International Journal of Innovative Studies in Sociology and Humanities (IJISSH)

ISSN 2456-4931 (Online) **www.ijissh.org** *Volume: 3 Issue: 5 | May 2018*

Changes in Land Use and Land Cover by Using Remote Sensing Data: A Study from Murshidabad District, West Bengal

*** Rozina Khatun, ** Dr. Sanjay Kr. Jha**

**Research Scholar, Department of Geography, T.M.B.U Bhagalpur, Bihar, India*
*** University Professor, Department of Geography, T.M.B.U, Bhagalpur, Bihar, India*

Abstract: *The land use and land cover change (LULC) of a region is an outcome of physical and socio-economic factors. Land is become scarce resource due to immense agricultural and demographic pressure. Present paper adequately demonstrates the utility of Remote Sensing and GIS Data to detect and record the land use and land cover of the area and its changes through time. In the present paper satellite data (Resourcesat-1, LISS-III) was used for different sensor for the year 2005-06 to 2011-12 to detect the land use and land cover changes of Murshidabad District. Hence information on land use and land cover and possibilities for their optimal use is essential for their reflection, planning and implementation of land use scheme to meet the increasing demands for basic human needs and welfare. The study reveals that marginal changes have occurred in most of the land use categories, except proportion of area under agriculture, fallow area which are drastically declined from 31.79% in 2005-06 to 6.37% in 2011-12. There was observed on Built-up- Mining area increased from 6.69% (2005-06) to 19.97% (2011-12).*

Keywords: *Remote Sensing, GIS, LULC, Resourcesat-1, LISS-III, Detection, Built-up, Demographic Pressure.*

1. INTRODUCTION

Land, a non-renewable resource is leading to all primary production systems. Remote Sensing and another Geospatial technology are playing an important role for assessment of natural resources. It also monitors environmental changes. Land use refers to the purpose of the land serves, for example recreation, wild habitat or agriculture. It is involved with mapping and monitoring. Land covers refer to the surface cover on the ground, whether vegetation, urban infrastructure, water, bare soil and other. It has related with resource management and planning activities. It can be performed in changed detection through monitoring and provides the ground cover information for baseline thematic maps.

Remote Sensing Data represent a powerful tool to understand to dynamics of the agriculture where the images allow a synoptic view of the area. In addition to an integrated data base a Geographic Information System (GIS) combines different data sets and simultaneously, facilities spatial and temporal analysis (Kurt Fedra et al. 1998). The Remote Sensing and GIS have played an important role in present study to assess the natural resources. Anthropogenic changes in land use and land cover are being increasingly recognized as critical factors influencing global change (Jayaraju et al. 2011).

2. SIGNIFICANCE OF THE STUDY

Land cover refers to the physical and biological cover over the surface of land including water, vegetation, soil and artificial structures. Land use is a complicated term. Natural scientists defined land use in terms of syndromes of human activities such as agriculture, forestry and building construction that changes in land surfaces. Social scientists defined land use more broadly to include the social and economic purposes and context for and within which land are managed or unmanaged, while land cover may be observed directly in the field or by Remote Sensing. Land use and land cover changes are the direct and indirect consequences of human actions. Its effect observed now all over the World. Its influence on environment are-

- Climatic Change
- Loss of Biodiversity
- Causes of Water, Soil and Air pollution
- Construction of Dam
- Irrigation Project

- Unplanned Urban Growth
- Increasing rate of Greenhouse gases and destruction of stratospheric Ozone

3. AIMS AND OBJECTIVES

The main objectives of the study are-

- To study land use and land cover patterns of the district
- To detection the changes of land use and land cover with comparative statistical analysis.

4. STUDY AREA

Murshidabad is the northern most district of the presidency division of West Bengal, in eastern India. Situated on the left bank of the River Ganges, the district is very fertile. The geographical extension of the district is $23^0$43` 20`` N to $24^0$50`20``N and $87^0$49`17`` E to $88^0$46`00``E. with the geographical area of 5324 sq.km. The peer shaped district looked like a triangle with Farakka in the north-west. It surrounded by Birbhum district on west, Malda district in on north, on the south by Burdwan and Nadia and on the east by Bangladesh.

Geology of the study area is broadly classified into three parts according to A Mitra.

1. Recent Alluvium –The Bagri region of the district is formed by recent Alluvium, mainly the soil is composed with sands and clays. These are very fertile soil and useful for all kind of crop.

2. Pleistocene-recent older alluvium and lateritic clay- A major part of Rah region is gone under this categorical area. The Kankar (the beds of limestone) are scattered at places in this western part.

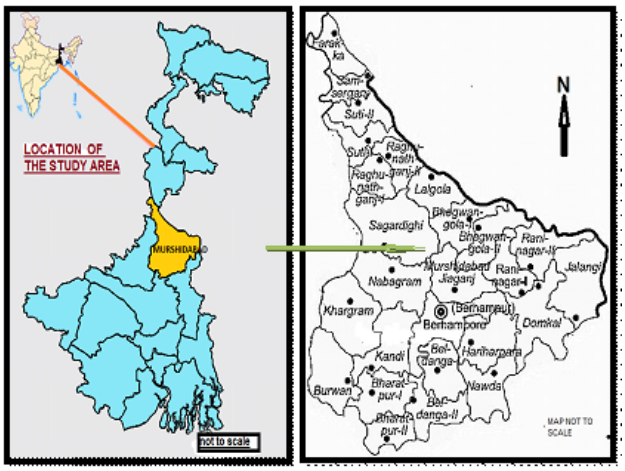
3. Jurassic Rajmahal Trap- The northern part of the district consists of basaltic lava.

5. DEMOGRAPHY

According to the 2011 census Murshidabad district has a population of 7,102,430, roughly equal to the nation of Bulgaria. The district has a population density of 1,334 inhabitants per square kilometer. Murshidabad has an average literacy rate 81.9% (higher than the National average of 74%).

6. ECONOMICS

The city is a centre for Agriculture, handicrafts and sericulture. The famous Murshidabad silk, much in demand for making saris and scarves, is produced here.



Location of Murshidabad District

7. DATA USED AND METHODOLOGY

The study has made use of various secondary data. Mainly vector data are used for Land Use and Land Cover Change (LULC). These include Resourcesat – 1, Resourcesat- 2 and LISS-III merged data on scale 1:50,000 for the

years 2005-06 and 2011-12. For the present study data used from National Remote Sensing Centre (NRSC), Hyderabad. Here used some simple statistical techniques for compare the statistical data and detection the changes.

8. DISCUSSION AND RESULTS

The discussion is carried forward with year-wise analysis of land use and land cover with detection of change along with state level and district level discussion and comparison. The topic is discussed this way-

- West Bengal -2005-06 and 2011-12.
- Murshidabad -2005-06 and 2011-12.

The various land use and land cover classes interpreted in the study area are include built up urban and rural area, Agricultural plantation, crop, fallow, Forest, Uncultivated land, Rivers and Water bodies , Wastelands , Wetlands, Grazing.

Detailed accounts of these land use and land cover classes of the study area are described in the following part

Table 1: *Land use and Land cover classification system of West Bengal of the Year 2005-06 and 2011-12*

Sl.No.	Name of the class	West Bengal 2005-06		West Bengal 2011-12	
		Area in sq.km	Percentage %	Area in sq.km	Percentage %
1	Built up urban	2276.19	2.56	2685.18	3.02
2	Built up rural	13131.14	14.79	12662.9	14.27
3	Built up , mining	191.61	0.22	212.84	0.24
4	Agricul, crop land	51466	57.99	54888.03	61.84
5	Agricul, plantation	2405.81	2.71	2371.58	2.67
6	Agriculture fallow	162.54	0.18	54.18	.06
7	Forest- Evergreen	0.12	0.0001	184.63	0.21
8	Forest Deciduous	6552.22	7.38	6293.13	7.09
9	Forest plantation	653.21	0.735	601.34	0.68
10	Forest scrub	586.33	0.66	422.72	0.48
11	Forest Mangroves	2154.9	2.43	1969.28	2.22
12	Grazing	151.47	0.17	100.41	0.11
13	Barren-Salt affected	0.12	0.0001	0.97	0.001
14	Barren-Gullied	19.24	0.02	15.36	0.02
15	Barren -scrubland	1528.59	1.72	1235.16	1.39
16	Barren-sandy area	41.33	0.05	31.85	0.04
17	Barren-Rocky land	62.05	0.07	45.66	0.05
18	Inland Wetland	391	0.44	337.11	0.38
19	Coastal Wetland	87.59	0.09	139.22	0.16
20	River/canal Wetland	5712.02	6.43	3240.29	3.65
21	Reservoir/lake/ponds Wetland	1178.53	1.33	1260.15	1.42
Total		88752	100.00	88752	100.00

Source: *Multi-temporal satellite data of 2005-06 and 2010-11*

In West Bengal Urban built up area is large compare between the years 2005-06 (2.56%) and 2011-12 (3.02%) and little bit changes in Rural built up area in the years 2005-06 (14.79%) and 2011-12 (14.27%). Of the total area agricultural crop land showed 57.99% in the year 2005-06 and 61.84% in the Year 2011-12. Agricultural fallow decreased through years from 0.18% (2005-06) to 0.6% (2011-12). The forest area of West Bengal divided into five sub types and their percentages are- Forest Evergreen 0.0001% in the year 2005-06, 0.21% in the year 2011-12; Deciduous forest 7.38% in the year 2005-06, 7.09% in the year 2011-12; Plantation forest 0.74% in 2005-06, 0.68% in 2011-12; Forest Scrub 0.66% in 2005-06, 0.48% in 2011-12; Forest Mangroves 2.43% in 2005-06, 2.22 % in 2011-12. The analysis of data about Grazing is clearly shows that its rate decreased through times from 0.17 % (2005-06) to 0.11 % (2011-12). From table 1 it would be say that some little changes happened in Barren/ Waste lands sub divisions like salt affected, Gullied, Scrubland, and Rocky land. Inland wetlands % is not so much change over the years but the coastal wetlands rate is little bit higher from 0.09% to 0.16%. The rate of River/Stream/Canals –Wetlands decreased with time from 6.43 %(2005-06) to 3.65% (2011-12).

With the help of table: 1 represent pie-diagram (Fig: 1 and Fig: 2) to show West Bengal Land Use system in the year 2005-06 and 2011-12 in the following section. Area is given in Sq.km and it converted into % with the help of total area.

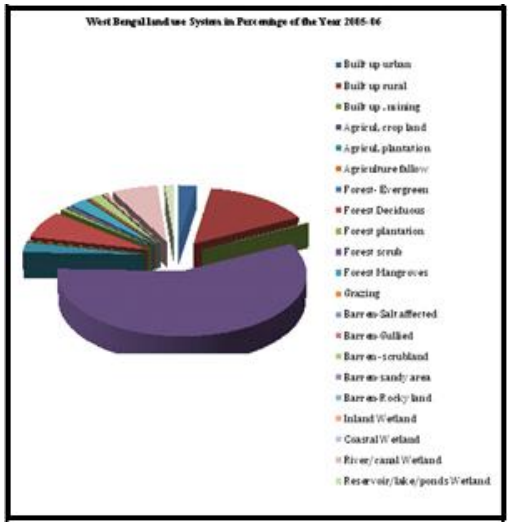


Fig 1:

Source: *Multi-temporal satellite data of 2005-06 (Resourcesat-1 and LISS-III).*

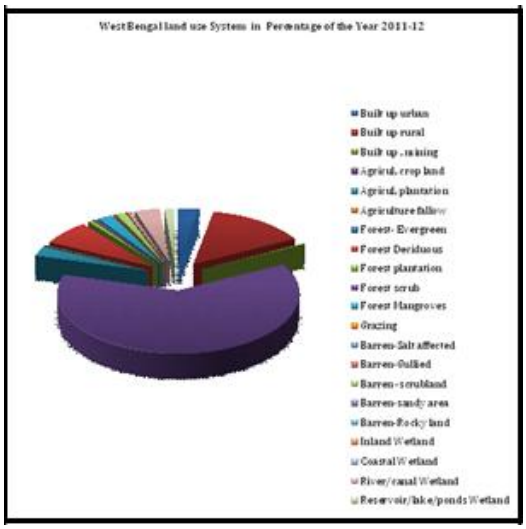


Fig 2:

Source: *Multi-temporal satellite data of 2011-12 (Resourcesat-2 and LISS-III).*

Table 2: *Land use and Land cover classification system of Murshidabad of the Year 2005-06 and 2011-12*

Sl.No.	Name of the class	Murshidabad 2005-06		Murshidabad 2011-12	
		Area in sq.km	Percentage %	Area in sq.km	Percentage %
1	Built up urban	93.28	1.75	87.65	1.64
2	Built up rural	793.02	14.89	736.05	13.83
3	Built up , mining	6.69	0.13	19.97	0.38
4	Agricul, crop land	3969.66	74.56	4013.97	75.39
5	Agricul, plantation	52.21	0.98	52.19	0.98
6	Agriculture fallow	31.79	0.59	6.37	0.12
7	Forest Deciduous	5.51	0.10	5.46	0.10
8	Forest plantation	1.12	0.02	1.15	0.02
09	Scrub Forest	**Nil**	-	0.28	0.01
10	Grazing	5.07	0.095	9.3	0.17
11	Barren-scrubland	**Nil**	-	1.43	0.03
12	Barren-sandy area	3.85	0.07	4.42	0.08
13	Inland Wetland	66.89	1.26	63.95	1.20
14	River/canal Wetland	265.88	4.99	295.29	5.55
15	Reservoir/lake/ponds Wetland	29.02	0.54	26.53	0.49
Total		5324.00	100	5324.00	100

Source: *Multi-temporal satellite data of 2005-06 and 2011-12*

In Murshidabad district decreased urban built up area and rural built up area through time according to data, these percentages are- 1.75% (2005-06), 1.64% (2011-12); 14.89% (2005-06), 13.83% (2011-12). The above data shown increased rate in Built up mining from 0.13% to 0.38%. In the section of agriculture data revealed that agricultural cropland changes in little (from 74.56% to 75.39%) and agricultural plantation area are the same through the years. The positive thing is that the decreased rate of agricultural fallow over times (from 0.59 % to 0.12%). Deciduous forest and Plantation forest rate are the same over the years in the district. But Grazing rate is increased from 0.095% to 0.17%. Most important thing is that Wastelands/ Barren land area is very little. Inland Wetland rate is decreased from 1.26% to 1.20 % over the time and the rate of River/Canal Wetland is increased from 4.99% (2005-06) to 5.55% (2011-12). The quantity of lakes and ponds are decreased from 0.54% (2005-06) to 0.49% (2011-12).

In comparison with West Bengal Murshidabad districts land use and land cover change is somewhere similar and in some sector of land use difference is lot. Similarity has seen Built up urban, built up rural, agricultural plantation and agricultural fallow areas percentage is lesser growth rate from the year 2005-06 to 2011-12. Built up mining and agricultural crop land growth rate is higher from the year 2005-06 to 2011-12 for both (West Bengal and Murshidabad). But opposite condition shows for land use wetlands/water bodies/reservoir/lakes/ponds. Its rate increased in West Bengal from the year 2005-06 to 2011-12; In Murshidabad its rate is lesser from the year (0.49%) 2005-06 to (0.54%) 2011-12. Grazing rate in West Bengal is decreased with times but in Murshidabad its rate is higher from the year 2005-06 (0.095%) to 2011-12 (0.17%).

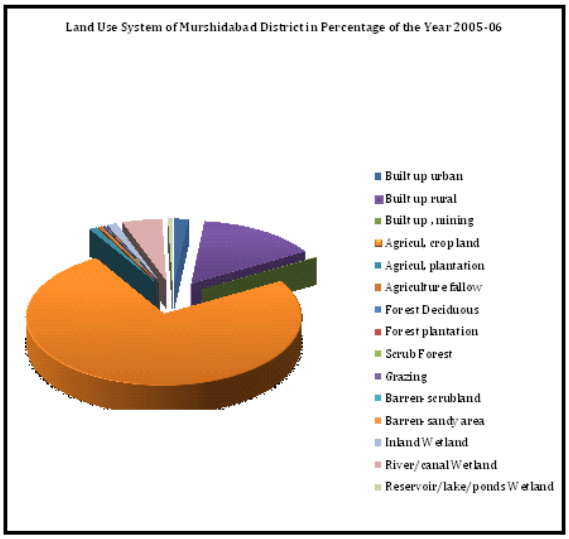
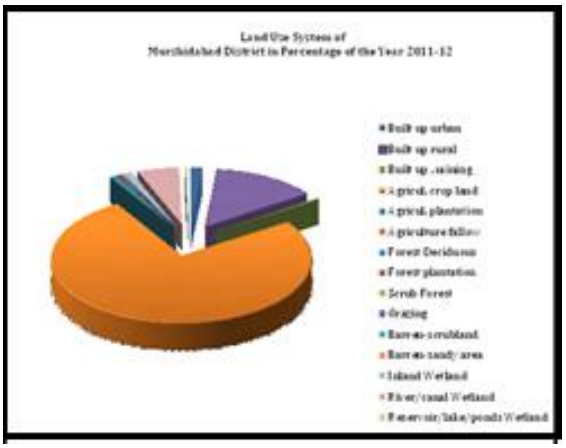


Fig: 3

Source: *Multi-temporal satellite data of 2005-06 (Resourcesat-1 and LISS-III).*



Source: *Multi-temporal satellite data of 2011-12 (Resourcesat-2 and LISS-III).*

Fig 4:

The main features are summarized with the data as follows:

- Increasing crop land- converted of forest areas into cropland is not beneficial for mankind and natural environment and another cause is higher rate of population density which converted from agricultural lands to residential land.
- Degraded forest is the basic symbol of degraded environment.
- Increased rate of built up mining- is also the symbol environmental degradation
- Increased grazing rate is sometimes effects on ecosystem and plant community
- Decreased rate of Wetlands- For demand of settlement and industry wetlands are used. Some of activities are negatively impact on wetlands. These are-
  i. Draining or filling wetland areas
  ii. Sand and gravel mining
  iii. Waste Disposal
  iv. Nutrient enrichment

9. CONCLUSION

Changes in land use and land cover are the direct and indirect consequence of human actions. The land use of a region is always influenced by physic-socio-economic factors. The major portion of Murshidabad land is used in agricultural purpose because it is agro based district. At the same time the district is densely populated. The study of land use change is important in the field of geography (degrading forest, increasing built up mining, water bodies, uncultivated land and increasing rate of agricultural land). It is helpful further macro and micro level planning. It also help to optimal land use planning through spatial information of the surface and projecting possible future changes and preserving our natural resources and environment.

REFERENCES

[1] Fazal, Sahab. 2009,Remote Sensing Basics, page no:338-346

[2] Kaul, Mr. Sibananda, 2016. Comparison of land use and land cover change of Jalpaiguri district with West Bengal and India from the Journal of Social Science Researcher, Volume V Number II.

[3] Prasad, T.Lakshmi and Sreenivasulu.G, 2014. Land Use /Land Cover Analysis Using Remote Sensing and Gis, a Case Study on Pulivendula Taluk, Kadapa District, Andhra Pradesh, India. International Journal of Scientific and Research Publications, Volume 4, Issue 6.

[4] Kumari, Prof.A.Krishna and Alivelamma, 2017. Change detection in Land Use /Land Cover by Using Remote Sensing and Gis Techniques in Kunavaram Watershed, east Godavari District, Andhra Pradesh, North Asian International Research Journal of Social Science and Humanities, Vol 3 Issue 7, Page No: 109-116.

[5] Jayaraju, N and Abdullah Kahan p.2011. Land use planning from parts of South India Using Remote Sensing and GIS: Implications to natural resource assessment, Advances in soil classification book 1 Part 2, page 371.

[6] Khullar, D.R, 2007. India- A Comprehensive Geography, Page No: 545-553.

[7] Kurt, Fedra and Enrico Fedi, GIS Technology and spatial analysis in coastal zone management, EEZ Technology, 1998, 3, pp, 171-179.

[8] Prakasam, C.2010. Land Use/Land Cover Change Detection Through Remote Sensing Approach: A Case Study of Kodaikanal Taluk, Tamilnadu, International Journal of Geomatics and Geo Sciences, Vol 1 No 2, Page No: 150-158.

[9] Singh, Prabhir and Khanduri. Kamlesh, 2011. Land Use and Land Cover Change Detection Through Remote Sensing and GIS Technology: Case Study of Pathankot and Dhar Kalan Tehsils, Punjab International Journal of Geomatics and Geo Sciences, Vol 1 No 4, Page No: 839-846.

[10] Khan, Rubia and Jhariya.D.C, 2016. Land Use/Land Cover Change Detection Through Remote Sensing and Geographic Information System in Raipur Municipal CorporationArea, Chhattisgarh. Scientific Society of Advanced Research and Social Change SSARSC International Journal of Geosciences and Geoinformatics, vol 3 Issue 1, Page No: 1-4.

[11] Sheoran, Aleenjeet. Sharma, Parveen. Yadav Manoj and Sharma M.P, 2013. Assessment of Land Use/ Land Cover Changes in Jind District of Haryana in a Period of 1.5 Decade Using RS and GIS Approach. International Journal of Emerging Science and Engineering (IJESE), Vol 2 Issue 2, Page No: 26-30.

AUTHORS' BIOGRAPHY

Rozina Khatun was born in Murshidabad, West Bengal, India in 1986. She received the B.A degree in Geography from the University of Kalyani, West Bengal, India in 2007, M.A in Geography from C.S.J.M University, Kanpur, India in 2009.

She is Pursuing PhD Degrees in Geography from T.M.B.U, Bihar, India. She has presented paper in one International Conference and four National Seminars. She has published six papers in International Journal and one paper in National Journal.

Dr. Sanjay Kumar Jha was born in Banka, Bihar, India in 1959. His qualification is M.A, PhD in Geography. He was appointed as an assistant professor in 1985. He was became Associate Professor in 1995. Now he is working as a University Professor from 2003. He has published 2 papers in international journal and 55 in national journals. He has also published 2 books. He supervised total 7 numbers of students for PhD degree and 6 students under process for PhD.