliary wellsprings of data to arrange its discoveries. Essential wellsprings of information incorporate ground truth and photos taken in the field, while optional wellsprings of information incorporate aide maps, geological sheets, and high goal satellite symbolisms. Changes in land use and land cover in the study area were identified with the help of these supplementary data sources.

In Rahman, A., Kumar, S., Fazal, S., and Siddiqui, M. A. (2012) distributed their discoveries. To accomplish the objectives of sustainable development, sustainable urbanization should begin with quantitative information on metropolitan landscape. Faridabad, which is a constituent locale of the Public Capital District, doesn't get a lot of review consideration notwithstanding having the quickest development of metropolitan region and unfortunate air quality. Current analysis, based on publicly available multi-transient satellite symbolism, has shown a 3% increase in the developed region and a 2% decline in arable land between 2008 and 2018. The high spray fixation has been caused to a limited extent by the direct development of private built up, modern, and business regions along parkways, streets, and

rail lines, notwithstanding the commitment of vehicle outflow. Then again, a high spray stacking has likewise been accounted for in the farming locale, which can be credited to the broad utilization of compost and the copying of stubble. The formulation of a metropolitan plan for environmental change transformation and relief approaches may be significantly advanced by on-going research on changes in land use and land cover and the effects of those changes on air quality.The research conducted by Sharma, M., Sharma, M., and Kumar, S. (2013) came to the conclusion that the most significant shifts in land use have occurred in urban constructed and crop/vegetation land.The built up area has increased mostly on agricultural and woodland land, with some of the expansion taking place on unoccupied and uncultivated ground. Kiesecker et al., Baruch-Mordo et al., Heiner et al., Negandhi et al., Oakleaf et al., Kennedy et al., and Chauhan et al(2013) . In this study, satellite data were utilised to analyse different types of land use changes. The software known as Eradas has been used to carry out supervised classification. For the purpose of geo-referencing the M.C. map of the research region during various time periods, the topographic sheet numbers H43Q16, H43R4, H43W13, and H43X1 each have a scale of 1:50,000. According to the findings of a study, the built-up area has expanded from 432.71 hectares to 1561.62 hectares over the past 21 years, which is nearly equivalent to a fourfold growth between 1989 and 2011. On the other hand, the area devoted to agriculture and vegetation has fallen from 2181.93 hectares to 1143.90 hectares during this time period.

Khanna, P., Babu, P. R., and George, M. S. (2019) to find middle ground between optimal production utilisation levels via the misuse of strong limit within its regenerative potential and ecological quality within the assimilative limit of the territorial biological system, the proposed planning process expressly includes communication between the local community, specialists, and leaders. These compromises are fundamental to show up at the ideal degree of creation and utilization for the locale. This compromises lead to underlying movements that are significant for adjusting contradicting requests in the general course of financial development through proper mechanical, administrative, and hierarchical mediations. These underlying movements are achieved because of sufficient innovative, administrative, and authoritative intercessions.

3. RESEARCH METHODOLOGY

Both essential and auxiliary wellsprings of data were used to incorporate the discoveries of this review. Pre- and post-storm Landsat series (MSS to OLI) data were used to determine the new location of the LULC in 1975, 1979–1980, 2000–2010, and 2019–2020 (see Table 1). The US Land Review's Earth Pioneer was used to download these satellite photographs.

Table 1:sequence of Landsat metadata

Series Number	Satellite and Sensor	Year	Path/Row and Swath [km]	Resolution
1	Landsat 2 (MSS)	1975	158/40 and 185	60
2	Landsat 3 (MSS)	1979–1980	158/40 and 185	30
3	Landsat 5 (TM)	1989–1990	147/40 and 185	30
4	Landsat 7 (ETM+)	2000–2010	147/40 and 185	30, 15_Pan
5	Landsat 8 (OLI)	2019–2020	147/40 and 185	30, 15_Pan

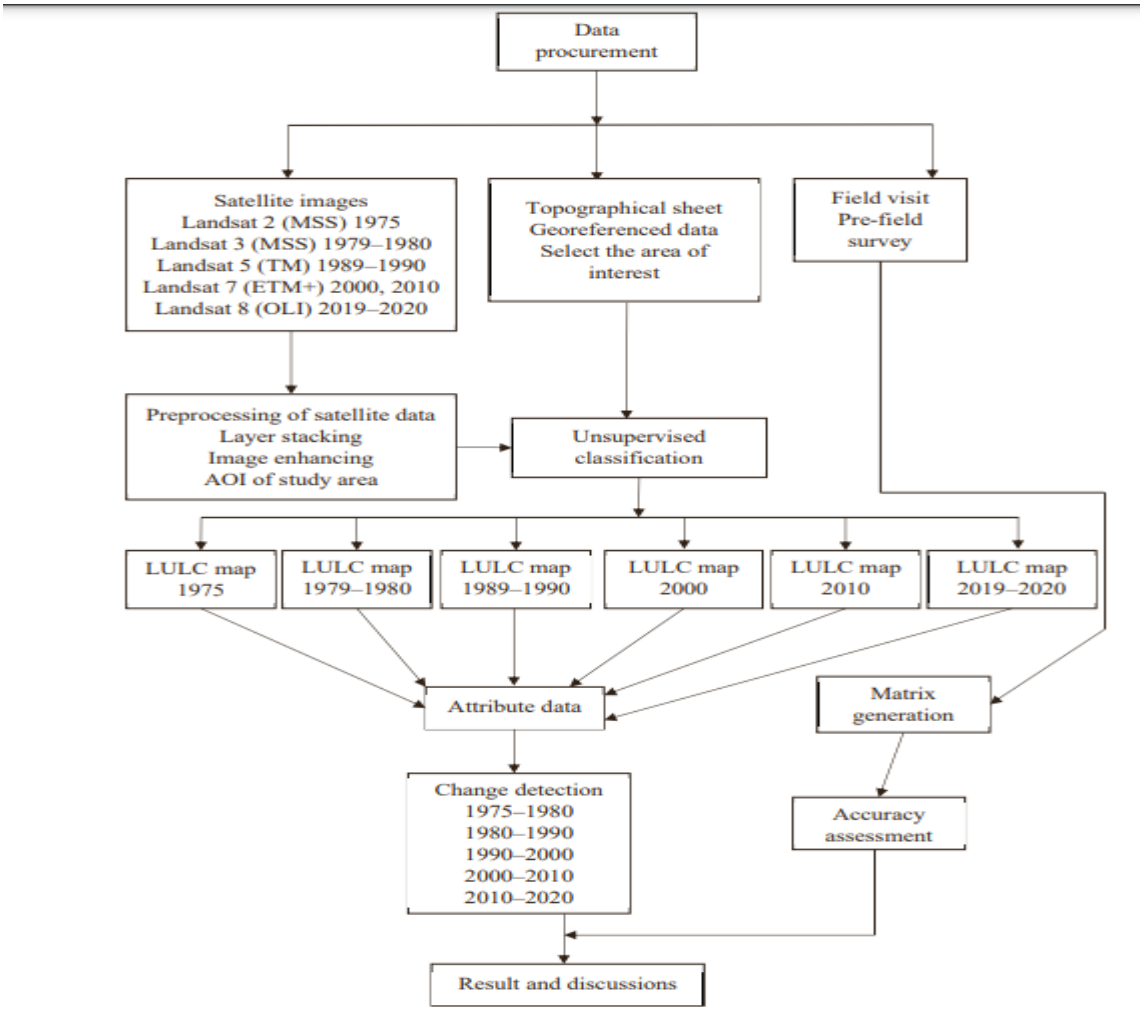


Fig. 1:Diagram of the methodology

Fieldwork was conducted both before and during the review period to identify and confirm the various land use characterisations and to guide a study of the LULC change that occurred throughout the review period. The topic area can be broken down into a total of eight different categories, including:

1) A built up area;
2) A body of water;
3) Agricultural land that is not waterlogged;
4) Agricultural land that is waterlogged;
5) An open waterlogged area;
6) An area that is influenced by salinity;
7) Vegetation;
8) fallow land or sand dunes;

ArcGIS 10.2 was utilised for the production of maps, while ERDAS IMAGINE 2015 was utilised for unsupervised categorization. The ENVI 5.3 programme has been updated with thematic changes. Figure 1 presents an illustration of the methodology that was applied to the research endeavour.

4. DATA ANALYSIS

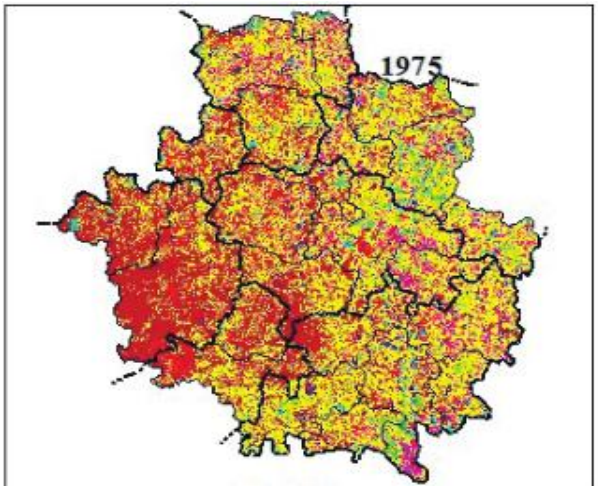
4.1.Land Use and Land Cover Classification

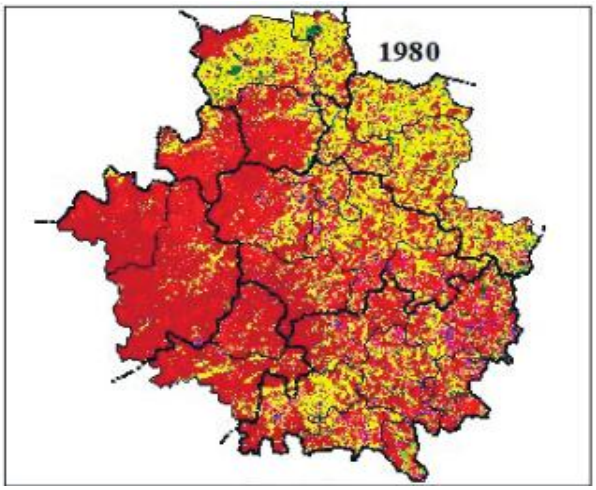
The Focal Haryana region was divided into eight categories based on data from the Landsat series collected during both storm seasons. Land use and land cover patterns are changing in the study area. The level of land that is based on, how much land used for farming, and the saltiness of the land all show a vertical propensity, while the level of land covered by vegetation shows a descending pattern, and the patterns for different gatherings are best portrayed as factor. The LULC classification of the exploration area is depicted in Figures 3 and 4, and the distribution of each class is reported in Table 2. All of these factors contribute to the global circulation of the LULC before and after a storm in the Focal Haryana region. An assessment of the information uncovers that in the pre-rainstorm classes 1, 2, and 3 display a climbing propensity, while class 7 shows a slipping pattern. Different classes show a fluctuating pattern. During the post-rainstorm time frames, the land area of classes 1 and 2 is developing, while the land area of class 7 is declining. The land area of the remaining classes has variable tendencies. A significant shift can be seen in the class of vegetation, with

almost 85 percent of the land covered by vegetation moving to other classes between 1975 and 2020. During the same time span, built up areas saw a 65% rise in population. Between 1975 and 2020, the amount of agricultural area that was not subject to waterlogging rose by 72% during the pre- to pre-monsoon period and by 79% during the post- to post-monsoon era. The area of fallow land and sand dunes shrunk by 70 percent between 1975 (before the monsoon) and 2020 (before the monsoon), and a significant drop was observed beginning in the year 2000 and continuing.

Table 2: **LULC categorises the pre-monsoon and post-monsoon seasons**

Year		Class							
		1	2	3	4	5	6	7	8
1975	pre	94438	8073	320434	56220	43517	33309	55208	160311
1975	post	94860	8082	272021	85114	47932	32380	53076	178045
1979–1980	pre	95147	8462	327412	39724	43043	34890	52408	170424
1979–1980	post	95406	8512	191495	47129	47839	34681	47433	299015
1989–1990	pre	100454	8791	332313	47014	42041	35941	43991	160965
1989–1990	post	100512	8807	292194	50674	50333	33484	40433	195073
2000	pre	112429	8884	383070	85402	43667	37133	35429	65496
2000	post	113073	8914	324313	94211	48892	35208	33954	112945
2010	pre	124349	9080	412392	83581	40827	38979	21414	40888
2010	post	125906	9122	332326	113522	84977	35526	19899	50232
2019–2020	pre	144166	9472	439557	54410	38031	39256	8490	38128
2019–2020	post	145912	9512	344032	28792	41277	37188	7986	156809





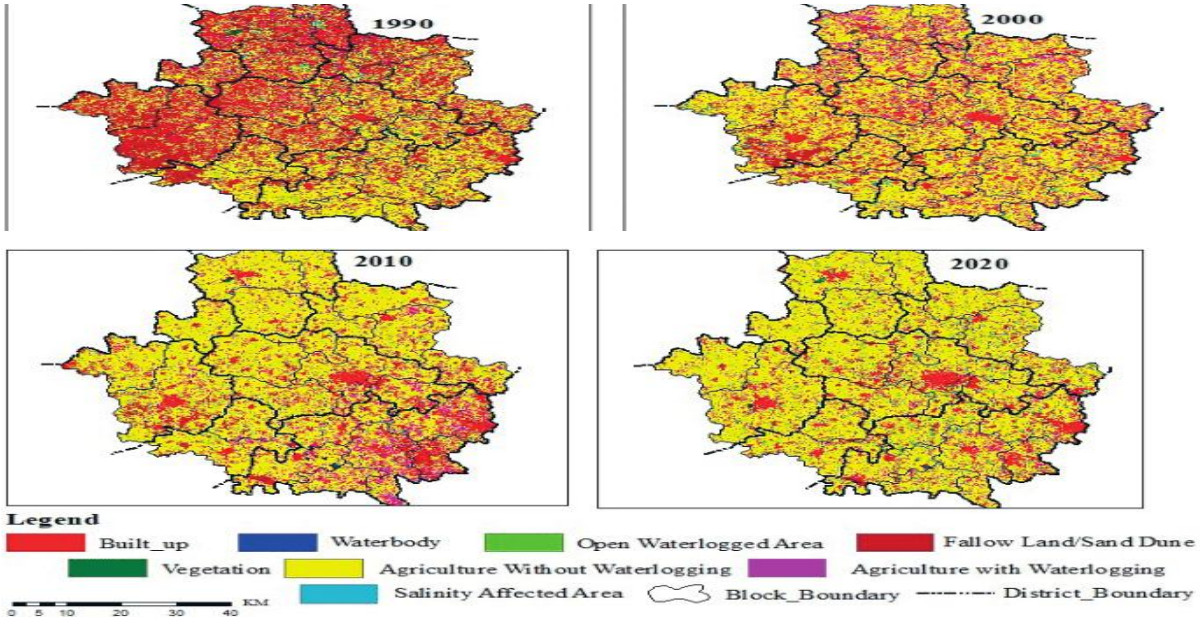


Figure 2: Pre-monsoon era, unsupervised picture categorization using LULC, 1975–2020, Central Haryana

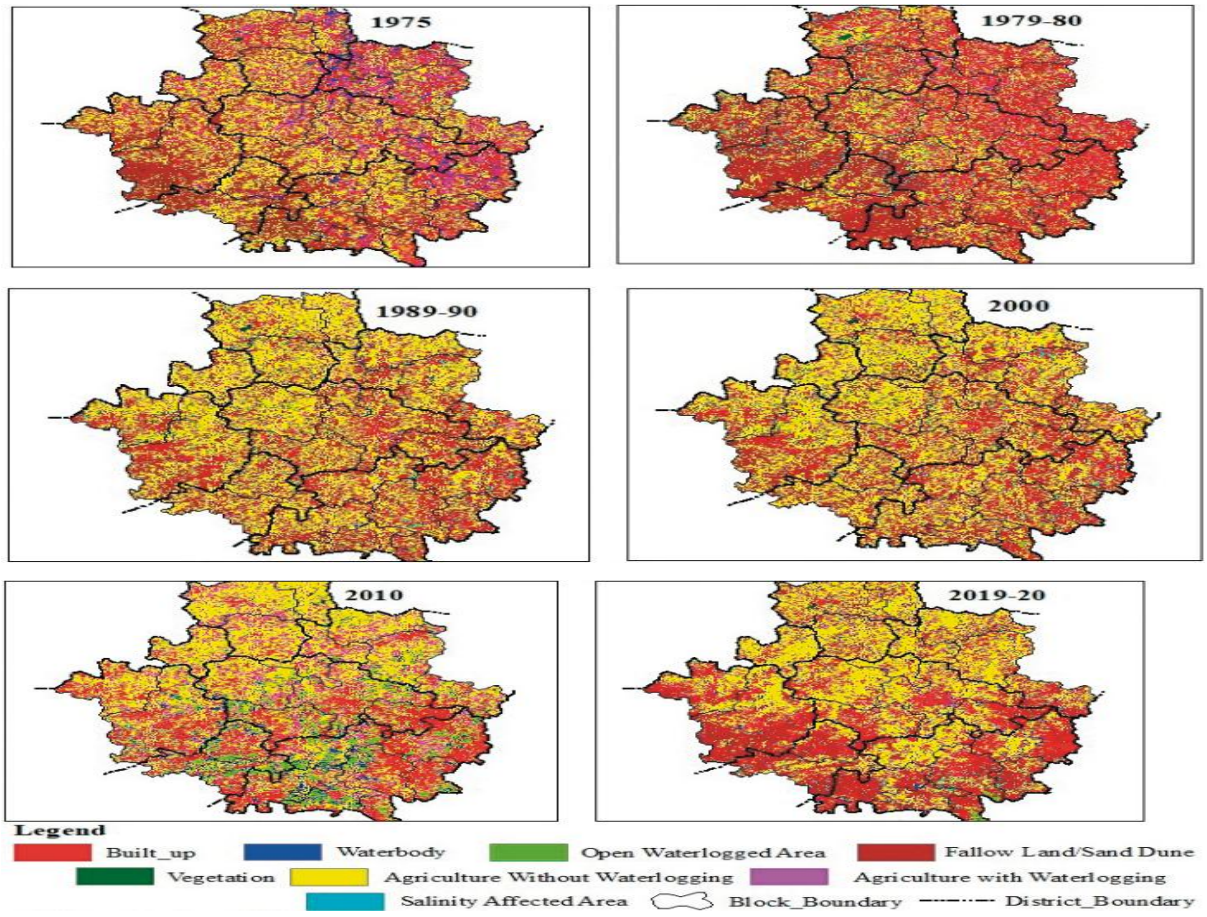


Figure 3:Central Haryana, post-monsoon period (1975-2020), unsupervised picture classification

5. CONCLUSIONS

Changes in LULC have an effect on a region's environment, ecosystem, and the capacity for sustainable development. As a result, in order to accomplish sustainable development on all levels throughout the region, it is essential to collect information that is fair and specific regarding LULC. After ground truth verification, the reliability and accuracy of the data obtained using geospatial techniques improves. The LULC change that occurs in Central Haryana is primarily due to the activities that are induced by humans. The evolution of LULC has been faithfully documented by means of geospatial data. Over the course of the past half century, the study area has been subjected to a significant shift in the pattern of LULC. The eight categories are: developed, water body, horticulture land without waterlogging, and salinity; farming with waterlogging; untamed water logged region; decrepit land/sand ridges; and farming with waterlogging; untamed water logged region; and farming with waterlogging. How much land covered by vegetation has been consistently diminishing? Such examinations that depict the progress of LULC might be important in direction and strategy making, and they may likewise help strategy producers and organizations in pursuing arriving at sustainable development objectives. Land use and land cover have changed in an ergonomically designed area like Focal Haryana, and this study will help determine what factors led to these shifts and what effects they have had.

REFERENCES

1. Bhardwaj, P., & Kumar, S. (2012). Urban Expansion and Land Use Change Analysis of Karnal City in Haryana: A Study Based on Open Source Satellite Data. Int. J. Emerg. Technol. Adv. Eng, 2, 182-186.
2. Khanna, P., Babu, P. R., & George, M. S. (2019). Carrying-capacity as a basis for sustainable development a case study of National Capital Region in India. Progress in Planning, 52(2), 101-166.
3. Kiesecker, J., Baruch-Mordo, S., Heiner, M., Negandhi, D., Oakleaf, J., Kennedy, C., &Chauhan, P. (2019). Renewable energy and land use in India: a vision to facilitate sustainable development. Sustainability, 12(1), 281.
4. Paul, S. K., &Dasgupta, N. (2013). Urbanization and impact on environment: A case study of Kolkata Metropolitan Area, India. International Journal of Advanced Remote Sensing and GIS, 2(3), 326-334.

5. Rahman, A., Kumar, S., Fazal, S., &Siddiqui, M. A. (2012). Assessment of land use/land cover change in the North-West District of Delhi using remote sensing and GIS techniques. Journal of the Indian Society of Remote Sensing, 40, 689-697.
6. Saini, S. S., &Kaushik, S. P. (2011). Land use changes in Haryana sub region of Chandigarh periphery controlled area: a spatio-temporal study. Institute of Town Planners, India Journal, 8(4), 96-106.
7. Sangwan, S., Puri, V. K., & Singh, A. L. (2012). Impact of urbanization on land use/land cover and environment: A case study of Chandigarh, India. Journal of the Indian Society of Remote Sensing, 40(2), 261-270.
8. Sharma, M., Sharma, M., & Kumar, S. (2013). Analysis of Spatial Extension and Land Use Changes: A Case Study in NCR Region of Haryana. International Journal of Science, Engineering and Computer Technology, 3(3/4), 132-135.
9. Singh, A. K., & Kumar, B. (2012). Urbanization and its impact on environment: A case study of Jaipur city, India. International Journal of Environmental Sciences, 3(1), 35-42.
10. Singh, A. L. (2012). Urban growth and environmental degradation: A case study of Delhi, India. Journal of Environmental Pollution and Human Health, 1(1), 1-10.