

Spatio-Temporal Change of Land Use Pattern (2001-2017) in Nadia District, West Bengal

Iman Sk

Assistant Teacher in Geography

Vivekananda Palli Kishore Bharati High School, Behala, Kolkata

ABSTRACT

Land use pattern is perhaps the clearest indicator for the management and modification of natural environment into cultural environment. The present paper is an attempt to analyze the Spatio-temporal change of land use pattern in Nadia district and also to explore the considerable uses of land with different natural and socio-economic parameters for sustainable development. Based on the block wise secondary data obtained from the Statistical Abstract of Nadia, I prepared the land cover mapping of the area by taking the percentage values of different land use categories. The results show that marginal changes have occurred in all land use categories. Based on proportional area negative changes has been recorded in net sown area (-2.55%), forest cover area (-0.24%) and area under waste land (-0.14%). Positive changes have been recorded in area under non agricultural use (0.31%) & residential uses (2.62%) from 2001 to 2017. However, a planned land use pattern is suggested considering demographic change of the region.

Key word: Land use, Environment, Sustainable development, Demographic changes.

INTRODUCTION

Land use pattern refers the layout or arrangement of the uses of the land. The land may be used for agriculture, forest, pasture etc. Land use is determined by many natural environmental and socio-economic factors like relief features, climate, soil and density of population, technical, ownership of land property and administrative regulation of the country. Land use is the surface utilization of all developed and vacant land on a specific point at given time and space (Mandal, 1982). It is a very important indicator of the agricultural development. The lower the proportions of net sown area to the total geographical area lower the agricultural production. The land use analysis is an important aspect of geographical studies which provides proper guidelines for the regional planning and development and also for future orientation of agriculture. Information on land use in the form of maps and statistical data is very vital for spatial planning, management and utilization of land for agriculture, forestry, pasture, urban-industrial, environmental studies, economic production etc. Today, with the growing population pressure, low man-land ratio and increasing land degradation, the need for optimum utilization of land assumes much greater relevance. The draft outline on the National Land Use Policy and strategy on Optimum Land Use Planning and the creation of National Land Use Conservation Board (NLUCB) in 1985 clearly indicate the serious

concern of the Government in this regard. To understand the proportion of area under different land use categories in Nadia district in 2001 and 2017 time periods and to analyze the changes that take place in land use pattern in Nadia and also to find out the inter-blocks variations in land use pattern.

METHODS

STUDY AREA

Nadia district is a district in the state of West Bengal, in eastern India. Nadia district is situated between $22^{\circ}53'$ N and $24^{\circ}11'$ N latitude and $88^{\circ}09'$ E and $88^{\circ}48'$ E longitude, this district is irregular linear in shape with orientation of North-South. The district is Approximately 46 feet or 14 metres above the mean sea level. The Tropic of cancer divides the district in two parts. The geographical boundary of Nadia district comprises Bangladesh in East, Bardhaman and Hoogly district in West, Murshidabad district in North and North West and North 24 Parganas towards South and South East. The district has 17 blocks and covered an area about 3927 sq. km (1,516 sq mile).

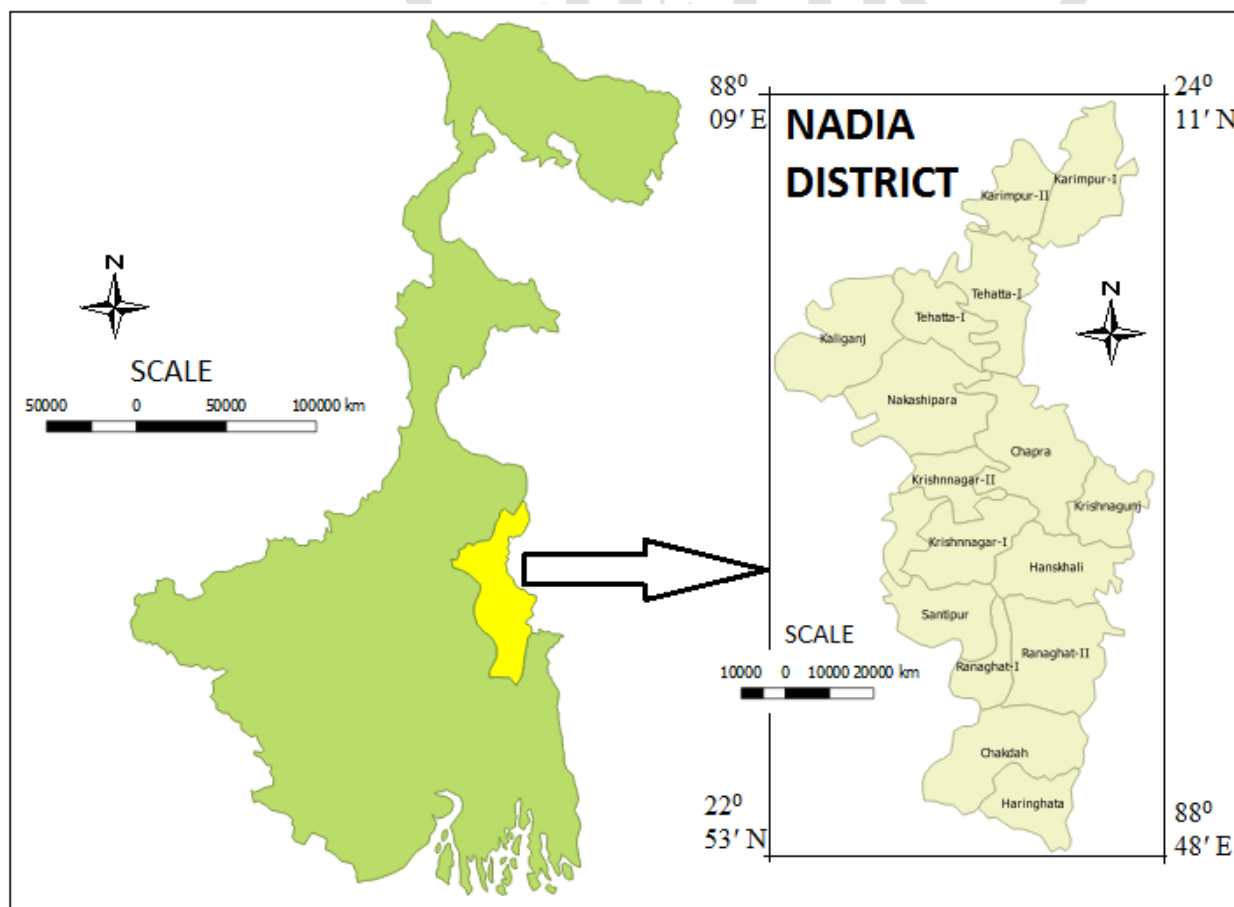


Figure 1: Location of study area

DATA ANALYSIS

The study is based on the secondary data obtained from Statistical Abstract of Nadia district and District Disaster Management Plan, Nadia. Block is taken as a unit of study, for analysis and mapping purpose. Data thus collected,

interpreted and represented cartographically by using choropleth technique. Here, represent the choropleth map of the study area in block wise for analysis the nature and density or intensity of land use pattern in Nadia district.

The main data source of this study is Statistical Abstract of Nadia district, 2005, District Disaster Management plan of Nadia district, 2017-18, C.M.O.H. Office, Nadia and the Office of the Director, Bureau of Applied Economics and Statistics, Govt. of West Bengal, various books, articles etc. The data taken from Census and used MS Excel and Geographical Information System (GIS) Software for analysis the cartographical presentation the block-wise proportion of area under different land use categories and also the data has been calculated to show the change that is taken place from 2011 to 2017 time of periods.

RESULT AND DISCUSSION

The land use is the cumulative product of an area with the interaction between natural environment and socio-economic condition in that area. Land use is a most important indicator of the extent and degree to which man has modified the land resources in different way. It is the application of human controls in a systematic manner, indicating an intimate relationship between prevailing ecological conditions and man (Vaidhya, 1997). The spatial differences in physical environmental and socio-economic condition lead to significant spatial variations in agricultural land use, transport, residential housing, recreation and commercial land use pattern. The information on the land use provided by the Statistical Abstract of Nadia district is based on nine fold classification of land use by the Revenue Department, Government of India.

Table 1: Percentage of Area under Different Land use categories in Nadia District (2001)

Sl No.	Name of Block	Net Sown area	Area under non Agricultural use	Area under forest	Area under waste land	Area under Residential uses
1	Karimpur I	69.94	16.89	0.67	0.06	12.14
2	Karimpur II	69.27	10.01	0.59	0.15	19.98
3	Tehatta I	73.09	9.87	0.09	0.13	16.82
4	Tehatta II	81.07	8.67	0.09	0.05	10.12
5	Kaliganj	57.34	7.60	0.40	0.35	34.31
6	Nakashipara	61.30	6.55	8.88	0.24	23.03
7	Chapra	67.43	6.69	1.08	0.21	24.59
8	Krishnagar-II	79.54	10.92	1.67	1.59	6.28
9	Nabadwip	81.11	8.94	0.25	1.66	8.04
10	Krishnagar-I	66.59	6.06	0.23	0.15	26.97
11	Krishnaganj	62.29	6.69	0.15	0.17	30.70
12	Hasnkhali	66.91	8.01	0.13	0.03	24.92
13	Shantipur	82.05	8.08	1.65	2.01	6.21
14	Ranaghat-I	77.06	7.26	0.96	0.03	14.69
15	Ranaghat-II	63.04	6.95	0.94	0.05	29.02
16	Chakdah	75.52	7.01	0.47	0.27	16.73
17	Haringhata	67.16	6.79	0.25	0.21	25.59
	Nadia	68.08	8.72	0.85	0.30	22.05

Source: Statistical Abstract of Nadia district 2005-2006.

Table 2: Percentage of Area under Different Land use categories in Nadia District (2017)

SI No.	Name of Block	Net Sown area	Area under non Agricultural use	Area under forest	Area under waste land	Area under Residential uses
1	Karimpur I	67.8	18.14	0.47		23.59
2	Karimpur II	67.87	8.14	0.41		23.58
3	Tehatta I	72.28	8.64	0.05	0.15	18.84
4	Tehatta II	79.97	9.60	0.12		10.32
5	Kaliganj	55.74	6.69	0.44		37.14
6	Nakashipara	60.42	7.25	7.87		24.46
7	Chapra	64.45	7.73	0.85		26.97
8	Krishnagar-II	75.20	9.02	1.25	1.22	13.31
9	Nabadwip	79.08	9.49		1.06	10.37
10	Krishnagar-I	63.46	7.62	0.11		28.79
11	Krishnaganj	60.44	7.25		0.10	32.20
12	Hasnkhali	66.15	7.94			25.91
13	Shantipur	79.51	9.54	1.05	1.85	8.05
14	Ranaghat-I	74.56	8.95	0.83		15.66
15	Ranaghat-II	60.43	7.25	0.66	0.02	31.66
16	Chakdah	72.67	8.72		0.47	18.14
17	Haringhata	65.76	7.89	0.28	0.17	25.90
	Nadia	70.63	8.41	1.09	0.44	19.43

Source: District Disaster Management Plan 2017-2018, Nadia.

NET SOWN AREA

Net sown Area refers to the part of cultivated land on which sowing is actually done at least once during a year (Dhian, 1991). For the level of agricultural production the proportion of net sown area is a very important indicator. The percentage of Net Sown Area to total area has increased from 68.08 percent in 2001 to 70.63 percent in 2017. In 2001, highest proportion under Net Sown Area was recorded in Santipur block (82.05 percent) and lowest percentage in Kaliganj block (57.34 percent). Among 17th blocks 6th blocks have more than 70 percent Net Sown Area, 10th blocks have Net Sown Area between 60 to 70 percent and one block have Net Sown Area less than 60 percent, this one is Kaliganj block with 57.34 percent Net Sown Area. In 2017 highest Net Sown Area is recorded in Tehatta-II block with 79.97 percent and lowest percentage of Net Sown Area is recorded in Kaliganj block (55.74 percent) respectively. More than 70 percent Net Sown Area also found in 7th block, but not found more than 80 percent Net Sown Area in 2017, that figure was recorded in Santipur block in 2001.

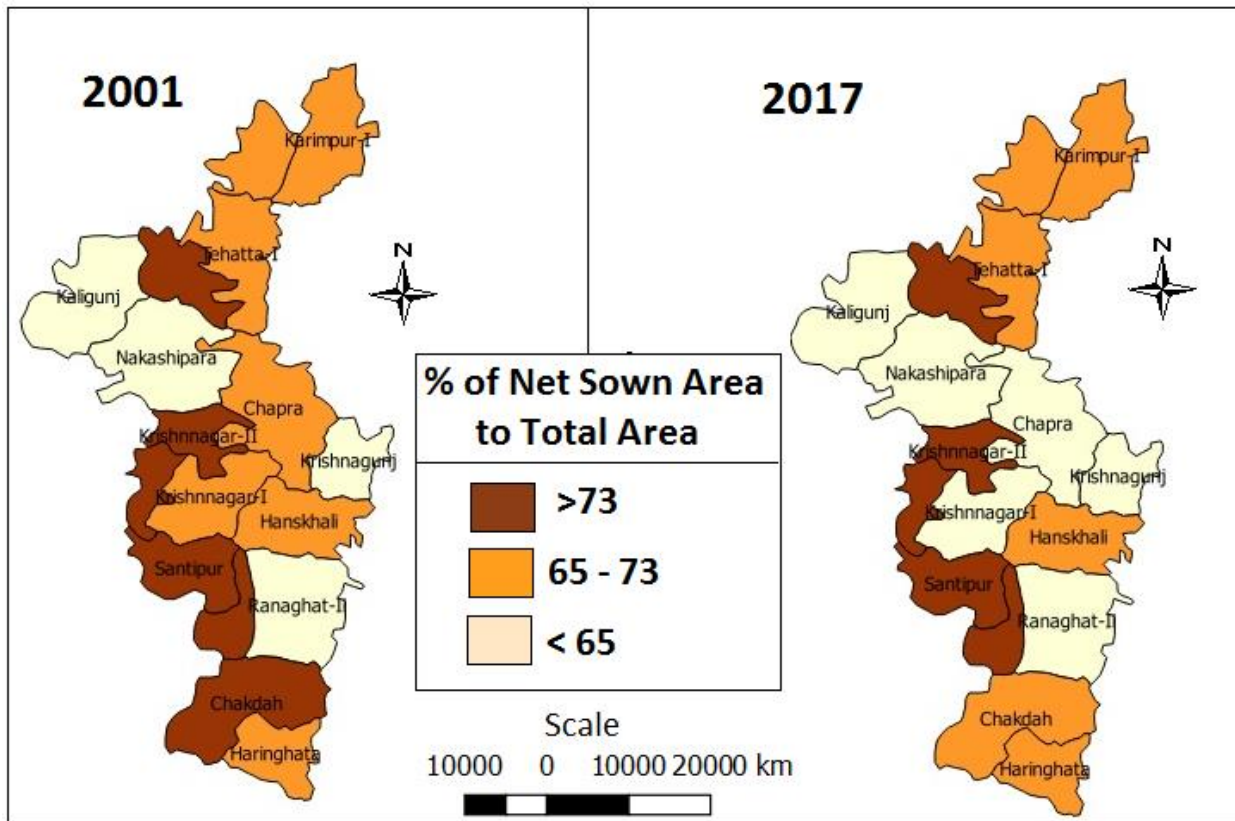


Figure 2: Net Sown Area in Nadia District

AREA UNDER FORESTS

This category of land use includes all the areas actually under forests whether state owned or privately owned and classed or administrated as forest under any legal enactment dealing with the forests. Besides, the forest area along roads, railways and canals is also included in this category. Proportion of area under this category has declined from 1.09 percent in 2001 to 0.85 percent in 2017. According to revenue records in 2001, forests covered an area of just about 4280.43 hectare which has declined to 3337.95 hectare in 2017. In 2001, maximum area under forest was recorded in Nakashipara block (8.88 percent), more than 1 percent forest cover area was followed in Chapra(1.08 percent), Krishnanagar-II(1.67 percent) and Santipur block(1.65 percent) and other blocks of Nadia district have an area under forest cover less than 1 percent. But among the 17 blocks least forest cover area found in Tehatta block (0.09 percent).

In 2017, maximum area under forests is found in same block of 2001 with 7.87 percent forest covered area, more than 1 percent forest cover area are followed in Krishnanagar-II(1.25 percent) and Santipur block(1.05 percent) and other blocks of Nadia district have an area under forest cover less than 1 percent. But least forest covered area found in Tehatta-I block (0.09 percent). Nabadwip, Krishnanaganj, Hanskhali and Chakdah are the four blocks where there is no area under the forest covered area.

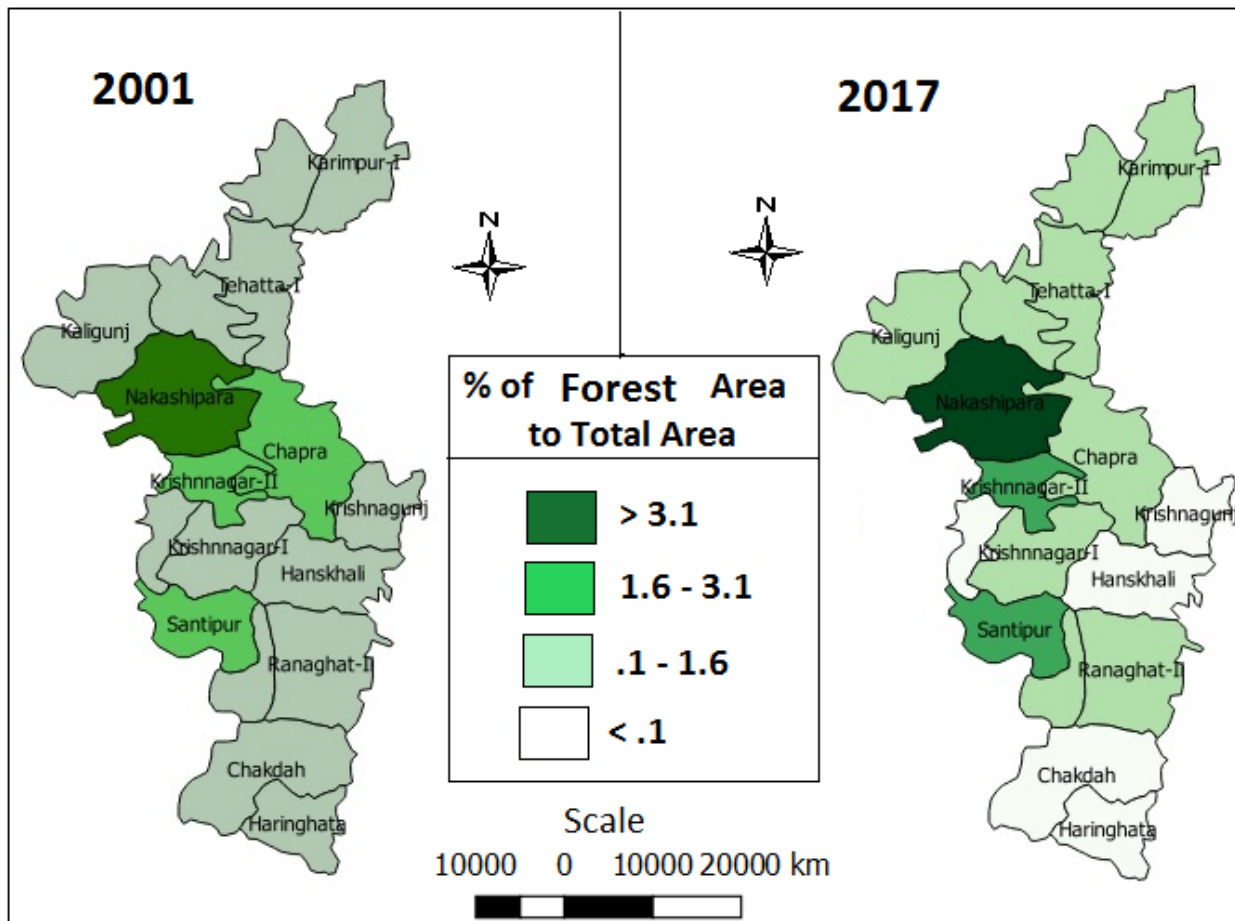


Figure 3: Forest Area in Nadia District

AREA UNDER NON- AGRICULTURAL USES

All the lands that are occupied by residential housing or human settlements, transport, likely roads, railways and airways or under water bodies i.e. rivers, lakes, ponds, tanks canals etc are includes in the non agricultural land use area. The proportional area under non agricultural land use has been slightly increased 0.31 percent from 8.41 percent in 2001 to 8.72 percent in 2017 due to the expansion of residential housing; different developmental infrastructure works such as construction of roads, railways, canals, establishment of industrial factories and recreation land, namely park, cinema hall or establishment of green belts etc. In 2001 highest and lowest proportion of area under non agricultural uses was recorded in Karimpur-I (16.89 percent) and Krishnnagar-I (6.06) respectively. Among 17th blocks only 5th blocks have area under non agricultural use more than district average (8.72 percent) and remaining 12th blocks have the proportional non agricultural land less than district average. In 2017, highest proportion of area under non agricultural uses was recorded in Karimpur-I with 18.14 percent. These are the eight blocks which have area under this category more than the district average (8.41 percent) and rests of the blocks have less than the district average in 2017 and respectively lowest proportion of area under non agriculture is found in Kaliganj block with 6.69 percent.

AREA UNDER WASTELAND

The Wasteland Survey and Reclamation Committee have defined “cultivable wasteland as that land available for cultivation but not used for cultivation for one reason or the other.” These lands was used for cultivation in the

past but is not being used (cultivated) at present or for last five years or more in succession because of physical, socio-economic and demographic limitations. The proportion of area under the waste land has decreased 0.14 percent from 0.44 percent in 2001 to 0.30 percent in 2017. In 2001, highest area under the waste land was recorded in Santipur block with 2.01 percent and next followed in Nabadwip block (1.59 percent) and respectively lowest proportion of waste land area was recorded in Hanskhali and Ranaghat-I block with 0.03 percent. There are only three blocks have area under wasteland more than 1 percent and remaining 14th blocks have less than 1 percent. In 2011, highest and lowest percentage is recorded in Santipur block with 1.85 percent and Ranaghat-II block with 0.02 percent respectively. But in 9th blocks no wasteland area are recorded in 2017.

AREA UNDER RESIDENTIAL USES

The proportion of area under the residential uses has increased 2.62 percent from 19.43 percent in 2001 to 22.05 percent in 2017. In 2001 highest proportion was recorded in Kaliganj block with 34.31 percent and followed by Krishnaganj (30.70 percent) and Ranaghat-II (29.02 percent) and respectively lowest proportional area was recorded in Santipur block with 6.21 percent. The proportional area under this category above district average (22.05 percent) founds in 12th blocks and rest blocks have these lands below the district average in 2001. In 2017 highest proportion is recorded in Kaliganj block with 37.14 percent and followed by Krishnaganj(32.20 percent), Ranaghat-II(31.66 percent), Krishnnagar-I(28.79 percent) and respectively lowest proportional area was recorded in Santipur block with 8.05 percent. The proportional area under this category above district average (19.43 percent) founds in 10th blocks and rest 7th blocks have these lands below the district average in 2017.

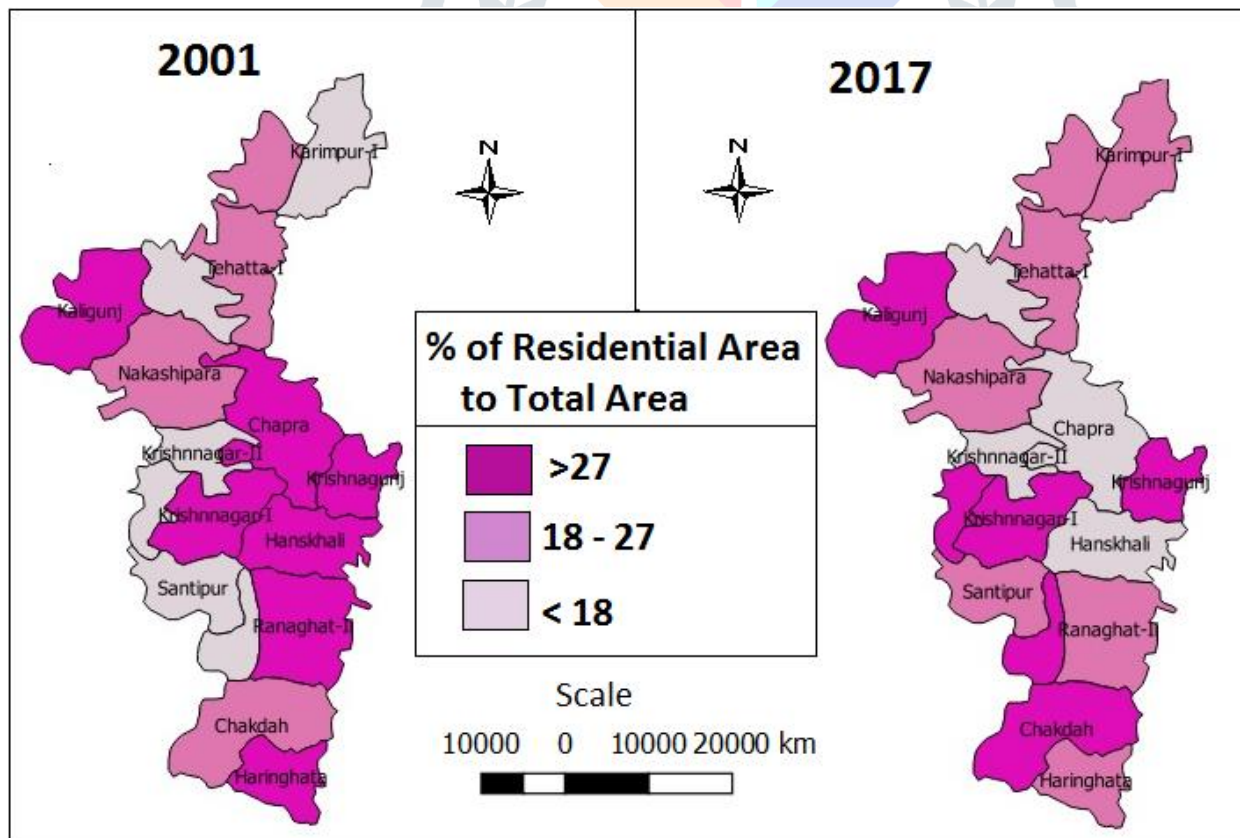
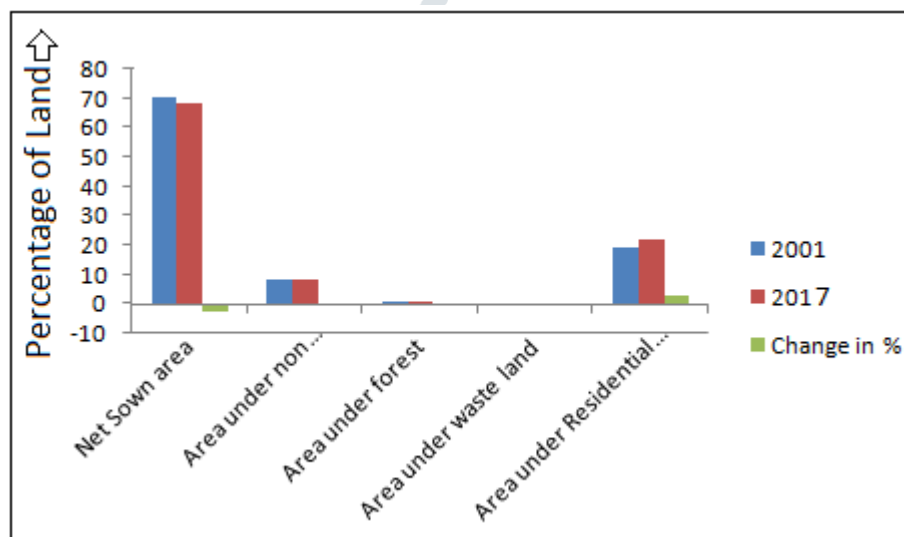


Figure 4: Area under the Residential Uses in Nadia District

Table 3: Change in land use pattern in Nadia District from 2001 to 2017

Land use categories	2001	2017	Change in %
Net Sown area (%)	70.63	68.08	-2.55
Area under non Agricultural use (%)	8.41	8.72	0.31
Area under forest (%)	1.09	0.85	-0.24
Area under waste land (%)	0.44	0.30	-0.14
Area under Residential uses (%)	19.43	22.05	2.62

**Figure 5: Change of Land Use Pattern in Nadia District from 2001 to 2017**

From the above table No. 3 and figure 5, we found that in Nadia district took place little change in land use pattern from 2001 to 2017 census year. Table No. 3 is the evident that negative growth has been recorded in net sown area, area under forest and area under waste land. Among these three types of land use pattern highest negative growth was found in net sown area category. The positive growth was found in area under non agricultural uses and area under residential uses.

CONCLUSION

From the above systematic study, it is included that in Nadia district little changes have occurred in different land use category from 2001 to 2017 time period. From the above observation, discussion and interpretation we find that the proportion of net sown area has declined 2.55 percent from 70.63 percent in 2001 to 68.06 percent in 2017 and also reduced the forest cover areas from 1.09 percent to 0.85 percent from 2001 to 2017 due to the urbanization, construction and developmental works, namely roads, railways, establishment of industries. For

these reasons, the proportion of area under non agricultural uses has increased 0.31 percent from 8.41 percent in 2001 to 8.71 percent in 2017 and also little positive changes have been found in the area under residential use in Nadia district. For the ecological balance for any area as well as Nadia district, there must be the forest coverage percent almost 33 percent, but we observed the block wise land use pattern of Nadia district during 2001 to 2017, then we found that there have no any one block with 33 percent forest coverage areas even more than 10 percent. We also found that the land use pattern of 2017, there have four blocks, namely Nabadwip, Krishnaganj, Hanskhali and Chakdah no forest coverage areas. For the increased forest coverage areas or green belts creation in Nadia district strictly applied the social forestry program, afforestation program by Government or local people or individual force.

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