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Mapping Urban Growth of Hansi Town Using Geo-Informatics Technique

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Abstract

The present study deals with the changes in Land Use and Land Cover in Hansi Town. The main aim of this paper is to generate the real time information on Land Use and Land Cover of Hansi Town. The paper also emphasises the GIS output of provided information study area. The study has been done on the basis of design standard and methodology formulated in "NUIS". The study mainly is based on both sources of data, primary as well as secondary. The study reveals that there is 43.22 per cent urban built-up area, 34.37 per cent agricultural land, 1.42 per cent water bodies and 20 per cent vacant land. The residential area occupy highest area in percentage in town.

Key Words: Land use, Land Cover, Thematic Mapping

Introduction

Land use/Land cover (LULC) maps describe the vegetation, water and natural features on the land surface. Although the terms land cover and land use is often used interchangeably, their actual meanings are quite distinct. Land cover refers to the surface cover on the ground, whether vegetation, urban infrastructure, water, bare soil or other. Identifying, delineating and mapping land cover is important for global monitoring studies, resource management and planning activities. Identification of land cover establishes the baseline from which monitoring activities like change detection can be performed and provides the ground cover information for baseline thematic maps.

Land use refers to the purpose the land severs, for example, recreation wildlife habitat, or agriculture. Land use applications involve both baseline mapping and subsequent monitoring, since timely information is required to know what current quantity of land is in what type of use and to identify the changes from year to year. Over the years, remote sensing has been used for

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land use/land cover mapping in different parts of application of remotely sensed data made possible to study the changes in less time, at low cost and with better accuracy. Remote sensing and Geographic Information System (GIS) provide efficient methods for analysis of land use issues and tools for land use planning and modelling.

Study Area

Hansi is a city and a municipal council in Hisar district in the Indian state of Haryana. Hansi is located at 29.1°N 75.97°E. It has an average elevation of 207 metres (679 ft). In 2011, population is estimated to be 134,568. It is located at a distance of 16 miles (26 km) east of Hisar on National Highway 10. Geographically, it is semi-arid with around 46 cm of annual rainfall. It appears that at one time Hansi was larger, more prosperous and more important than Hisar. The town has several important buildings of archaeological importance. It is also a very influential sub-caste of Arain. The town area falls in Yamuna sub-basin of Ganga basin. There is no natural drainage in the district area.

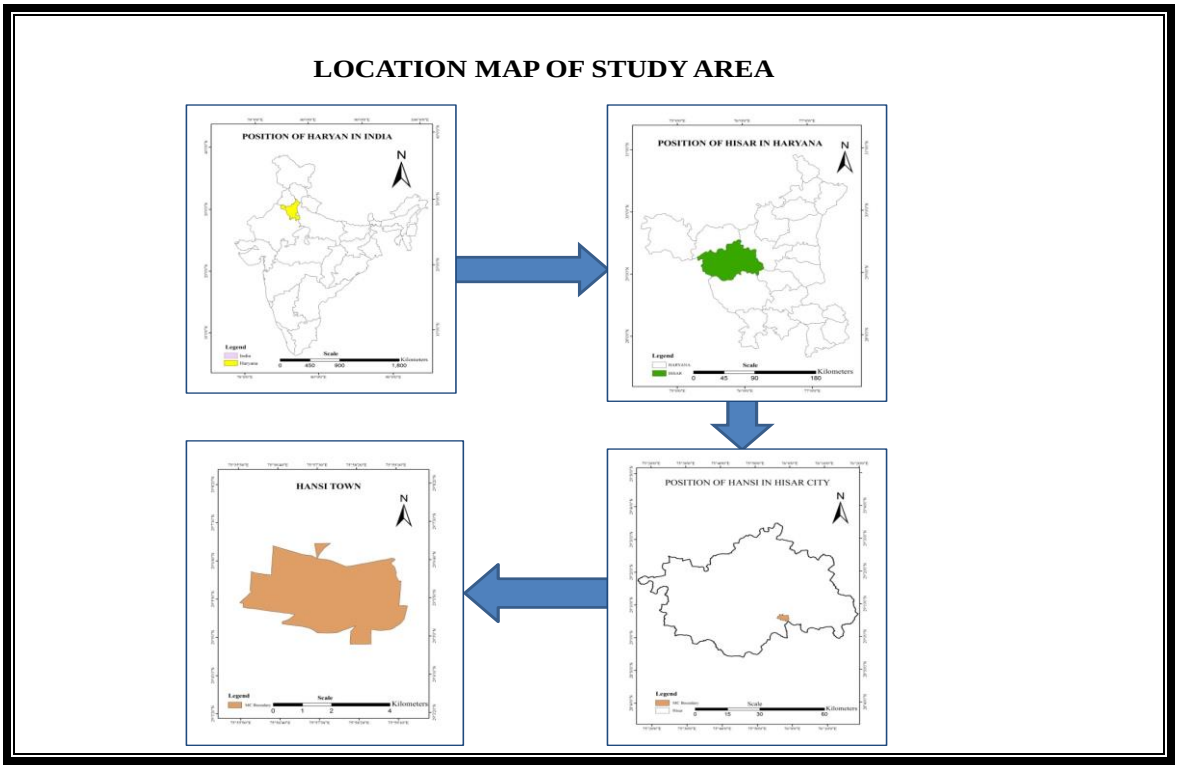


Fig. 1.1

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Objectives

The main objective of this study is to demonstrate the advantages of using remotely sensed data and their analysis with GIS tools particularly Arc GIS software. The main objectives of this are:

- To generate accurate and real time information on Land Use/Land Cover of Hansi Town.
- Thematic mapping of Land Use/Land Cover of Hansi Town.

Database and Methodology

The data for the present study has been taken from both primary and secondary sources. A brief description of data used in present study is given below:

- **Primary Data Source**
  - GPS Point from field survey
  - Photograph from the field
- **Secondary Data Source**
  - GeoEye-1 Satellite Image
  - Topo-sheet H43 P16 (1:50,000)
  - Guide Map of Hansi Town
  - M.C. boundary Map of Hansi Town

Acquisition of Data

In this study data used different type which have acquired in different sources. Toposheet No. (H43P/16) at scale of 1:50,000 and Guide map of Hansi Town which is prepared by SOI. They are acquired from Haryana Space Research Application Centre (Harsac) Hisar. Google Earth Image of Hansi Town 2014 acquired from Google Earth Pro. M.C boundary has acquired from M.C. Office of Hansi Town.

Results and Discussion

Urban Land Use/Land Cover

Remote sensing and GIS are highly capable in urban studies particularly in urban management and planning. The present study “mapping of urban land use/land cover” clearly demonstrates the importance and role of GIS based information system and potentialities of satellite remote sensing technique for preparation of more updated and reliable information.

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The first objective of the study, e.g. to prepare LULC map of Hansi town using satellite data, has been obtained in this chapter. This map shows the features of the first level as depicted the classification scheme. It includes the features of built-up urban, vacant land, agriculture land, water bodies, transportation, vacant land, wet land features.

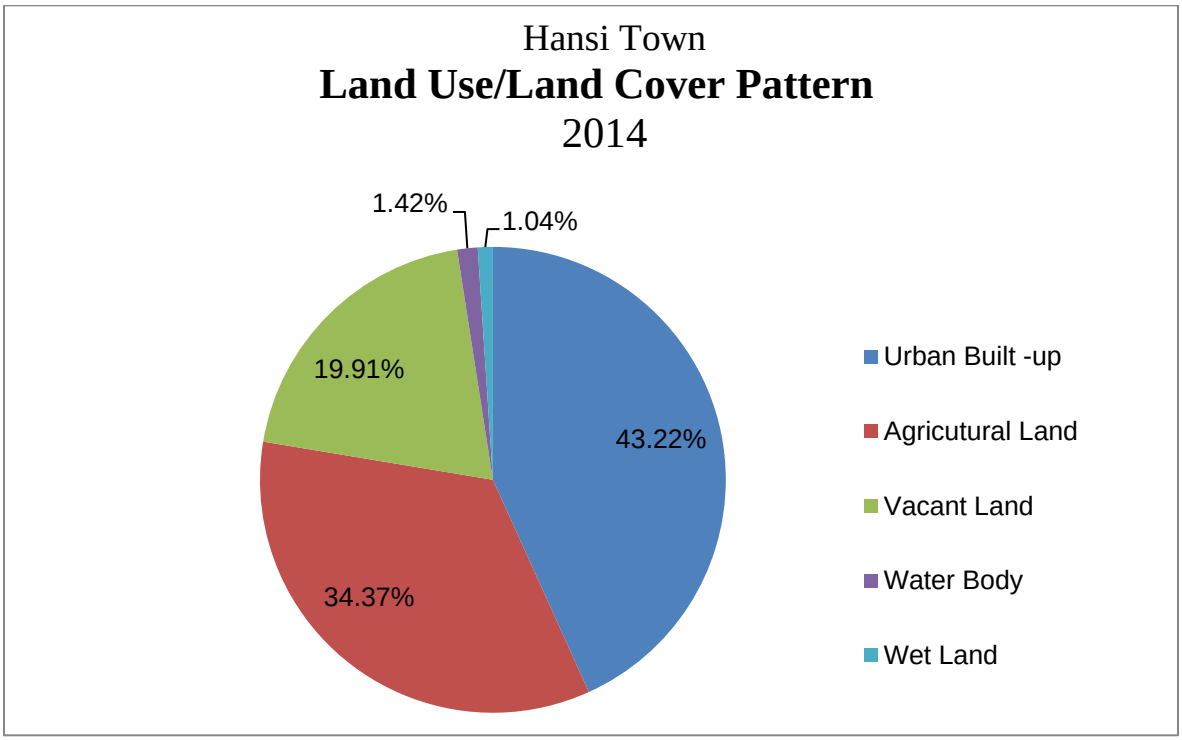
The Urban area can be delineated from GeoEye-1 Satellite data up to Level-IV. The classes as mentioned in the classification may or may not reflect in Hansi town and vice-versa. Similarly all land use classes observed in a Hansi town might not have been incorporated in the classification schema. This classification schema is indicative and flexible. Any new or additional classes delineated during the process of interpretation can be suffixed against the appropriate classes which would also enable to strengthen the classification schema in Geo data base Structure in Arc GIS 9.3 Software.

Table 1.1: Land Use/Land Cover Statistics of Hansi Town

Sr. No.	Category	Area in Sq. Meters	Area in Per Cent
1	Urban Built-up	6017123	43.22
2	Agricultural Land	4785539	34.37
3	Vacant Land	2772792	19.91
4	Water Body	198640	1.42
5	Wet Land	145806	1.04
6	Total Area	13919900	100

Source: Calculated by Author

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Source: Table. 1.1

Fig. 1.2

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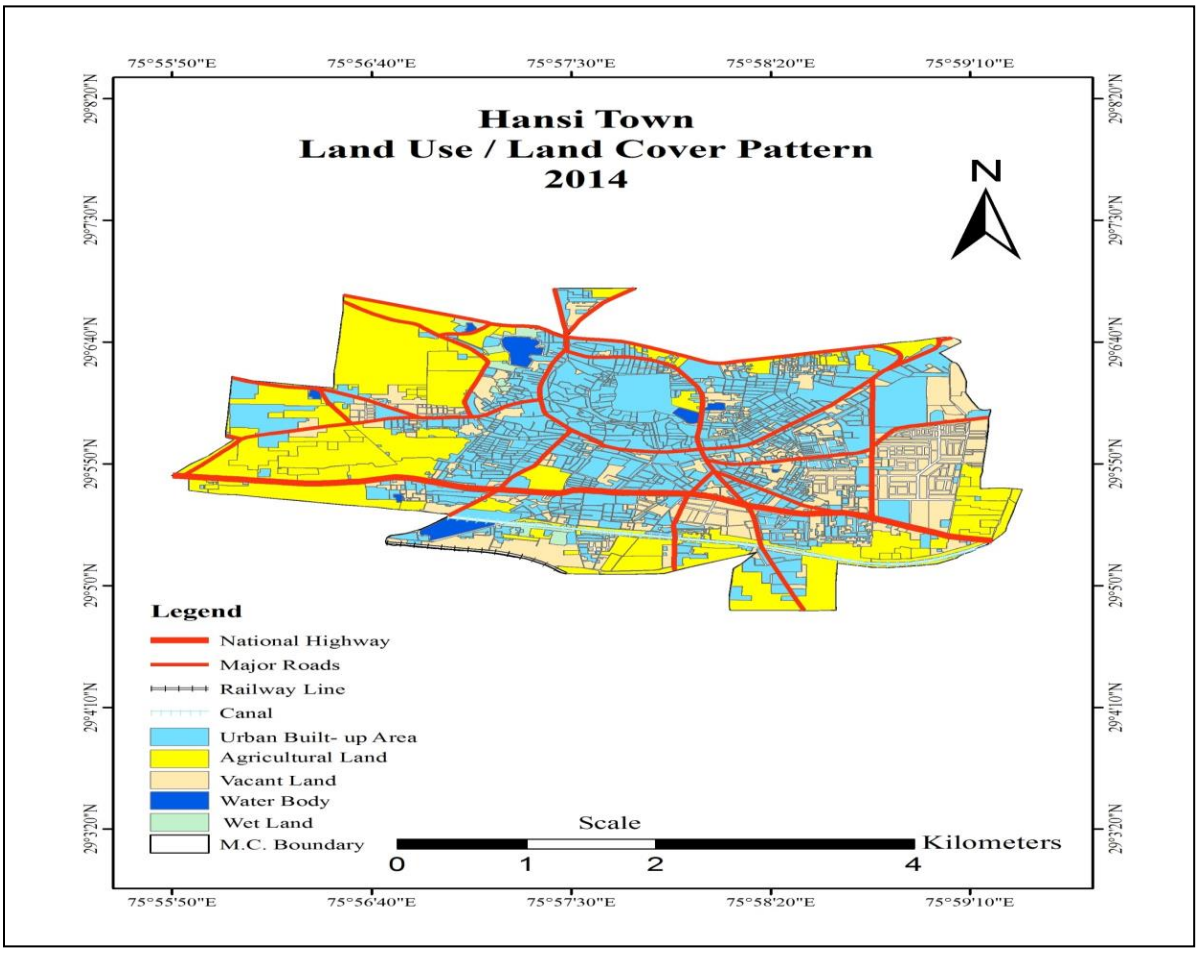


Fig. 1.3

The study area, e.g. Hansi municipal covers a total area of 13919900 square meters. It is dominated by the Built-up urban that covers its 43.22 per cent. Other features, e.g. agriculture land, vacant land, water body, wet land cover in serial 34.37, 19.91, 1.42 and 1.04 percent respectively of the total study area.

1. **Built-up Urban**

An urban area is characterized by higher population_density and vast human features in comparison to areas surrounding it. Urban areas may be cities, towns or conurbations, but the term is not commonly extended to rural settlements such as villages and hamlets. The present study we find out the present urban status of Hansi town with the help of remote sensing and GIS. The Built up Urban area alone covers 43.22per cent of total area of Hansi municipal

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boundary. It is an area of human settlements comprising residential area, transportation and communication lines, industrial and commercial complexes, utility and services etc. collectively cities, towns and habitations are included under this category**.**

Urban or built up Land is comprised of areas of intensive urban land use. Included in this category are cities, towns, industrial, townships, villages, and strip developments along transportation corridors, areas occupied under construction activity, public/semi-public complexes, institutions, recreation and so on.

Sr. No.	Category	Area in Sq. Meters	Area in Per Cent of Built-up Urban Area	Area in Per Cent of Total Area
1	Residential Area	4064923	67.55	29.20
2	Industrial Area	690871	11.48	4.96
3	Commercial Area	446580	7.42	3.20
4	Public Utility	310355	5.15	2.22
5	Recreational Area	265795	4.41	1.90
6	Educational Area	214291	3.56	1.53
7	Transport	24308	0.40	0.17
8	Total	6017123	100	43.22

Table 1.2: Urban Built-up Area of Hansi Town

Source: Calculated by Author

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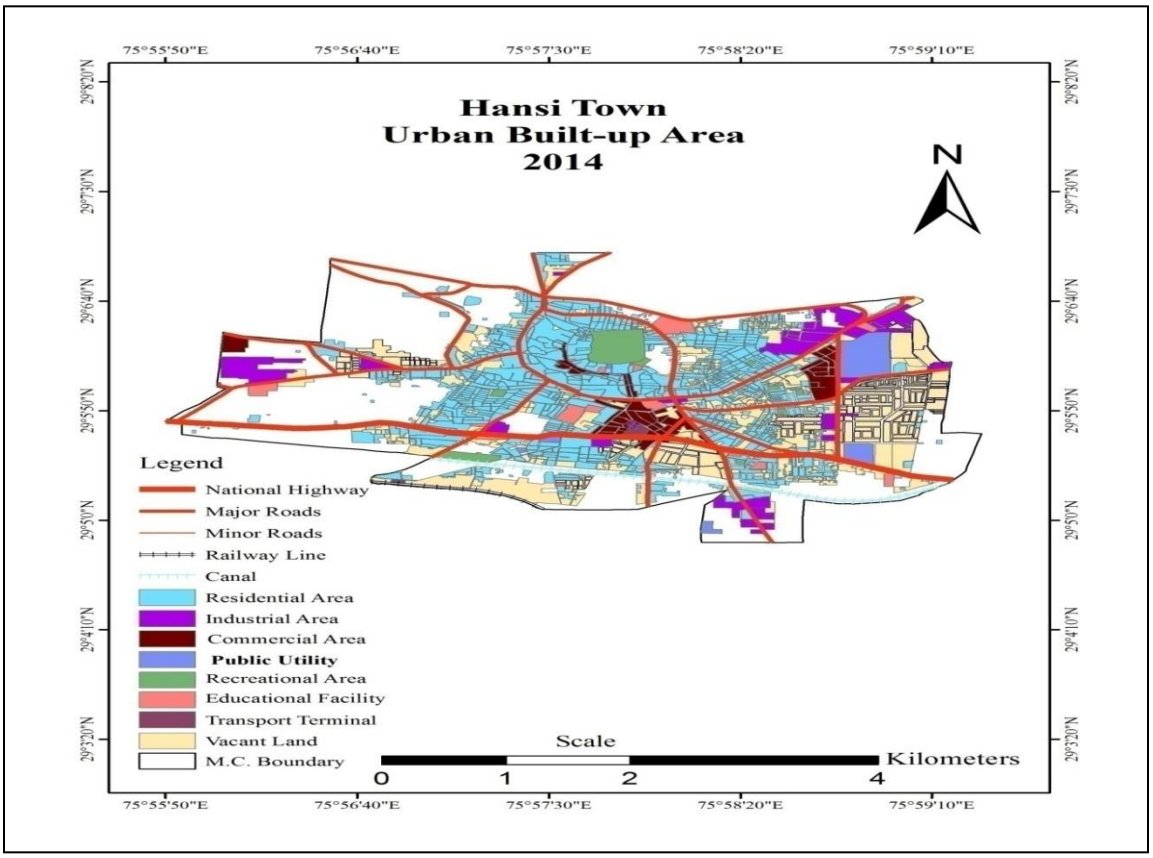


Fig. 1.4

Residential

In the Urban area of Hansi municipal boundary the residential development is of circular form in core area, linear along transportation corridors extending outward from town centre and planned & rectangular shape in sectors & outer region of the town. The residential areas in a planned locality have a uniform size and spacing of structures unlike the unplanned with less spacing for open areas and roads. The category of residential area covers 67.55 per cent of built-up urban area and 29.20 per cent of the total area.

Industrial

The study area consists of many industrial units, covering 11.48 per cent of the urban built-up area and 4.96 per cent of the total area. There are number of Mustard Oil Industries in the study area.

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Recreational

In present study, there are number of parks. Prithvi Raj Chauhan fort situated at Hansi. The category of Recreational land is covering of 4.41 per cent area of built-up urban area and 1.90 per cent area of the total area.

Public Utilities and Facility

These constitute water supply, sewerage, waste disposal/landfill, electric power, inland gas supply and so on. It includes water pumping and treatment plants; gas and oil storage tanks and pipelines, and power plant, transmission lines and so on. Its area is 5.15 per cent of the built-up urban area and 2.22 per cent of the total study area. In this present study I have include more facility the list has given below.

- Electricity facilities.
- Administrative offices.
- Filling stations.
- Banks
- Communication facilities.
- Water facilities.

Educational Facility

Educational activity set-up in the town played an important role in the development of Hansi town. The category of Educational facility is covering of 3.56 per cent area of built-up urban and 1.53 per cent area of the total area. There are a number of schools in Hansi town. Neharu Memorial College situated on Barwala byepass in South direction of the study area.

Commercial area

Commercial areas are those used predominantly for the sale of products and services. They often develop mixing with the residential, public and semi-public or along the main roads/streets. Commercial category includes Central Business District (CBD); retail and wholesale business

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and hospitality outlets, shopping malls, warehouse market yards and others in Hansi study area they also occur as commercial class. Its area is 7.42 per cent of the built-up urban area and 3.20 per cent of the total study area. Barsi gate road and back side of the bus stand have most commercial area you can say that CBD of the Hansi town. The commercial area of the Study area has mainly along the road (N.H.10), it crossed the middle part of the town from east to west direction.

Transportation

The act of carrying or conveying a thing or person is called transport communication and transport system is one of the major aspects of development of any region. Majorly of population uses road network because most of the places are linked with road only. Hence proper connectivity of roads with other places is a good indicator of development. The roadways include major and minor roads/streets, bridges/flyovers, expressway. There is one Natioal Highway (N.H 10), across the Hansi town. Another transportation network is railway, railway stations and bus terminus. There is two bus stand (new and old), railway station having broad gauge rail facility in Hansi town.

Table 1.3: Transport Network of Hansi Town

Sr. No.	Category	Length in Meters	Length in Percent
1	Minor Road/ Street	147187	80.29
2	Major Road	29098	15.87
3	Highway	5709	3.11
4	Railway Network	1304	0.71
5	Total	183294	100

Source: Calculated by Author

Agricultural Land

The agricultural land can be under crop, fallow land, agriculture plantation, grazing and saline land. In Hansi study area, the total agricultural land comprises 34.37 per cent of total area. There is no grazing and saline land.

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Table 1.4: Area under Agricultural Activity of Hansi Town

Sr. No.	Category	Area (in Sq. Meters)	Area (In per cent)
1	Crop Land	3816167	79.74
2	Plantation	54090	1.13
3	Fallow Land	915282	19.12
4	Total	4785539	100

Source: Calculated by Author

Crop Land

It is a land over which the crop is grown that is called crop land. It covers an area of 79.74 per cent of the agriculture area. The predominant crops grown are wheat, mustered and jawar etc.

Fallow Land

The land which is left uncultivated for one to three years is called the fallow land. It covers an area of 19.12 per cent of the agriculture area. From the agriculture point of view, the fallow land is an important indicator of the agriculture development; the more the fallow land, more is the fallow land possibility for growth of the crop area. Mainly this type of land has situated Barwala bypass road and along the N.H.-10**.**

Plantation

A plantation is a large artificially established forest, farm or estate, where crops are grown for sale, often in distant markets rather than for local on-site consumption. Plantation has occupied 1.13 per cent percent of the total agricultural area. Its area is near around the canal.

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Surface Water Bodies

It comprises areas with surface water, either impounded or in the form of lakes/ponds, tanks/reservoirs or cooling ponds and abandoned quarries with water. There are clearly identified and delineated on the satellite image based on size and shape characteristics. The present study have not any river like perennial and seasonal, they have very small part of surface water bodies in the form of pond and water tank. The category of surface water body is covered 1.42 percent of the study area.

Vacant Land

Vacant land is the area left unutilized or kept for future development. The availability of the vacant land in an urban area determines its future development projects. Such lands may be plotted or developed as layouts under construction. Only 19.91 per cent percent of area is vacant land in Hansi study area. The vacant land of the Hansi town, has mainly situated on the surrounded of dense urban built-up area. Most vacant area has found between Jind bypass road and some area near around bus stand has also found.

Conclusion

The study demonstrates the importance and potentiality of Satellite Remote Sensing technique for preparation of more consistent, accurate and up-to-date baseline information on urban land use/land cover for future planning, management and development of any area. Present study is based on interpretation of topsheet-No-H43P16 (SOI) and Google Earth Pro Image. Besides satellite data present study also used ground truth with GPS survey and other secondary data.

Study found five major land use/land cover categories in the study area which are - built-up, agricultural land, vacant land, water body and wet land. Out of study total area 43.22 percent is urban built-up whereas 56.78 percent is used for agricultural and other purposes. Residential

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and Industrial are the major activity in the study area which occupied 67.55 and 11.48 percent of built-up urban area respectively. Majority of residential area is under unplanned category. There is one National Highway (N.H 10), across the Hansi town. Hansi town is well connected by road and railways with the important cities of Haryana and Delhi. Some other category in the study area like Agricultural land, Vacant land, Water body and Wet land which occupied 34.37,19.91,1.42 and 1.04 percent respectively of the study area.

Study highlight that city has mixed pattern of land use. Central core areas (Barsi gate road and back side of the bus stand) comprise not only residential but also commercial, public and semi-public activities. Land use/land cover mapping and analysis show here may not provide the ultimate explanation for all problems related to land use/land cover pattern but it serves as a base to understanding the patterns and possible causes and consequences of land use/land cover in the study area.

Suggestions

After a through image interpretation and data analysis, of the Land Use/Land Cover pattern of the Hansi town following are few suggestions that can be implemented to ameliorate its problem. It is found that problems of Hansi town like parking, environmental pollution, and land use lies in the unplanned development in the surrounding areas. And for ameliorating the problems of Hansi following reformative actions can be taken by concern authorities:

1. As majority of town is under unplanned residential area so proper planned area should be developed as it has been done in some parts; particularly this kind of unplanned development which is taking place at outskirts of town need to be checked for balanced development of town .For this strict measure should be adopted for control and management of urban land use.
2. We should make optimal use of wet land into recreational or other activities taking into consideration suitability of local environment.
3. There is a serious lack of forestry in town so urban forestry should be developed immediately at large scale.

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4. Vacant land available in inner parts of town should be optimally utilized for parking facilities so that traffic congestion can be avoided.
5. Mapping of existing land use/ land cover with the help of geo spatial technologies be done at frequent intervals for proper estimation of success of planning and policies.

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