

# Changing Land Use/ Land Cover Analysis in Pulwama District of Jammu & Kashmir

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**Abstract-** Rapid and extensive modifications of land use /land cover due to accelerated human activities have been a major cause of global environmental change in the past three centuries. During the past 20 years, humans changed these landscapes to meet the growing demand for food, fodder, timber, fiber and fuel more rapidly and extensively than in any comparable period of time. Changes in land use/ land cover have occurred to such an extent that it has significantly affected the functioning of biosphere, being one of the most important causes of biodiversity loss as well as climate change. This change is one of the primary causes of soil degradation and has a major impact on the provision of ecosystem services to people. Although this phenomenon is global in nature and is neither region specific nor country specific. But the nature and magnitude varies from one part of the globe to other, from developed to developing and under developed part of the world. It varies from plains to deserts and mountains. The present study is based on changing land use / land cover analysis with special reference to agroforestry in Pulwama District of Jammu & Kashmir, which is located in the central part of Kashmir Valley and is mostly dominated by agricultural occupation. The study is based mainly of secondary sources. A multi-temporal analysis was carried out in order to analyze the extent as well as direction of change. The study revealed that in Pulwama District, there was a major change in some of land use/ land cover categories. The change was mainly because of shifting to horticulture and agriculture plantation which are economically beneficial and also due to increasing pressure of population resulting in to a lot of residential and commercial developments. Therefore it becomes imperative to develop a sustainable land management strategy that does not cause the degradation of such valuable resources.

**Index Terms-** Landscape, Biosphere, Degradation

## I. INTRODUCTION

Rapid and extensive modifications of land use /land cover due to accelerated human activities have been a major cause of global environmental change in the past three centuries, although evidence for land cover alteration dates back many thousand years. Over the past 200-300 years, humans have been dominant drivers of landscape transformations (Vitousek et al., 1997). During the past 20 years, humans changed these landscapes to meet the growing demand for food, fodder, timber, fiber and fuel more rapidly and extensively than in any comparable period of time (Millennium Ecosystem Assessment, 2005). Changes in land use/ land cover have occurred to such an extent that it has

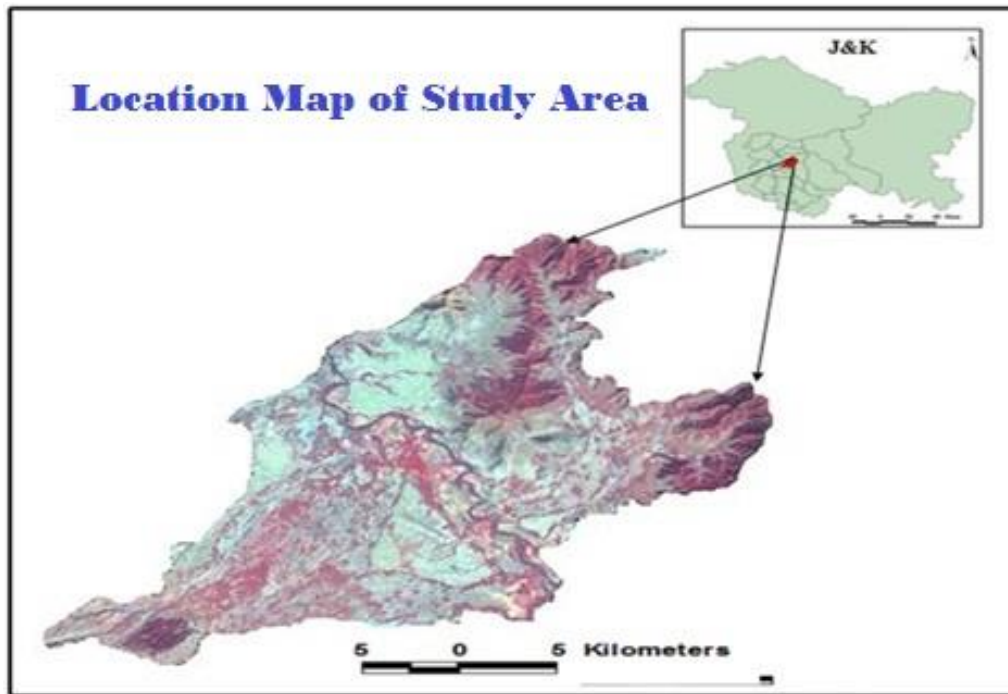
significantly affected the functioning of biosphere, being one of the most important causes of biodiversity loss as well as climate change. This change is one of the primary causes of soil degradation and has a major impact on the provision of ecosystem services to people. Although this phenomenon is global in nature and is neither region specific nor country specific. But the nature and magnitude varies from one part of the globe to other, from developed to developing and under developed part of the world. It varies from plains to deserts and mountains. Land use/ land cover change in mountainous areas have wider ramifications. The ecosystem is fragile and it is more susceptible to the negative impacts of this change. Deforestation bad agricultural practices, unplanned growth of settlements and developmental activities have wide ranging effects in mountainous regions. Kashmir valley is known for its beauty throughout the world. This valley has snow clad mountains, diverse landscapes cascading rivers and streams etc. But this vale has been experiencing environmental deterioration since last several decades. The lush green forests which dotted the landscapes have started dwindling because of the unprecedented anthropogenic impact. The land use/ land cover pattern has changed over the period of time. The forest cover has decreased not only in extent but also in terms of density. (Kango and Qadri, 1984; Ahmed, 2009). This land has been brought under agriculture, agriculture plantation, settlement and horticulture uses. Globally, remote sensing and GIS technologies are being applied to carry out change detection studies for land use/ land cover analysis especially in mountainous regions where there are other constraints besides accessibility.

The present study/ has been carried out to identify the existing land use/ land cover analysis of district Pulwama. The detailed work has been carried out with the following **objectives:**

- (i) To observe the existing land use/land cover analysis in the study area.
- (ii) To workout the factors responsible for land use/ land cover change.

## II. STUDY AREA

The study area is the Pulwama district of Kashmir valley. It came into being in 1979 when it was carved out of Anantnag district. It is centrally located in the valley of Kashmir, situated between the geographical coordinates of 33°37' -34°06' N latitude and 74°33' -75°14' E longitude.



Source: IRS P6 LISS III (2010)

Fig. 1.1

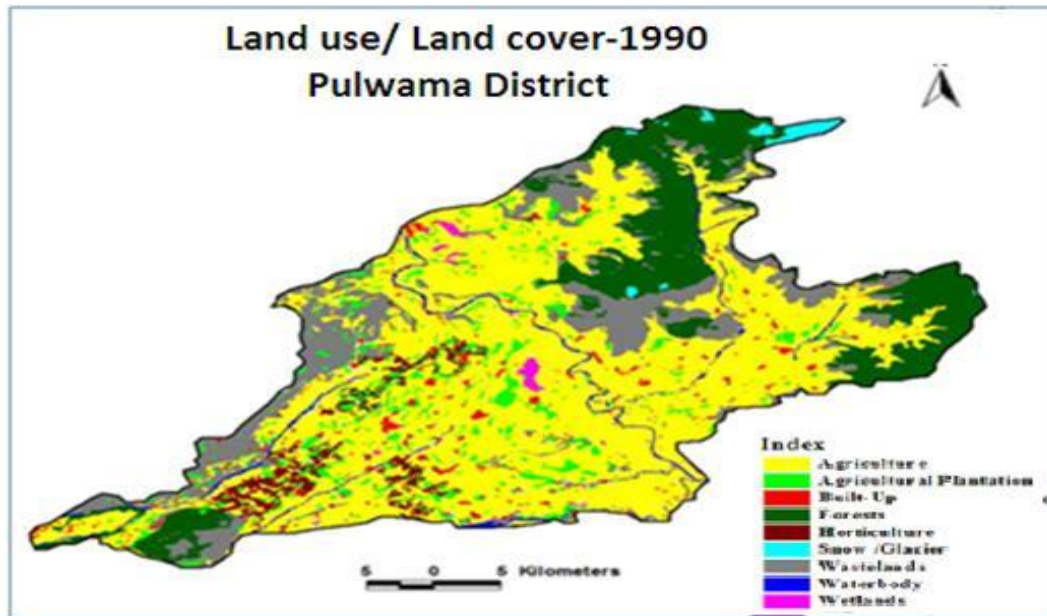
#### Data base & Methodology

The study area was delineated from the SOI toposheet No.43 K/13, K/14, J/16 and O/5 of 1961 on 1:50,000 scale. Land use map was generated by using images of the two time periods of the year 1990 and 2010. The land use/land cover map for 1990 was generated from Landsat-TM (1990) with resolution of 30 meters while as the land use / land cover map for 2010 was generated by using IRS P6 LISS-III (2010) image with a resolution of 23.5 meters, through the method of digitization in Arcview 3.2 a GIS software. These two images were compared to work out the change detection. The generated land use / land cover maps of the two different time periods were validated after ground truthing.

area. The agriculture plantation covered an area of about 3914 hectares that accounted a percentage of 4.97 of the total land area. The total area under built up category was 1793 hectares which constitutes about 2.28 percent. Forests accounted for 12487 hectares accounted a percentage of 15.86 of the total land area. Horticulture occupies an area of about 2527 hectares constitutes a percentage of about 3.21 of the total land area. Snow/ Glacier covered an area of 584 hectares constitutes 0.74 percent. The wasteland covered an area of about 13157 with a percentage of about 16.71. The water body covered an area of 1425 hectares and constitutes a percentage of about 1.81 and the wetland covered an area of about 360 hectares, thus occupying a percentage of about 0.46.

#### III. LAND USE & LAND COVER ANALYSIS - 1990

The analysis of land use /land cover of the study area for the year 1990 and 2010 were done in order to detect the changes that had taken place in different categories. The Table 1.1 and Fig.1.2 reflects that in 1990, the total area under agriculture category was 42503 hectares about 53.97 percent of the total area of the study

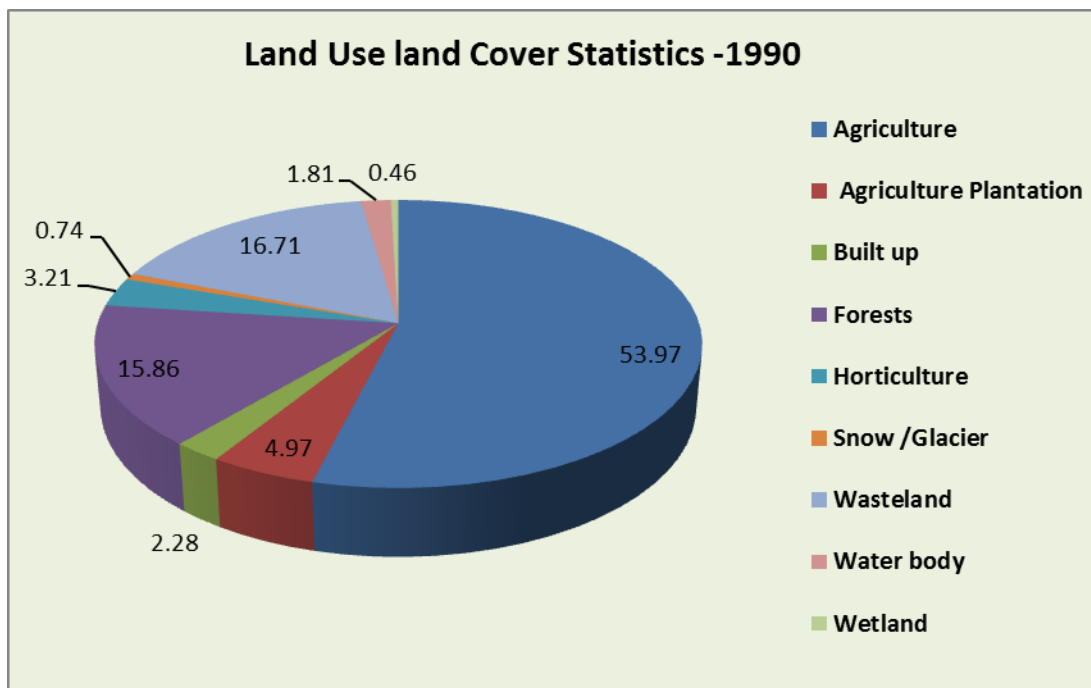


Source: Landsat-TM (1990)  
 Fig. 1.2

Table 1.1: Land Use/ Land Cover of Pulwama District (1990)

Land use / Land cover classes	Area (Hectares)	% of the total area
Agriculture	42503	53.97
Agriculture Plantation	3914	4.97
Built up	1793	2.28
Forests	12487	15.86
Horticulture	2527	3.21
Snow /Glacier	584	0.74
Wasteland	13157	16.71
Water body	1425	1.81
Wetland	360	0.46
<b>Total</b>	<b>78750</b>	<b>100.00</b>

Source: Landsat-TM (1990)



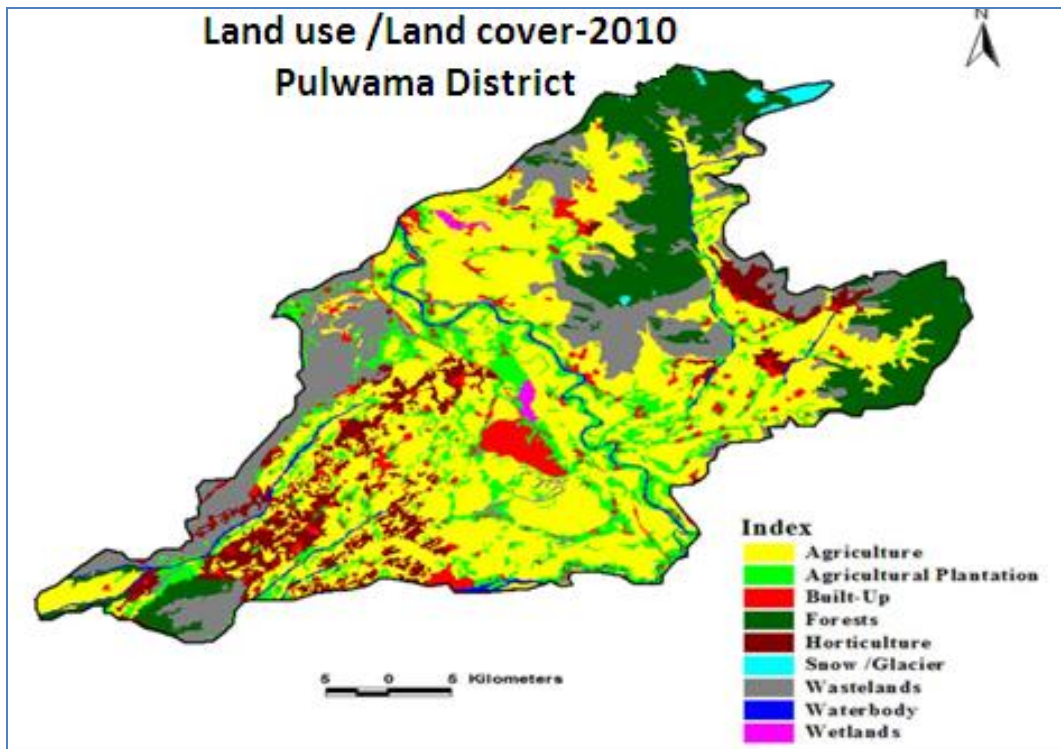
Source: Landsat-TM (1990)

Fig. 1.3

#### IV. LAND USE/LAND COVER ANALYSIS-2010

Land use/Land cover status of year 2010 reveals that there has been discernible change in some of the categories. The Table 1.2 and Fig. 1.2 shows that so far as agriculture is concerned it recorded total area of 34569 hectares accounts 43.90 percent, which means a decrease in area under this land use. The agriculture plantation showed an increased trend and covered an area of 9399 hectares, accounted a percentage of 11.94 of the total land area. The built up covered an area of 3844 hectares

constituted a percentage of 4.88 of the total land area. The forests accounted 11408 hectares i.e. about 14.49 percent of the total geographical area of the district. Horticulture constituted an area of about 5483 hectares accounts 6.96 percent. The area under snow cover is 449 hectares with a percentage of about 0.57. The wasteland category covered an area of 11999 hectares and accounted a percentage of 15.24 of the land. The water body covered an area of 1308 hectares accounts 1.66 percent and the wetland constituted an area of 291 hectares constituted a percentage of 0.37 of the land area.

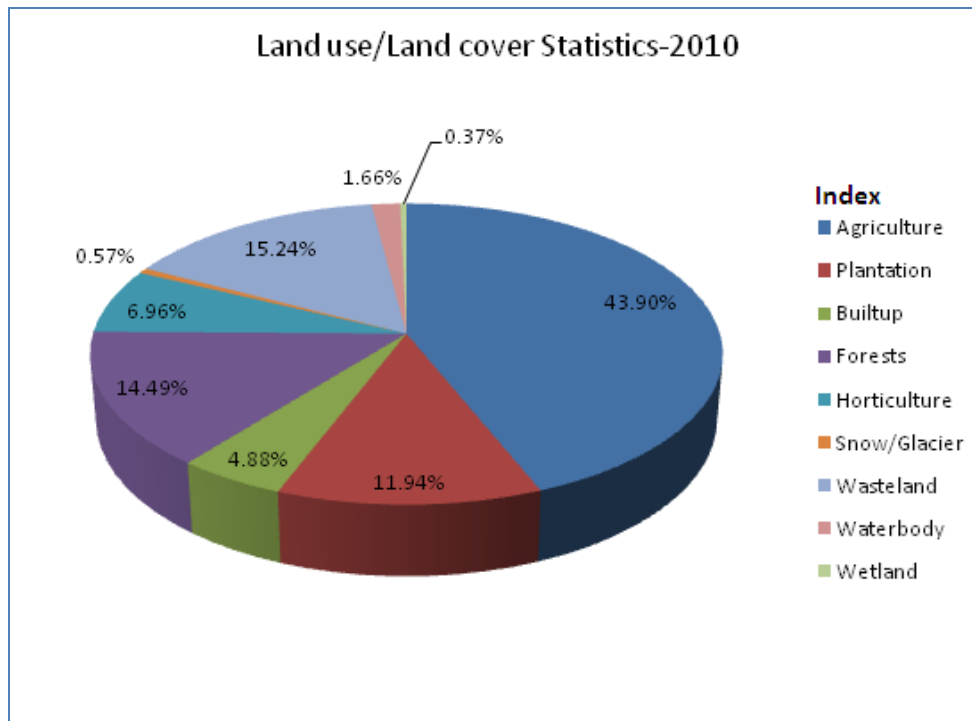


Source: IRS P6 LISS III (2010)  
 Fig. 1.4

Table 1.2: Land use/ Land cover of Pulwama District (2010)

Land use / Land cover classes	Area (Hectares)	% of the total area
Agriculture	34569	43.90
Agriculture Plantation	9399	11.94
Built up	3844	4.88
Forests	11408	14.49
Horticulture	5483	6.96
Snow /Glacier	449	0.57
Wasteland	11999	15.24
Water body	1308	1.66
Wetland	291	0.37
<b>Total</b>	<b>78750</b>	<b>100.00</b>

Source: IRS P6 LISS III (2010)



Source: IRS P6 LISS III (2010)

Fig. 1.5

#### V. CHANGE DETECTION ANALYSIS-1990-2010

The change detection analysis was performed in order to analyse the change in land use/ land cover that has occurred from 1990-2010. The perusal of Table 1.3 reveals that there has been discernible change in land use / land cover status of the study area during the years from 1990 to 2010. The land under agriculture has shown a remarkable change as it has decreased from 42503 hectares in 1990 to 34569 hectares in 2010, a decrease of 7934 hectares depicting a negative growth rate of 18.66 percent and an average annual negative growth of 0.93 percent. As far as agriculture plantation is concerned, there was an area of 3914 hectares in 1990 and in 2010 the area under this category was 9399 hectares showing an increase of about 5485 hectares. This category showing a growth rate of 140.13 percent and an annual growth of 7.00 percent. The built up area in 1990 was 1793 hectares and in 2010 it was 3844 hectares accounting an increase of 2051 hectares. The growth rate in this category was 114.38 percent and an annual average growth was 5.71 percent. The total area under forest category was 12487 hectares in 1990 and in 2010 it was only 11408 hectares, registering a negative growth rate of 8.64 percent and an average annual negative growth rate of 0.43 percent. The land under horticulture

has increased. It was only 2527 hectares in 1990 but in 2010 it was 5483 hectares depicting an increase of about 2956 hectares during the period from 1990 to 2010. This category showing a growth rate of 116.97 percent and an average annual growth of 5.84 percent. The snow covered an area of about 584 hectares in 1990 and in 2010, it was only 449 hectares showed a decreasing trend of about 135 hectares. It is showing a negative growth rate of 30.06 percent and an annual average negative growth of about 1.50 percent. The area under wasteland has also decreased, it was 13157 hectares in 1990 and in 2010 it was only 11999 hectares registering a decrease of about 1158 hectares, showing a negative growth rate of 8.80 percent and an annual average negative growth rate of 0.44 percent. The water body covered an area of about 1425 hectares in 1990 and in 2010 it covered an area of 1308 hectares showing a decrease of 117 hectares, registering a negative growth rate of 8.21 percent and an average annual negative growth rate of 0.41 percent. The wetland covered an area of about 360 hectares in 1990 and in 2010 it was only 291 hectares. This category is showing a decreased trend of about 69 hectares showing a negative growth rate of 19.16 percent and an annual average negative growth rate of 0.95 percent.

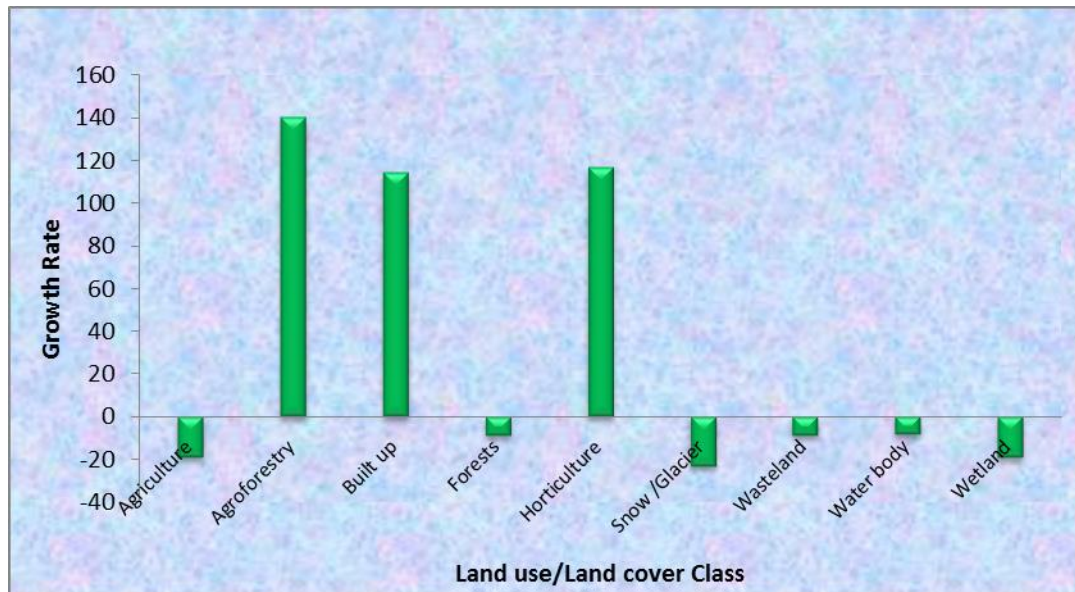
Table 1.3: Growth of Land use / Land cover categories in Pulwama district-1990-2010

Land use/Land cover	Area (Hectares) 1990	% of the total area	Area (Hectares) 2010	% of the total area	Growth rate	Average annual growth rate
Agriculture	42503	53.97	34569	43.90	(-)18.66	-0.93
Agriculture Plantation	3914	4.97	9399	11.94	140.13	7.00

Built up	1793	2.28	3844	4.88	114.38	5.71
Forests	12487	15.86	11408	14.49	(-)8.64	-0.43
Horticulture	2527	3.21	5483	6.96	116.97	5.84
Snow /Glacier	584	0.74	449	0.57	(-)30.06	-1.50
Wasteland	13157	16.71	11999	15.24	(-)8.80	-0.44
Water body	1425	1.81	1308	1.66	(-)8.21	-0.41
Wetland	360	0.46	291	0.37	(-)19.16	-0.95
Total	78750	100.00	78750	100.00	-	-

Source: Landsat- TM (1990) &IRS P6 LISS-III (2010)

**Growth Rate of Land use / Land cover - (1990-2010)**



Source: Landsat-TM (1990) & IRS P6 LISS III (2010)

Fig. 1.6

**VI. CONCLUSION**

During the field work, it was observed that most of the land has been shifted to agriculture plantation and horticulture. The most important reason for this is that the returns from plantation and horticulture sector have been quite attractive and the farmers are fast transferring their paddy lands to agriculture plantation and horticulture. It was found that the wasteland has also decreased substantially as a sizeable area has been brought under agriculture plantation and horticulture. The land use / land cover map also shows that the area under snow cover has decreased because of less precipitation and comparatively higher temperature. It was also observed that deforestation has also taken place and sizeable forest land has been lost. In 1990 the total area under forests cover was 12487 hectares and by 2010 it was only 11408 hectares. So there was decrease of about 1029 hectares during the past twenty years from 1990-2010.

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