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Land use/ Land Cover Study of Rohtak City using Geoinformatics

Dinesh Kumar[1] and Satpal[2]
[1,2]Haryana Space Applications Center, Hisar

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Abstract

In this study the land use land cover of Rohtak city is analyzed. The main aim of the study is to generate a spatial framework in GIS environment for perspective Development plans and evolving tools and methodology to analyze land use data. Residential Commercial Industrial, Public utilities and under construction, Drainage and water bodies, Agriculture land, Forest, Open Space and Play Ground, Vacant Land, Area under roads and Parking are the main category in land use land cover mapping in this study. The major category is residential area followed by other categories. Total study area having 28521.66 acres and residential category is having maximum part 10467.35 acres followed by open space, public- semipublic categories. Public utilities have minimum area of 182.54 acres.

Keywords: *Land use, Land cover, Rohtak, GIS.*

Introduction

The modern technology of remote sensing which includes both aerial as well as satellite based systems, allow us to collect a lot of physical data easily, with speed and on repetitive basis, and together with GIS helps us to analyze the data spatially, offering possibilities of generating various options (modeling), thereby optimizing the whole planning process. These information system also offers interpretation of physical (spatial) data with socio-economic data, and thereby providing an important linkage in the total planning process and making it more effective and meaningful. (Ravindra Kumar Verma[1], et.al.) [1].

The use of the study is to shows the use of GIS technology in planning of Rohtak. With the help of this technology different land use and land cover patterns have been categorized namely; built up areas, agriculture land, waste land, forest, open spaces, water bodies and transportation etc. The use of this technology saves money, time and gives the result with more accuracy by updating database from time to time. There has been a strong interest in using earth observation data in urban areas for several decades (Tuyahov et al., 1973) [2]. In an early attempt to relate remotely sensed reflectance to socio-economic parameters, Forster (1983) devised a classification scheme for Landsat imagery that could be applied to urban areas to produce a residential quality index. Remote sensing data have also been used in attempts to estimate population (Lo, 1986 [3] and 2001[4]) and quantify urban growth and land use (Mesev et al[5]., 1995; Stehanov et al., 2001[6]). Welch (1982) [6] conducted a resolution analysis of satellite sensors and demonstrated that 0.5 to 10 m spatial resolution is necessary to adequately characterize urban infrastructure in most of the cities/towns. Jensen and Cowen (1999) [7] have identified a hierarchy of urban/suburban attributes that can be measured using remote sensing data.

Goals and Objectives

- Generating a spatial framework in GIS environment for perspective Development plans.
- Evolving tools and methodology to analyze land use data.
- Mapping unauthorized colonies.

Location of the Study Area

Rohtak is located 70 km North West of New Delhi. It covers an area of approximately 115 km^2 (44 sq m) and shares its borders with Jhajjar, Sonipat and Bahadurgarh. The exact cartographic co-ordinates of Rohtak are 28.8909°N 76.5796°E

28.8909°N 76.5796°E. It has an average elevation of 220 m (720 ft).

Figure 1: Location Map of Rohtak

Average annual rainfall in Rohtak city is 458.5mm (18.0 inch). Rohtak's climate shows extreme variation in temperature. It does not usually fall below freezing point in the winter months from November to January. In summer from April to July, the day temperature generally remains between 30 °C and 40 °C occasionally going up to 48 °C on a few days. The climate is almost same as that of Delhi due to Rohtak being just 70 km far. So Delhi chart can be followed. Annual rainfall of the district is about 58 cm. The rainfall is unevenly distributed and decreases from south east to south west. The rainy season is from July to September. About 80% of the total rainfall is received during this period. Some rainfall is received from western disturbances during the winter season. Due the low rainfall and its short duration, agricultural activities are mostly dependent upon canal irrigation and tube wells. As of the provisional 2011 census figures, Rohtak municipality had a population of 373,133. The municipality had a sex ratio of 887 females per 1,000 males and 10.9% of the populations were under six years old. Effective literacy was 84.08%; male literacy was 88.94% and female literacy was 78.68%.

Methodology

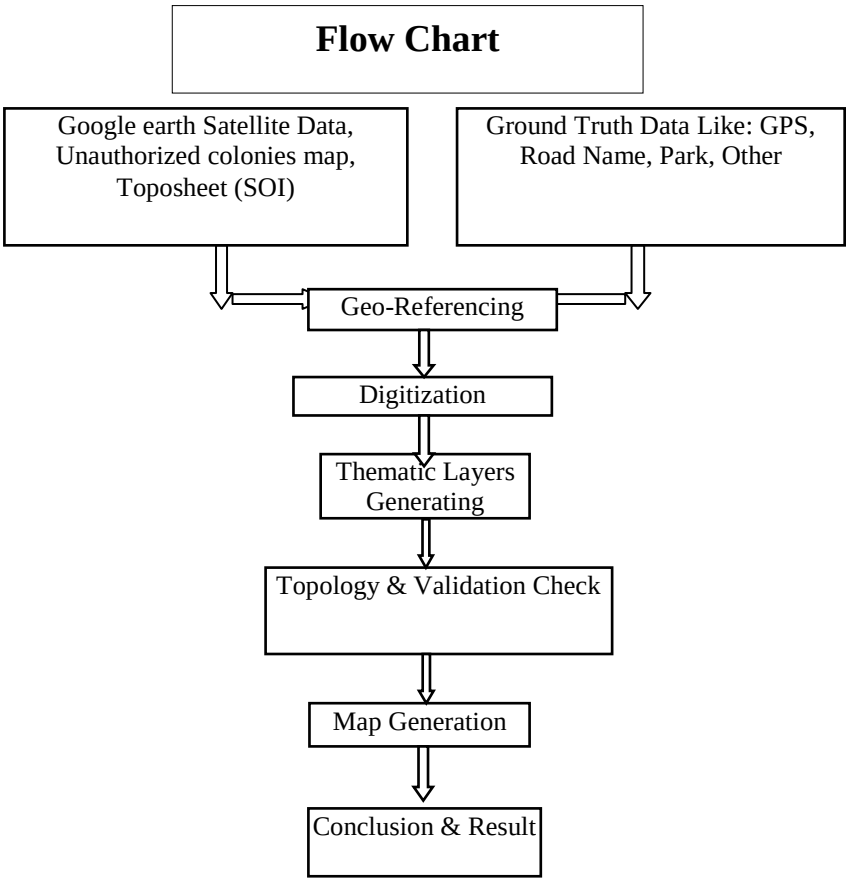
The methodology used in the preparation of land use map of the study area is shown in the flow chart. Two types of data is used, which are as follow.

A. Satellite Data: Google Earth satellite data have been used for the study purpose. Google Earth displays satellite images of varying resolution of the Earth's surface, allowing users to see things like cities and houses looking perpendicularly down or at an oblique angle. In this study satellite imagery is used for preparation of base map by downloading and mosaicing the images from Google Earth and for marking elevation point for generating contours.

B. Secondary Data:

i. Survey of India (SOI) Toposheets on 1:50,000 scale. SOI Toposheets no. 53B/13, 53B/14 were used in study.

ii. Reports and other related material (Census Reports, General, Thesis, Books and Internet etc.).



Results

Application of GIS and Remote Sensing to Study Area with Finding.

Preparation of Existing Land use

Land use is the human utilization of land. It involves the management and modification of natural environment or wilderness into built environment such as fields, pastures, and settlements. It has also been defined as "the arrangements, activities and inputs people undertake in a certain land cover type to produce, change or maintain it.

Existing Land Uses of the Study Area

Total Area of the study area is 28521.66 acres in which different land uses categorized as residential, industrial, commercial, public and semi-public, open spaces and play ground, Public utilities and under construction, Drainage and water bodies, Agriculture land, forest, vacant land and roads and parking etc. Further these land uses categorized into sub land uses as residential built up and residential open within built up etc.

Table 1: Existing Land Use of the Study Area

Sr.No	Land Uses	Area in Acres	Percent
1	**Residential**	**10467.35**	**36.7**
	Built up	3096.83	10.86
	Open within Built Up	7370.52	25.84
2	**Commercial**	**788.02**	**2.76**
	Built up	230.72	0.81
	Open within Built Up(parking, pavements)	557.3	1.95
3	**Industrial**	**727.19**	**2.55**
	Built up	205.04	0.72
	Open within Built Up	522.15	1.83
4	**Public and Semi-Public**	**2186.96**	**7.67**
	Built up	288.52	1.01
	Open within Built Up	1898.44	6.66
5	**Public utilities and Under Construction**	**182.54**	**0.64**
6	**Drainage and Water Bodies**	**923.03**	**3.24**
7	**Agriculture Land**	**2481.4**	**8.70**
8	**Plantation**	**1667.55**	**5.85**
9	**Open Spaces and Play Ground**	**3593.29**	**12.60**
10	**Vacant Land**	**3322.54**	**11.65**
11	**Area Under Roads and Parking**	**2181.79**	**7.65**
	Total Area	**28521.66**	**100.00**

1. Residential: - Total area of residential in Rohtak is 10467.35 acres. This is 36.7 percent out of total study area. Out of these 3096.83 acres is built up and 7370.52 acres is open within built up.

2. Commercial: - Total commercial area is 788.02 acres (2.76%). In which 230.72 acres is built up and 557.3 acres is open within built up.

3. Industrial: - Total area of industrial is 788.02 acres (2.55%). 205.04 acres is built up and 522.15 acres is open within built up.

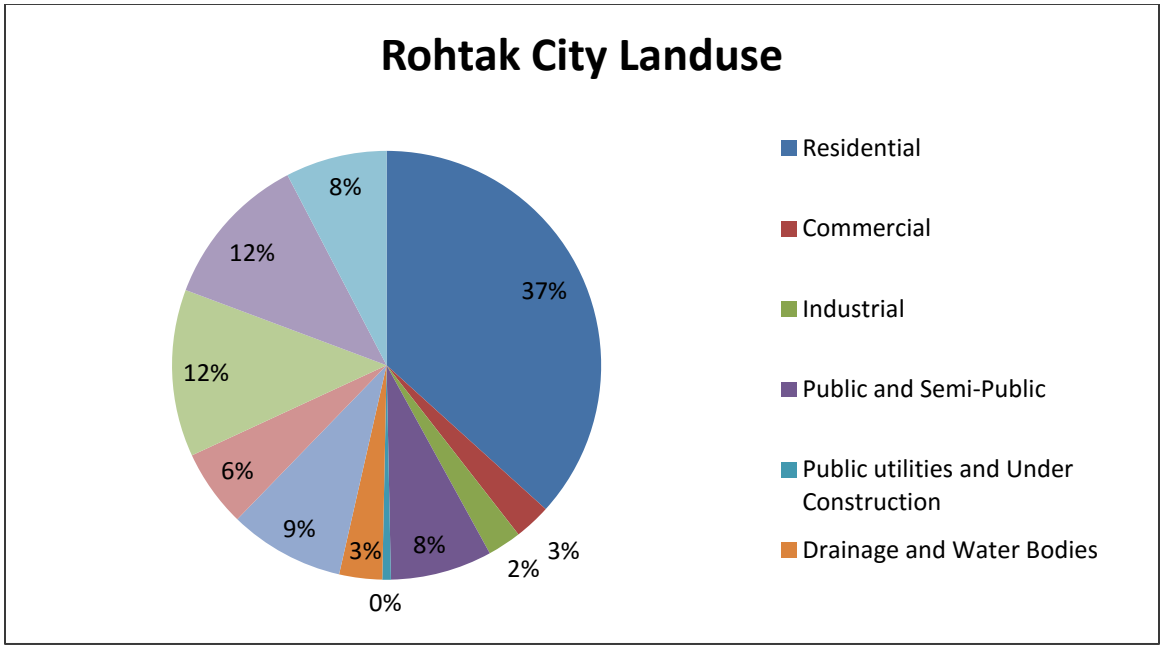


Figure 2: Distribution of Land use Study Area

4. Public and Semi-Public: - Total area of public and semi- public is 2186.96 acres (7.67%). Out of this total area 288.52 acres is built up and 1898.44 acres is open within built up. Public and semi-public included with all government offices, all institutional and hospitals etc.

5. Public utilities and under construction: - Total area under this land uses category is 182.54 acres (0.66%).

6. Drainage and water bodies: - Total area under this land use category is 923.03 acres (3.24%). This category included all water bodies (lake, Pound and water tank natural and manmade), sewerage and river etc.

7. Agriculture land: - Total area agriculture is 2481.4 acres (8.70%).

8. Open Space and Play Ground: - Total area under open space and play groundis 3593.29 acres (12.60%). This open space included with play ground and all parks.

9. Vacant Land: - Total area under vacant landis 3322.54 acres (11.65%).

10. Area under roads and Parking: - Area under roads and parking is 2181.79 acres (7.65%)

Conclusion

In this study, it is observed the significance of GIS and Remote Sensing in current scenario. It is helpful to know about the existing infrastructure of any place. On the base of GIS and Remote Sensing, a planner identified the problems of the city and gives good facilities in future. This study has attempted to demonstrate the efficacy of Remote Sensing and GIS as a Decision Support System (DSS) in analyzing the colonies of Rohtak city.

It is observed that Janta Colony is the largest area covered out of other two colonies. It has covers 181.45 acrearea. In this colony park has lowest area covered. Area under vacant land covered 11% of total colony. Model Town has 102.95 acre area covered. In this colony only 2.99% area covered by park. Adarsh Nagar is smallest colony. It covers only 65.68 acre area. Built –up covered 68% area of total colony area. Thus this technology is very useful in current scenario as well as future development.

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