Chapter–III
LAND USE/LAND COVER
3.1 Land:
Land is the basic natural resource that provides habitat and sustenance for living organisms, as well as being a major focus of economic activities (UNEP, 2001a).

Land and land resources refers to a delineable area of earth’s terrestrial surface, encompassing all attributes of the biosphere immediately above or below the surface, including those of the near-surface climate, the soil and terrain forms, the surface hydrology (including shallow lakes, rivers, marshes and swamps), the near-surface sedimentary layers and associated groundwater and geohydrological reserve, the plant and animal populations, the human settlement patterns and physical results of past and present human activity (terracing, water storage or drainage structures, roads, buildings, etc) (FAO/UNEP, 1997).

3.1.1 Basic Functions of Land: The basic functions of land in supporting human and other terrestrial ecosystems can be summarized as follows:

- a store of wealth for individuals, groups, or a community
- production of food, fiber, fuel or other biotic materials for human use
- provision of biological habitats for plants, animals and micro-organisms
- co-determinant in the global energy balance and the global hydrological cycle, which provides both a source and a sink for greenhouse gases
- regulation of storage and flow of surface water and ground water
- storehouse of minerals and raw materials for human use
- a buffer, filter or modifier for chemical pollutants
- provision of physical space for settlements, industry and recreation
- storage and protection of evidence from the historical or pre-historical record (fossils, evidence of past climates, archaeological remains, etc.)
- enabling or hampering movement of animals, plants and people between one area and another.

Every person is shaped in many ways by the landscape in which they live, and the products and resources produced on the land. The way land is used has a central role in defining the identity of an area and its community. Land and its uses are particularly important for rural communities, where many people are directly
dependent on land for their livelihood. Changes in land use can have a profound impact on the social, economic and cultural lives of people.

3.1.2 Stress on Land:
Increasing population pressures and demands of society on scarce land, water and biological resources and the increasing degradation of these resources is affecting the stability and resistance of our ecosystems and the environment as a whole (Fazal and Amin, 2012) (Figure 3.1). Globally the expansion of human settlements and infrastructure, intensification of agriculture, expansion of agriculture into marginal areas and fragile ecosystems emphasizes the need for integrated planning and management of land resources.

Figure 3.1: Man Land Relationship
In India, land is generally inherited in the family, which is divided among son and daughters in different proportion. However, variations are found in different religion, caste and regional traditions. The division of land is mostly not properly documented and which many times leads to conflict among family members.

The division of land has also resulted in shrinking of land holding. In the year 1901 the per capita availability of land in India was 1.37 hectares, which decreased to 0.33 hectares in 2000 (Ministry of Rural Development, 2003). This led to transformation of land holdings into uneconomic land holding within a period of few generations. Moreover, due to prevalence of law of inheritance, reduction in the size of operational land has adversely affected agricultural activity.

3.2 Urbanization in India:

India has a long tradition of urbanisation which started from Indus Valley civilization dates back to 3000 BC. The post Vedic period, the Maurya period and the Mughal period are considered as water mark in urban growth. Although few urban centres such as hill stations, port cities etc., emerged during British period. However, this period is considered as period of urban stagnation due to exploitative economic policy of British rulers (Ramachandran, 1998).

**Table 3.1: Trend of Urbanization in India**

<table>
<thead>
<tr>
<th>Census Years</th>
<th>Number of Towns</th>
<th>Urban Population (in millions)</th>
<th>Percent Urban</th>
<th>Annual Growth Rate (in percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901</td>
<td>1961</td>
<td>25.9</td>
<td>10.8</td>
<td>--</td>
</tr>
<tr>
<td>1911</td>
<td>1908</td>
<td>25.9</td>
<td>10.3</td>
<td>0.03</td>
</tr>
<tr>
<td>1921</td>
<td>2048</td>
<td>28.1</td>
<td>11.2</td>
<td>0.79</td>
</tr>
<tr>
<td>1931</td>
<td>2220</td>
<td>33.5</td>
<td>12.0</td>
<td>1.75</td>
</tr>
<tr>
<td>1941</td>
<td>2422</td>
<td>44.2</td>
<td>13.8</td>
<td>2.77</td>
</tr>
<tr>
<td>1951</td>
<td>3060</td>
<td>62.4</td>
<td>17.3</td>
<td>3.47</td>
</tr>
<tr>
<td>1961</td>
<td>2700</td>
<td>78.9</td>
<td>18.0</td>
<td>2.34</td>
</tr>
<tr>
<td>1971</td>
<td>3126</td>
<td>109.1</td>
<td>19.9</td>
<td>2.24</td>
</tr>
<tr>
<td>1981</td>
<td>4029</td>
<td>159.5</td>
<td>23.3</td>
<td>3.79</td>
</tr>
<tr>
<td>1991</td>
<td>4689</td>
<td>217.6</td>
<td>25.7</td>
<td>3.09</td>
</tr>
<tr>
<td>2001</td>
<td>5161</td>
<td>284.5</td>
<td>27.8</td>
<td>2.73</td>
</tr>
<tr>
<td>2007*</td>
<td>---</td>
<td>341.2</td>
<td>29.2</td>
<td>---</td>
</tr>
<tr>
<td>2011</td>
<td>---</td>
<td>377</td>
<td>31.1</td>
<td>---</td>
</tr>
</tbody>
</table>

Census of India, 2011; Provisional population totals.
India’s total population in 1901 was about 238.4 million. This increased to 1210 million in the year 2011. Thereby it increased by more than four times during the period of 110 years. Since the beginning of the last century, urban population in India showed a steady increase. After independence India’s urban population has increased more than four times from 62.5 million in 1951, 284.5 million in 2001 and 377 million in 2011 (Table 3.1).

Table 3.2: Million-Plus cities in India: 1951-2001

<table>
<thead>
<tr>
<th>Rank</th>
<th>City</th>
<th>Population (in million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bombay(Mumbai)</td>
<td>2.97 5.97 12.57 16.37</td>
</tr>
<tr>
<td>2</td>
<td>Calcutta</td>
<td>4.67 7.42 10.92 13.22</td>
</tr>
<tr>
<td>3</td>
<td>Delhi</td>
<td>1.44 3.65 8.38 12.79</td>
</tr>
<tr>
<td>4</td>
<td>Madras(Chennai)</td>
<td>1.54 3.17 5.36 6.42</td>
</tr>
<tr>
<td>5</td>
<td>Hyderabad</td>
<td>1.13 1.80 4.28 5.53</td>
</tr>
<tr>
<td>6</td>
<td>Bangalore</td>
<td>0.79 1.66 4.09 5.69</td>
</tr>
<tr>
<td>7</td>
<td>Ahmadabad</td>
<td>0.88 1.75 3.30 4.52</td>
</tr>
<tr>
<td>8</td>
<td>Pune</td>
<td>0.61 1.14 2.49 3.75</td>
</tr>
<tr>
<td>9</td>
<td>Kanpur</td>
<td>0.71 1.28 2.11 2.69</td>
</tr>
<tr>
<td>10</td>
<td>Nagpur</td>
<td>0.48 0.93 1.66 2.12</td>
</tr>
<tr>
<td>11</td>
<td>Lucknow</td>
<td>0.50 0.81 1.64 2.27</td>
</tr>
<tr>
<td>12</td>
<td>Surat</td>
<td>0.24 0.49 1.52 2.81</td>
</tr>
<tr>
<td>13</td>
<td>Jaipur</td>
<td>0.30 0.64 1.52 2.32</td>
</tr>
<tr>
<td>14</td>
<td>Kochi</td>
<td>0.18 0.51 1.14 1.35</td>
</tr>
<tr>
<td>15</td>
<td>Coimbatore</td>
<td>0.29 0.74 1.14 1.45</td>
</tr>
<tr>
<td>16</td>
<td>Vadodara</td>
<td>0.21 0.47 1.12 1.49</td>
</tr>
<tr>
<td>17</td>
<td>Indore</td>
<td>0.31 0.56 1.10 1.64</td>
</tr>
<tr>
<td>18</td>
<td>Patna</td>
<td>0.32 0.56 1.10 1.71</td>
</tr>
<tr>
<td>19</td>
<td>Madurai</td>
<td>0.37 0.71 1.09 1.19</td>
</tr>
<tr>
<td>20</td>
<td>Bhopal</td>
<td>0.10 0.38 1.06 1.45</td>
</tr>
<tr>
<td>21</td>
<td>Vishakhapatnam</td>
<td>0.11 0.36 1.05 1.33</td>
</tr>
<tr>
<td>22</td>
<td>Varanasi</td>
<td>0.37 0.64 1.03 1.21</td>
</tr>
<tr>
<td>23</td>
<td>Ludhiana</td>
<td>0.15 0.40 1.01 1.40</td>
</tr>
<tr>
<td>24</td>
<td>Srinagar</td>
<td>0.24 0.41 ----- 0.95</td>
</tr>
</tbody>
</table>

Source: Census of India, 2001, Decadal Census reports.

The number of urban centres has increased from 3060 to 5161 from 1951 to 2001. Still the level of urbanization is very low. Only 29.2% of its population is living in urban areas (United Nations, 2007). The pattern of urbanization in India is characterized by continuous concentration of population and activities in big cities where urban poverty and poverty exists side by side (Dubey, 2010).
The growth in urban population can be attributed to (i) natural increase, (ii) rural to urban migration, (iii) reclassification of settlements and (iv) inclusion of villages in urban areas. The contribution of natural increase has been dominant followed by rural to urban migration and reclassification (Pathak and Mehata, 1995; Visaria, 1997).

The number of million plus cities in India has increased from 5 in 1951, 23 in 1991 to 35 in 2001 (Table 3.2). About 37% of the total urban population lives in these million plus cities. As per 2001 census 12 million plus cities have been newly added and they are: Agra, Meerut, Nashik, Jabalpur, Jamshedpur, Asansol, Dhanbad, Faridabad, Allahabad, Amritsar, Vijayawada, Rajkot.

3.3 Indian Census Definition of Urban Area:
In Census of India 2001, two types of town were identified:

a) Statutory towns: All places with a municipality, corporation, cantonment board or notified town area committee, etc. declared by state law.

b) Census towns: Places which satisfy following criteria:-

i) A minimum population of 5000;

ii) At least 75% of male working population engaged in non agricultural pursuits;

iii) A density of population of at least 400 persons per sq km.

The present study is based on Srinagar city which is located in the northern most state of India i.e., Jammu and Kashmir. It is also the summer capital of the State. The city was founded about 2000 years ago. Presently Srinagar is an important urban centre with the total population of 1192792 people according to 2011 census. It has also acted as the primate city in the past. The present study is focused to analyse spatial and temporal information of land use and land cover patterns.

3.4 Land Use and Land Cover:
Natural scientists define land use as human activities such as agriculture, forestry and building construction that alter land surface processes including biogeochemistry, hydrology and biodiversity. Social scientists and land managers define land use more broadly to include the social and economic processes.
define land in contexts within which lands are managed or left unmanaged, such as subsistence versus commercial agriculture, rented versus owned, or private versus public land. The observations of land use and its changes generally require the integration of natural and social scientific methods e.g., expert knowledge, interviews with land managers etc., to determine which human activities are occurring in different parts of the landscape.

Land cover refers to the physical and biological cover over the surface of land, including water, vegetation and bare soil. Land cover may be observed directly in the field or by remote sensing. Land cover is defined as ‘the vegetation and artificial constructions covering the land surface’ (Burley 1961). Land use and land cover are always used in association. This partly reflects the collection of data by satellite imagery from which it is difficult to distinguish many activities. Besides, it also reflects the internally inter-dependent nature of activity and reveals an unclear distinction between them (Anderson et al. 1976). However, considerable field work is necessary to convert formally classified land use data taken from air photographs into functional or activity-based data. Therefore land cover will be used in the sense defined by Burley (1961) and Land use will be used when activity-based data alone is under discussion.

The fundamental base of any survey of land use is whether the information recorded relates to some activity carried on at different places, or whether it relates to inherent physical characteristics of those places. In urban areas, such distinction is usually simple.

3.5 Land Use/Land Cover Change (LULCC) and Definitions:

Land use/Land cover change, also known as land change, is a general term for the human modification of earth's terrestrial surface. Though humans have been modifying land to obtain food and other essentials for thousands of years but the present rates, are far greater than ever in history. This initially occurred with the burning of areas to enhance the availability of food by early man. It accelerated with the birth of agriculture, resulting in the extensive clearing i.e., deforestation and management of earth’s terrestrial surface that continues today. More recently, industrialization has encouraged the concentration of human populations within urban areas and the depopulation of rural areas. This change is accompanied by the
intensification of agriculture in the most productive lands and the abandonment of marginal lands. Changes in land use and land cover reveal direct and indirect consequence of human actions to secure essential resources. These modifications are driving unprecedented changes in ecosystem and environmental processes at local, regional and global scales. Such changes encompass the environmental concerns of human populations today, including climate change and biodiversity loss and the pollution of water, soils and air (Ellis, 2010).

Without the actual knowledge about the existing use of land in a region, it is not possible to formulate a detailed scheme of land development and rational land use policy. To generate land use information there is need of land use surveys. The aim of such survey is to record the existing land use on the map. In addition to land use data these surveys provide sound information about the physical conditions of a region i.e., relief, drainage, climate, and soils and their impact on the nature. Further, the comparative study of these physical conditions and their possible effects on type of land use may ascertain the quality and the character of the present utilization of land.

Land use/land cover includes both built-up and non built-up classes characterized by rural or urban areas. In the present study a total of 14 land use/land cover classes were mapped in Srinagar city which includes both built-up and non built-up classes, they are; Residential, Scattered settlement, Commercial, Industrial, Parks/Gardens & Playgrounds, Restricted area, Vacant Land, Agricultural Land, Plantation/Orchards, Forest, Barren, Marshy, Water body and Others (Educational, Governmental, Hospital, Religious).

Built-up is composed of area of intensive use with much of the land covered by structures. Included in this category are the cities; towns; villages; strip developments; along highways; transportation, power, and communication facilities; and areas such as those occupied by mills, shopping centers, industrial and commercial complexes, and institutions that may, in some instances, be isolated from urban areas (Lillisand and Kiefer, 2000). In the present study the built-up classes include residential, scattered settlement, commercial, industrial, parks/gardens & playgrounds and restricted area. The meaning and definition of all these classes is given below:
3.5.1 Residential: Residential land uses include high density settlement, represented by the multiples of structures of urban cores. Linear residential developments along transportation routes extending outward from urban areas are included as residential branches to urban centers. The residential strips generally have a uniform size and spacing of structures, linear driveways, and lawn areas.

Scattered settlement is also part of residential land use. However, it is the area of sparse or low density residential found in the scattered form, where houses are on lots of more than an acre, on the periphery of urban expansion. These settlements are adjoined by open or agricultural fields.

3.5.2 Commercial: Commercial areas are those areas which are used predominantly for the sale of products and services. They are often adjoined by residential, agricultural, or other contrasting uses. Components of the commercial and services category are urban central business districts; shopping centers, usually in suburban and outlying areas; commercial strip developments along major highways and access routes to cities; resorts. The main buildings, secondary structures, and areas supporting the basic use are all included e.g., office buildings, warehouses, driveways, sheds, parking lots, landscaped areas, and waste disposal areas.

3.5.3 Industrial: Industrial areas include a wide range of land uses from light manufacturing to heavy manufacturing plants. It includes those industries which are focused on design, assembly, finishing, processing, and packaging of products often based on the type of building, parking arrangements. Light industrial areas may be, but are not necessarily, directly in contact with urban areas.

3.5.4 Restricted Area: A Restricted area is an area in which certain restrictive measures employed to prevent or minimize interference from city residents. It can be an area under military jurisdiction in which special security measures are employed to prevent unauthorized entry.

3.5.5 Parks/Gardens & Playgrounds: Park is a land that is reserved for pleasure, recreation or for the protection of wildlife or natural habitats. It may consist of rocks, soil, water, flora and fauna and grass areas. Parks commonly resemble open woodlands, the type of landscape that human beings find most relaxing.

Garden is a planned space, usually outdoors, set aside for the display, cultivation, and enjoyment of plants and other forms of nature. The garden can
comprise both natural and man-made materials. The most common form is known as a residential garden.

A playground or play area is a place with a specific design for children to play. It may be indoors but is usually outdoors. Playgrounds often have facilities for playing informal games of sports, such as a Cricket, Football, Hockey, Tennis, Golf, basketball court etc.

3.5.6 Vacant Land: Vacant land is all unused land with no clear designation, though often it is in the middle of a process of conversion. This land may be covered with bushes and grass; it might also be completely barren. Many plots of vacant land are kept for speculative purposes and are therefore left vacant for extensive periods. Rising land prices induce some of the land owners to discontinue agriculture, construct a boundary wall, and leave the plot temporarily unused. In particular, it may be found near roads and adjacent to villages, where the land values are rising steeply.

3.5.7 Agricultural Land: Agricultural land may be broadly defined as land used primarily for the production of food and fiber. The category includes: cropland and pastures, orchards, groves and vineyards, nurseries and horticultural areas, and confined feeding operations. If wetlands are drained for agricultural purposes, they are included in the agricultural land category.

3.5.8 Plantation/Orchards: Plantation is a large farm or estate, where crops are grown for sale. Crop grown on plantations include, Coffee etc. It also includes the planting of trees for lumber. A plantation is always a monoculture over a large area and does not include extensive naturally occurring stands of plants that have economic value.

Orchard on the other hand is an intentional planting of trees or shrubs maintained for food production. Orchards comprise fruit or nut-producing trees grown for commercial production like, Almonds, Apricot, Apple, Pears, Cherry, Plum, Grapes, Peach, and Walnut etc. Orchards are also sometimes a feature of large gardens, where they serve as an aesthetic as well as productive purpose.

3.5.9 Forest: Forest is an area with a high density of trees. Forest land represents an area that has a ‘tree crown areal density’ of 10 percent or more, comprising of trees capable of producing timber or other wood products, experiencing an influence on
climate and hydrosphere. Some of the important trees grown are Willow, Pine, Fir, Kail, Partel etc. Forest areas that have wetland characteristics are placed in the wetland class.

3.5.10 Barren: Barren land is the land of limited ability to support life and in which less than one-third of the area has vegetation or other cover. The category includes areas such as dry salt flats, degraded land due to human activities, bare exposed rock, strip mines, quarries and gravel pits. Wet non-vegetated barren lands are included in the wetland category (Lillisand and Kiefer, 2000).

3.5.11 Marshy Area: Marshy area is included in the wetlands category of land use/cover classification. These are those areas where the water table is at, near, or above the land surface for most part of the year. The hydrologic regime is such that aquatic vegetation is usually observed. Wetlands frequently are associated with topographic depressions, even in mountainous regions. The similar land feature may include mudflats, and swamps situated on the shallow margins of lakes, ponds and streams.

3.5.12 Water Body: The water body category of land use/land cover includes streams, canals, lakes and ponds.

Urbanization led to the rapid increase in population due to modernization and rapid economic growth. The acceleration of economic growth in urban areas, leads to multiplier effects on many aspects of development. Economic growth creates opportunities leading to the overall infrastructural development which is called as pull factor (Amin et al. 2012). This factor attracts people from rural areas to the urban centres. The rural condition linked to high population and population pressures to environment, lack of agricultural land and resources, lack of employment opportunities and poverty problems is called as push factor. In the present study, emphasis is on the opportunities which led to the infrastructural development in Srinagar city. The multiplier effects of economic growth resulted into the expansion of the city built-up classes of land use. This work analyses the changes in various land use/cover classes due to urbanization. The core stress is upon the built-up land use classes i.e., residential, scattered settlement, commercial, industrial, educational, governmental, hospital, religious classes because they plays an important role city’s expansion.
3.6 Data used:
The study is based on the secondary sources of data which includes maps and satellite data.

(a) Satellite data and its significance:
Town planning map of the Srinagar city at the scale of 1:15000 was procured from the department of Town planning, Kashmir. Similarly, for the year 2008 IRS-1D LISS III + PAN October 2008 merged satellite image was used (Table 3.3).

Table 3.3: Details of Satellite Data used in the Study

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Data used</th>
<th>Path/Row</th>
<th>Date of Pass</th>
<th>Wave length width in µm/Band</th>
<th>Spatial resolution (in meter)</th>
<th>Swath (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IRS-1D LISS-III</td>
<td>92/46</td>
<td>10-10-2008</td>
<td>0.52-0.59, 0.62-0.68, 0.77-0.86, 1.55-1.70</td>
<td>23.5</td>
<td>142</td>
</tr>
<tr>
<td>2</td>
<td>IRS-1D PAN</td>
<td>92/46</td>
<td>10-10-2008</td>
<td>0.5-0.75</td>
<td>5.8</td>
<td>70</td>
</tr>
</tbody>
</table>


The merged data gives accurate description of shapes, features and structures in an urban area. Such description makes the task of interpretation easier and helps in accurate land use/land cover classification system.

(b) Topographic sheets:
The survey of India topographic sheet on a scale of 1:50,000, No-43J/16 was used in the study. The guide map of the city on a scale of 1:20,000 was also used.

3.7 Data Analysis:
The analysis of these two date data enabled to map a total of 14 land use land cover classes spread over 23446.5 hectares of Srinagar city (which incidentally is also the Municipal limit). These classes include, Residential, Scattered settlement, Commercial, Industrial, Parks/Gardens & Playgrounds, Restricted area, Vacant Land, Agricultural Land, Plantation/Orchards, Forest, Barren, Marshy, Water body and Others (Edu, Govt, Hosp, Relig) (Figure 3.2 & 3.3). Despite rapid urbanization in the
Photo Plate 1: Town planning map of the Srinagar city, 1971 (Source: Town Planning, 1971)

Photo Plate 2: IRS-1D LISS III + PAN October 2008 merged satellite image of Srinagar city (Source: NRSA, 2008)
Figure 3.3

LAND USE/LAND COVER OF SRINAGAR CITY - 2008

LEGEND
- Main Roads
- Residential
- Scattered settlement
- Commercial
- Industrial
- Restricted
- Parks/Gardens & P.G
- Vacant
- Agriculture
- Plantation/Orchards
- Forest
- Barren
- Marshy
- Waterbody
- Others

SOURCE: Based on IRS-Id LISS III+PAN (2008) Merged Satellite Imagery
city, agriculture class is still dominating because Jammu and Kashmir is predominantly an agricultural state (Figure 3.4, 3.5, 3.6). Agriculture in its broad sense is the important activity of the state. Even those engaged in other sectors dependence on agriculture for food and raw materials are crucial. The statistics derived of different land use/cover classes is given in Table 3.4. The different land use/land cover classes are explained below:

3.7.1 Built-up classes:
In the present study, built-up classes include residential, scattered settlement, commercial, industrial, restricted and others (Educational, governmental, hospital and religious classes). Analysis shows that the built-up land has increased from 2416.5 hectares in 1971 to 6251.5 hectares (increase of 158 percent) in 2008 (Figure 3.7 & 3.8). This increase in built-up area is because of increase in population due to natural increase of population and in-migration from the neighbouring rural areas and towns to the city. Also the developments in secondary and tertiary sectors have resulted in increases to built-up land. The increase has taken place at the cost of non built-up land which has shrunk from 21030 hectares to 17195 hectares (decrease of 18.23 percent) during the study period. The general pattern of expansion is along the roads which are in the radial pattern. Since, government agencies are weak in maintaining the balance between the population increase and the developmental activities, resulting into expansion of the city in an unplanned manner.

During the study period the older central part of the city has become congested with hardly any open spaces. New built-up area came up in western, northern and southern parts of the city in the form of residential, commercial and governmental infrastructural development. The city expansion has been challenged by its surrounding physiographic features. Eastern region of the city is dominated by the hilly terrain and the far western part is marshy and water area. Therefore the expansion of the city has been limited to the other directions only. Moreover the state of Jammu and Kashmir lies in the active seismic zone, which somewhat restrict the vertical expansion of the city.
Table 3.4: Land use/Land cover of Srinagar city, 1971 & 2008

<table>
<thead>
<tr>
<th>Land use/Land cover</th>
<th>1971</th>
<th>2008</th>
<th>Change (in hectares)</th>
<th>% age Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Residential</td>
<td>1074.5</td>
<td>3851</td>
<td>2776.5</td>
<td>258.3</td>
</tr>
<tr>
<td></td>
<td>(4.58%)</td>
<td>(16.42%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Scattered settlement</td>
<td>146</td>
<td>399</td>
<td>253</td>
<td>173.2</td>
</tr>
<tr>
<td></td>
<td>(0.62%)</td>
<td>(1.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Commercial</td>
<td>143.5</td>
<td>268.5</td>
<td>125</td>
<td>87.1</td>
</tr>
<tr>
<td></td>
<td>(0.61%)</td>
<td>(1.14%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Industrial</td>
<td>90.5</td>
<td>226.5</td>
<td>136</td>
<td>150.2</td>
</tr>
<tr>
<td></td>
<td>(0.39%)</td>
<td>(0.97%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Restricted Area</td>
<td>446</td>
<td>715</td>
<td>269</td>
<td>60.3</td>
</tr>
<tr>
<td></td>
<td>(1.9%)</td>
<td>(3.04%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Parks/Gardens &amp; Playground</td>
<td>140</td>
<td>372</td>
<td>232</td>
<td>165.7</td>
</tr>
<tr>
<td></td>
<td>(0.59%)</td>
<td>(1.59%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Vacant Land</td>
<td>517</td>
<td>255</td>
<td>-262</td>
<td>-50.6</td>
</tr>
<tr>
<td></td>
<td>(2.2%)</td>
<td>(1.08%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Agricultural Land</td>
<td>14408</td>
<td>10949</td>
<td>-3459</td>
<td>-24</td>
</tr>
<tr>
<td></td>
<td>(61.45%)</td>
<td>(46.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Plantation/Orchards</td>
<td>1266.5</td>
<td>2622</td>
<td>1355.5</td>
<td>107</td>
</tr>
<tr>
<td></td>
<td>(5.40%)</td>
<td>(11.18%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Forest</td>
<td>346.5</td>
<td>153.5</td>
<td>-193</td>
<td>-55</td>
</tr>
<tr>
<td></td>
<td>(1.47%)</td>
<td>(0.65%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Barren</td>
<td>539.5</td>
<td>480</td>
<td>-59.5</td>
<td>-11</td>
</tr>
<tr>
<td></td>
<td>(2.3%)</td>
<td>(2.05%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Marshy</td>
<td>1667</td>
<td>468.5</td>
<td>-1198.5</td>
<td>-71.8</td>
</tr>
<tr>
<td></td>
<td>(7.1%)</td>
<td>(2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Water body</td>
<td>2145.5</td>
<td>1895</td>
<td>-250.5</td>
<td>-11.6</td>
</tr>
<tr>
<td></td>
<td>(9.15%)</td>
<td>(8.08%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Others (Edu, Govt, Hosp, Relig)</td>
<td>516</td>
<td>791.5</td>
<td>275</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>(2.2%)</td>
<td>(3.37%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>23446.5</strong></td>
<td><strong>23446.5</strong></td>
<td><strong>---</strong></td>
<td><strong>---</strong></td>
</tr>
<tr>
<td><strong>Total Built-Up</strong></td>
<td><strong>2416.5</strong></td>
<td><strong>6251.5</strong></td>
<td><strong>3835</strong></td>
<td><strong>158</strong></td>
</tr>
<tr>
<td><strong>Total Non Built Up</strong></td>
<td><strong>21030</strong></td>
<td><strong>17195</strong></td>
<td><strong>-3835</strong></td>
<td><strong>-18.23</strong></td>
</tr>
</tbody>
</table>

**Note:** Area in hectares.

Source: Based on Town planning map of Srinagar city 1971 on 1:15000 scale and IRS-1D LISSIII+PAN 2008 merged satellite imagery of Srinagar city.
Figure 3.4

Land Use/Land Cover of Srinagar City
1971 & 2008

Land Use/Land Cover Classes

- 1971
- 2008
Figure 3.5:

LAND USE/LAND COVER OF SRINAGAR CITY - 1971

LEGEND

- Residential
- Scattered settlement
- Commercial
- Industrial
- Restricted
- Parks/Gardens & Playground
- Vacant
- Agriculture
- Plantation/Orchards
- Forest
- Barren
- Marshy
- Water body
- Others(Edu, Govt, Hosp, Relig)

Figure 3.6:

LAND USE/LAND COVER OF SRINAGAR CITY - 2008

LEGEND

- Residential
- Scattered settlement
- Commercial
- Industrial
- Restricted
- Parks/Gardens & Playground
- Vacant
- Agriculture
- Plantation/Orchards
- Forest
- Barren
- Marshy
- Water body
- Others(Edu, Govt, Hosp, Relig)
Srinagar Municipal Boundary
Built up Area
River
Main Roads
LEGEND
1971 BUILT UP LAND USE OF SRINAGAR CITY -
ROAD TO GANDERBAL
ROAD TO BARAMULLA
ROAD TO PULWAMA
ROAD TO PAMPORE
ROAD TO DARCHAM

SOURCE: Based on Town Planning Map of Srinagar City (1971)

Figure 3.7

77
Figure 3.8

BUILT UP LAND USE OF SRINAGAR CITY - 2008

LEGEND
- Main Roads
- River
- Srinagar Municipal Boundary
- Built up Area

The details of different built-up classes is as follows:-

**(a) Residential:**
The residential land use class includes both planned as well as unplanned residential/houses. Planned settlements are areas consisting of dwelling units built according to a planned layout proposed by government agencies and societies, e.g., Srinagar Development Authority (SDA), Srinagar Municipal Corporation (SMC), and J&K Housing Board etc. Whereas unplanned residential areas consisting of houses built individually without any plan or layout. These include both the residential forming the core area with less or devoid of green and open spaces.

In the year 1971 total area under this category was 1074.5 hectares (i.e., 4.58% of the total study area) which increased to 3851 hectares (16.42% of the total study area) in 2008. This class has recorded an increase of 2276.5 hectares (Figure 3.9) of land area (i.e., 258.3 percent increase) during the study period.

**Unplanned residential** area in the year 1971 was confined to the core area only. It was observed on east and west bank of river Jhelum. The general trend of settlement distribution was observed in north and south direction only because the area lying to its east is occupied by water body and western part was mostly marshy area. The important places where unplanned residential land use was observed includes Bar Bar shah, Ganpatyar, Bana Mohalla, Rainawari, Khangah Mualla, Khoja Bazar, Khanyar, Jogilankar, Saidakdal, Nowhatta, SR Gunj, Safakadal, Ali Kadal, Kowdara, Chattabal, Habba Kadal, Shaheed Gunj, Karan Nagar, Batamaloo, Maisuma. All these areas are lying in the older central part of the city. Also some sparse patches were mapped in the outskirts of the city at Hazratbal, Tail Bal, Harwan, Zoonimar in north and Bhagat, Rawalpora and Natipora in the south. These areas are characterized with narrow lanes without proper drainage and street lighting. However, the houses are good, built in concrete but old fashioned and generally two storied. Some are very old mud houses, about 80 to 100 years old. People belonging to these areas are mostly from poor economic strata. Also a good number among them are government employes. About 98% people residing in Zoonimar and Eidgah in the north are running small scale Kashmir Handloom Industry (locally called as Kashmir Arts).
Figure 3.9

RESIDENTIAL LAND USE OF SRINAGAR CITY - 2008

LEGEND

- Main Roads
- River
- Srinagar Municipal Boundary
- Residential Area


Figure 3.9
Photo Plate 3: Old City Residential Area

Photo Plate 4: New Residential Area
New unplanned residential areas came up in the outer areas of the city. These places include Zainakot, Malura, Parimpora and Bemina in west, Soura and Ahmad Nagar in the northern end, Magarmal Bagh in south west of the city etc. Houses observed are old fashioned, mostly two storied resembling village like infrastructure. People in these localities are mostly engaged in agricultural activities. Some slums and squatter settlements have been observed at Bemina in the west. In addition to it, numerous sparsely distributed unplanned residential land use were mapped in the outskirts of the city.

Planned residential area in the year 1971 was observed at Karan Nagar, Jawahar Nagar, Wazir Bagh, and Rajh Bagh; lying in the core area. These were the residential areas of the royal Dogra people during Dogra rule in Kashmir and these residential areas have shown significant increase during the study period (1971-2008). Newly planned residential areas came into existence at Lal bazar in the north and Chanapora, Natipora, Bhagat Barzulla, Rawalpora in south and Bemina in the west. Housing condition is very good in these areas; designed with modern architecture and are having adequate amenities and facilities. These houses include two to three storied bungalow type houses, built with concrete. These are well organized and planned colonies, with mettled roads. Generally people of higher economic and social strata are found here.

(b) Scattered settlement:
Scattered settlement includes the settlements including small hamlets/houses in the periphery of the city. In the year 1971 the total area under this category was 146 hectares (0.62% of the total study area) which increased to 399 hectares (1.7% of the total study area) in 2008. Some of these important settlements mapped were Nishat, Ishbar, Brain, Shalimar and Harwan etc., in the east, on the foothills of Zabarwan and Basiwan mountain peaks. People belonging to these settlements were mainly engaged in agricultural activities i.e., cultivation of paddy, various other food crops and cattle rearing etc. Later, they changed occupations to work in various secondary and tertiary activities.
(c) Commercial:

Commercial area includes those places of the city where trade and commerce is carried out. The total area under this category in the year 1971 was 143.5 hectares (0.61% of the total study area), which increased to 268.5 hectares (1.14% of the total study area) in 2008 (an increase of 125 hectares) (Figure 3.10). The places where commercial land use was observed includes Boulevard, Karan Nagar, Habba Kadal, Residency Road, Polo View, Court Road, Kokar Bazar, Maisuma, Wazir Bagh, Shaheed Gunj and Dalgate. All these area are located in and around the city centre i.e., Lal Chowk (CBD). Also, Hazratbal area adjoining to Dal Lake in the north, Fruit Mandi area at Parimpora in the west are some other commercial areas which are away from the city centre.

Boulevard area along the banks of Dal lake is another important commercial area. This area is an important tourist spot where various hotels and handicraft shops are observed. Lal Chowk is another important commercial area which includes Polo view, Residency road, Kokar bazar, Maisuma. These are the busiest and crowded places of the Srinagar city. People from all over India as well as Kashmir flock this area for buying and selling of goods and services. Polo-view and Residency road markets deals with the trade of retail readymade garment, banks, electronic gadgets, automobile show rooms, dry fruit and also the Kashmir Handloom Industry goods (Kashmir Arts). Court road, Kokar bazar, Wazir Bagh deals in both retail as well as wholesale trade of cloth, electronic gadgets, cosmetics, and various daily use goods. Maisuma market deals in automobile spare parts and accessories, and various building hardware goods etc. Habba Kadal is an old market with dilapidated and congested lanes where various traditional eatables, embroidery, and other daily need goods are sold. Karan Nagar and Shaheed Gunj commercial areas located on west of river Jhelum, in core area of the city, is a recent commercial development where handicrafts specializing in carpet goods are sold. In this area, people have rented their houses for commercial purposes. Similarly, Hazratbal commercial area deals in daily need goods. This area got developed because of religious and educational attraction by the Hazratbal Shrine and Kashmir University respectively. Lastly, the Fruit Mandi at Parimpora deals with the wholesale trade of fresh fruits.
Figure 3.10
Photo Plate 5: Commercial Area

Photo Plate 6: Industrial Area
(d) Industrial:
The industrial land use in the study area includes textile weaving, refining, construction, manufacturing and household industries. In the year 1971, the total area under this class was 90.5 hectares (0.39 \% of the total study area), which has increased to 226.5 hectares (0.97\% of the total study area) in 2008 (Figure 3.10). Although there is an increase of 136 hectares, but while comparing this share with the total land use of the study area, this percentage is insignificant.

The places of industrial land use include; H.M.T watch factory at Zainakot in northwest of the city. Bagh-I-Ali Mardan Khan light industrial area involves processing of raw materials e.g., spices, copper and steel wiring, ceramic and concrete tiles, wool products etc. Khrew and Khanmou industrial area in the southeast of the city carries out large scale cement manufacturing. Wineer industrial area at Parimpora in the southwest of the city is the old industrial area and contributes significant area to industrial land use. Here, timber is processed into various finished goods like wooden box for fruit packing, plywood manufacturing etc.

Jammu and Kashmir has good potential for industry and investment, but it could not flourish because of number of reasons. Firstly, the bar under Article 370 on absolute ownership of land for outsiders is the main obstacle. Similarly, the geographical accessibility to Srinagar city from the rest of India is weak, which hinders the transportation of raw materials and the finished goods. Moreover, the city lacks in basic raw materials and the ongoing political instability since 1980s, all have restricted the industrial development.

Industry in Srinagar city is promoted by the Department of Industries and other Public sector organizations, namely SIDCO, SICOP and JK Industries. These are the subsidiary public sector organizations of the government. There are incentives of power, land, raw material, transport of raw material and finished goods to and from the rail head Jammu. In spite of all these incentives not much change has occurred.

(e) Restricted Area:
Restricted area includes the area which is under military jurisdiction, i.e., cantonments, military barracks, military camps etc. In the year 1971 the total area
under this land use category was 446 hectares (1.9% of the total study area) which increased to 715 hectares in 2008 (3.04% of the total study area) (Figure 3.10), thereby experienced an increase of 269 hectares during the period of 37 years.

The places where restricted area was observed includes Badami Bagh cantonment area located to the northeast of Lal Chowk (CBD), on east bank of river Jhelum. Tattoo ground military camp; located in the west of city centre, Srinagar Airport area (Army base) at Humhama in south of the city. Police colony at Khumani Chowk in south west, Raj Bhavan; governor’s residence at Chashma Shahi in East (at the foothill of Zabarwan mountain). Sharifabad cantonment area; is the army base camp of Indo-Pak border in northwest of the city outskirts. It is also one of the oldest and largest cantonment areas of Srinagar.

3.7.2 Non built-up classes:

Non built-up classes include parks/gardens & playgrounds, vacant land, agricultural land, plantation/orchards, forest, barren, marshy area and water bodies. In the year 1971, the total area under these classes was 21030 hectares which decreased to 17195 hectares in 2008. The decrease is attributed to the increasing anthropogenic pressure on the available land resources. As the population grew in the city, the demand for more and more land increased which led to the conversion of ecologically important non built-up land use/cover classes into built-up classes.

Presently the non built-up area is distributed all over the study area. Agriculture is found in the dispersed patches, mostly in the periphery of the city. Similarly, vacant land and plantation/orchards are also found in the scattered patches, in the city outskirts. Barren, i.e., the rocky land is found around Koh-i-Maran and Koh-i-Sulaiman hill in the core of the city. Marshy areas are confined close to the water bodies. The important water bodies are; the Dal Lake in the east, Nigeen Lake in the northwest of Dal Lake and Brari Nambal located in the core area, river Jhelum running through the city from southeast to northwest direction. Following is the detailed explanation of these non built-up land use/land cover classes of Srinagar city:-
(a) Parks/Gardens & Play grounds:
This category includes various parks/gardens and playgrounds where people carry out recreational activities and these form an important part of city’s culture. In the year 1971 total land area under this class was 140 hectares (0.59% of the total study area) which increased to 372 hectares (1.59% of the total study area) in 2008 (Figure 3.10). Despite urban expansion, the total area under this class increased by 232 hectares. At the same time its proportion to the total study area is still low as compared to the developed world. The parks are important attraction of Srinagar city. Initially developed by Mughal rulers but some more parks and gardens have been added in the recent past.

Similarly the city also has many playgrounds to cater the requirements of city and state sportsmen. The presence of army persons are also helped in the development of sports facilities to the city. The Parks/Gardens & Play grounds observed are mostly the famous Mughal gardens and others like Shalimar Bagh, Harwan garden, Nishat Bagh, Botanical garden, Tulip garden, Zabarwan Park, Golf course, Polo ground, Nehru Park, Cricket pavilion, Sher-i-Kashmir Park and Iqbal Park etc.

_Nishat Bagh_ is located in the east at the foothills of Zabarwan mountain. It is about 11 Km from the city center. It was built by Emperor Jehangir in 1633 A.D. after his first visit to Kashmir. This garden is 600 yards long and 350 yards wide. *Shalimar Bagh* was built by Emperor Jehangir for his wife Nur Jahan in 1616 A.D. It is located in the northeast of the city and is about 15 km away from the city center. It is about 600 yards long and 200 yards wide. It is surrounded by brick and stone wall of about 10 feet height, and is arranged in four terraces of nearly equal dimension. *Harwan garden* is located to the northeast of Shalimar Bagh at Harwan. It is adjacent to the water reservoir at the foothills of Zabarwan mountain which feeds most parts of the Srinagar city. *Tulip garden, Botanical garden and Zabarwan Park*, are the recently constructed parks and gardens in the city. *Tulip garden* is the biggest and one of the beautiful tulip gardens of Asia. _Nehru Park_ is an island park which adds to the beauty of the Dal Lake. Every year millions of tourists from outside the state and other countries visit these parks and gardens. About 80% of the income generated in tourism industry of Jammu and Kashmir is from these parks and gardens.
Photo Plate 7: Parks and Gardens

Photo Plate 8: Vacant Land
Golf course, Polo ground, and Sher-i-Kashmir Park at the city center, Cricket pavilion at Sonawar (north of Koh-i-Sulaiman hill), Bakshi stadium and Indoor Stadium at Wazir Bagh (south west of Lal Chowk) are the important play grounds in the study area.

(b) Vacant Land:
Vacant land includes the land belonging to locals who left crop cultivation, most of which is speculative land holding. This class also includes the abandoned government land. Increasing demand from growing population leading to rapidly increasing land prices has resulted into the decrease in area under vacant land.

In the year 1971, the total land area under this category was 517 hectares (2.2% of the total study area), which decreased to 255 hectares (1.08% of the total study area) in 2008 (i.e., decreased by 262 hectares) (Figure 3.11). The existing vacant land was observed at Zakura & Tailbal in the northern end of the city which is about 10-12 km away from city centre. Also good proportion of vacant land was observed in the west and some patches at Ahmad Nagar in the northwest of the city. Although, vacant land was observed away from the city center, but at the same time these areas are well connected with the roads and possess all the basic amenities and facilities. Most of these vacant lands are speculative land holdings and in the recent past, very rapidly it is being converted as built-up land.

(c) Agricultural Land:
In the present study Agricultural class includes mostly Paddy land, Floating/vegetable gardens (locally called as Radh) and Saffron Karewa fields. In the year 1971 the total area under agricultural land use was 14408 hectares (61.45% of the total study area) which decreased to 10949 hectares (46.7% of the total study area) in 2008 (Figure 3.12). Thereby 3459 hectares of agricultural land has been lost during the period of 37 years in Srinagar. Paddy is the dominant crop in agricultural land use.

The places where the Paddy land still dominates include; Alestang, Ahmad Nagar, Buchpora and Zakura in the north; Palapora, Malura, Lawaypora, Zainakot
Figure 3.11
Figure 3.12

AGRICULTURE LAND USE OF SRINAGAR CITY - 2008

LEGEND

- Main Roads
- River
- Srinagar Municipal Boundary
- Agriculture Area

Photo Plate 9: Agricultural Land

Photo Plate 10: Plantation/Orchards
and Khumani Chowk in the west; Humhama in the south. These places are plain
areas of Srinagar and are lying about 10–12 km away from the city centre. Similarly,
New Theed, Harwan & some parts of Nishat in northeast are the hilly areas where
terrace farming is practiced and lastly, Khanmou in the southeast also has some
patches of paddy land.

Floating garden is the peculiar characteristic feature of the valley of
Kashmir. These are found generally in and around the water bodies and the wet
lands of the Srinagar city. Most of them are observed in the western part of Dal Lake
and Khushalsar wet land in the north. These gardens are owned by the boatmen
(locally called as Hanjis) who cultivate vegetables on these movable lands on water
surfaces.

Saffron cultivation is practiced on the famous Karewas in the southeast of
Srinagar. It is an important land use feature of Kashmir, where world’s best Saffron
is grown.

The agricultural land in the study area is mostly single cropped area where
paddy is grown. Some of these agricultural lands especially at hill slopes have
terrace farming.

(d) Plantation/Orchards:
Srinagar city was known for its orchards and the present orchards are the remains of
those ones. These orchards have now been converted into urban usages. These
places still bear the names of those orchards e.g., Raj Bagh, Ghulab Bagh, Wazir
Bagh, Mander Bagh and so on. “Bagh” in local Kashmiri language means an
Orchard. Orchards of Srinagar city have the plants of Cherry, Apple, Almond, Pearl,
Walnut, Apricot and also willow plantation.

In the year 1971 the total area under this class was 1266.5 hectares (5.40% of
the total study area) which increased to 2622 hectares (11.18% of the total study
area) in 2008 (Figure 3.13). This class has increased by 1355.5 hectares during the
study period. Significant proportion of land under Orchards was found in north at
Zakura, Alasteng, area in the north at Tail Bal, some patches at Omer colony in the
north. Apple orchards are located in the Khumani Chowk and Humhama in
southwest and southern end of the city respectively.
Figure 3.13

PLANTATION/ORCHARD LAND USE OF SRINAGAR CITY - 2008

LEGEND

Main Roads
River
Srinagar Municipal Boundary
Plantation/Orchard Area

Similarly, Willow plantation was found in small patches spread all over the study area. Significant area under Willow plantation was found along the banks of river Jhelum at Palapora, Malura and Zainakot in the west. Some Willow plantation was also observed at Nishat and Harwan in the east along the foothills of Zabarwan. Plantation area was also observed in Lokut Dal area.

(e) Forest:
Forest class includes the dense vegetation cover observed in the hilly areas of the city. In the year 1971, the total area under this class was 346.5 hectares (1.47% of the total study area) which decreased to 153.5 hectares (0.65% of the total study area) in 2008, recording decrease of 193 hectares (Figure 3.11). Presently, it was observed in the hilly areas of the city i.e., Koh-i-Maran and Koh-i-Sulaiman, and in southeast at Zabarwan foothills.

(f) Barren:
Barren class includes the bare exposed rocks, along with some quarrying. These are the areas of less vegetation and have limited ability to support life. In the year 1971 the total area under this class was 539.5 hectares (2.3% of the total study area) which decreased to 480 hectares (2.05% of the total study area), thereby losing 59.5 hectares (Figure 3.11).

This class was observed in the rocky areas of the city. Barren lands include the bare rock surfaces of Koh-i-Maran and Koh-i-Sulaiman hills. These areas are located in the north at a distance of about 8 km and in the southeast at a distance of about 2 km from the city center respectively. Similarly, some patches at Sharifabad in the northwest, Khanmou quarrying site in the southeast. Also some patches were observed in the north at Alestang and New Theed hilly areas.

(g) Marshy Area:
The marshy area includes the wet lands found in and around the water bodies of the city. In these areas water table is at, near, or above the land surface for a significant part of the year. Srinagar city had substantial area coverage under this type of land use class. Prominent among them are Bemina Nambal or Rakh-i-Gandakshah marsh,
Photo Plate 11: Marshy Area

Photo Plate 12: Water Body
Batamaloo, Littorals of Dal and Nigeen Lake, Khushalsar, Gillsar, Brari nambal, Mar Canal etc.

In the year 1971 the total area under this category was 1667 hectares (7.1% of the total study area) which decreased to 468.5 hectares (2% of the total study area) in 2008 (Figure 3.11). The marshy area was also not spared by the urbanization process in the study area. It lost 1198.5 hectares during the period of 37 years.

Presently, it exists in the eastern part of Dal Lake, Khushalsar marsh in the north, Brari Nambal located at a distance of 2 km north from city centre, small patches at Bemina and Parimpora in the west etc. These areas are owned by boatman (Hanjis) who derive out their sustenance from these marshes by cultivating fruits and vegetable which require water throughout their growth period. In recent years, government has demarcated these marshy areas as the green belt zone to restrict their conversion.

(h) Water Body:
In the present study water body includes the rivers, lakes and water reservoirs of the city. In the year 1971, the total area mapped under this category was 2145.5 hectares (9.15% of the total study area) which decreased to 1895 hectares (8.08% of the total study area) in 2008 (Figure 3.14). The anthropogenic pressure has resulted in the shrinking of water bodies in the study area.

Srinagar city is endowed with numerous water bodies. The existing water bodies of the city includes; the Dal Lake, Nigeen Lake, River Jhelum, Brari nambal, Tailbal Nallah and Harwan water reservoir. The lakes are the centres of tourist attraction, but at the same time, these water bodies are getting deteriorated both in area as well as in their quality of water. River Jhelum is another important water body of Srinagar city, which originates in the south east of Kashmir at a spring (Verinag). During its course, it dissect Srinagar city diagonally in southeast to northwest direction. Also, various other small tributaries join it during its course. Northern area of Brari nambal in the core area, Tailbal Nallah located to the northeast of Dal Lake which also feeds the Lake. Harwan water reservoir at Harwan in the northeast of city, supplies water to most parts of the city.
Figure 3.14
(i) Others (Educational, Governmental, Hospital, and Religious):  
In this class, four built-up classes have been grouped together because their individual proportion to the total land use of the study area was not significant. Educational class contributes only 1% to the total study area, governmental (1.47%), Hospital (0.47%) and religious (0.43%). However, during the study period, all these classes have gained significant area. Educational class includes government and private Schools, Colleges, Universities. Governmental class includes government offices, residential and quarters. Hospital land use includes government and private hospitals and health centers. Religious land use includes graveyards, cremation grounds, and religious places.

In the present study, the total area under this class in the year 1971 was 516 hectares (2.2% of the total study area) which increased to 719.5 hectares (3.37 % of the study area) in 2008, (i.e., increased by 275.5 hectares).

The educational land use observed includes Sher-i-Kashmir University of Agricultural Sciences and Technology at Shalimar located in northeast, about 12 km away of the city centre. University of Kashmir and National Institute of Technology located at Hazratbal about 9 km north of city centre. Sri Pratap Singh College and Higher Secondary school, Government College for Women’s, Government college of Education, Kothi Bagh girl’s higher secondary school, Tyndale Biscoe and Mallinson convent School, Presentation convent school for girls, Burn hall convent school, Amar Singh college and Government Polytechnic all are located in and around the city centre i.e., Lal Chowk area. Government degree college Bemina and, Iqbal Memorial school located about 6 km west of Lal Chowk, Islamia college at Maideen sahib in the north about 8 km from the city centre.

The government offices and residential mapped are Department of Animal Husbandry, Department of Information, Directorate of Education, Public Health Engineering (P.H.E), Manager BSNL, Directorate of Tourism. All are located at Lal Chowk (CBD). Department of Revenue, Board of School Education, Government Garages, Directorate of Environment and Remote Sensing, Srinagar Development Authority are located at Bemina in the west. Similarly, Department of Agriculture, Chief Executive Engineer’s office, District Police Lines, Deputy Commissioner’ office (D.C’s office) and Civil Secretariat, located in and around Lal Chowk.
**Hospital** land use has significantly increased during the study period. In the year 1971 there were few hospitals namely Jawahar Lal Nehru Hospital, Shri Maharaja Hari Singh Hospital (SMHS), Lala Ded Maternity Hospital and Children's Hospital. These are located in and around the core area of the city. After 1971, number of hospitals were built for example, Sher-i-Kashmir Institute of Medical Sciences (SKIMS) and Jhelum Valley College in the north and west of the city respectively.

**Religious** land use includes grave yards, mosques and temples of the city e.g., Malakah, Buchwara, and Kawdara in the north. Only one cremation ground was observed in the core area. Srinagar city is the Muslim dominated state, therefore, numerous Muslim religious places are found. Apart from this, few Hindu religious places are also found there because in past, the state of Jammu and Kashmir was ruled by Hindu rulers for a long period of time. Some of the important religious places are Jama Masjid which is the biggest mosque of the city, Shankaracharya Temple on top of Koh-i-Sulaiman hill, Dargah Hazratbal on the west bank of the Dal Lake and Eidgah in the north.

### 3.7.3 Overview of Land Use/Land Cover of Srinagar City:

Located on the banks of River Jhelum, Srinagar city has peculiar pattern of land use/land cover than the other cities of India. This peculiarity is because of hill topography and different social, economic and political environment of the study area. The study finds water bodies (8%), plantation/orchards (11.2%) and marshy area (2%) as significant land use classes. These features give the picturesque look to the city, thereby differentiating it with the other cities in the plain areas. It is a city located at an elevation of 1583 meters above mean sea level and at the same time is a leveled plain which enables it to accommodate nearly 1 million people. Besides it, Srinagar city is the centre of trade, education, Arts and Crafts etc in the state of Jammu and Kashmir ever since its evolution. It has functioned as a central place in socio-economic life, hub of political activities, place of important religious activities and the centre in the spatial framework. The built-up land contributes more than 26% land area to the total land use/cover of the Srinagar city.

From time to time, the city was ruled by various rulers, belonging to different religions, regions and dynasties, who shaped its land use according to their
desires. Mughals in the 16th century designed the city as per their luxurious styles. They built various parks/gardens, cultural and religious monuments e.g., Nishat Bagh, Shalimar Bagh, Pari Mahal etc., which are today known as the Mughal gardens. These parks/gardens and playgrounds today contributes significant proportion to the total area of the city. Later in the early 19th century, during the Dogra rule in Kashmir various royal residential areas came into existence e.g., Karan Nagar, Wazir Bagh, Gogji Bagh and Rajh Bagh etc. They gave the administrative look to the city.

Later, with the onset of urbanization, physiographic limitations e.g., Dal lake in the east, marshy area in the west, hilly tracks in the north and the mountain peaks in the east and northeast played its role in shaping city’s landscape. However, because of the growing demand for land, people started to live at the foothills. However these land use features act directly as well as indirectly in the growth and development of city’s economy through Tourism and allied activities.

The political disturbance in the state has also resulted in the change in land use pattern. There has been significant increase in the area under restricted land use class.