JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

A comparative analysis of the Last Two Decades in Changing Land Use Patterns of Balagarh Block, Hugli district, WEST BENGAL

Nirupama Bairagi

ABSTRACT:

The land is a scarce resource, whose supply is fixed for all practical purposes. However, increasing population and economic activities are putting pressure on the available land resources. The study includes the land-use pattern *of the period from 1991 to 2021 in Balagarh block, Hugli District, by utilizing satellite imagery and associated techniques. The use of remote sensing data will enable the assessment of changes over a large spatial extent and long period, supporting informed decision-making for land management, conservation, and sustainable development in the Block. This comparative analysis aims to develop into the evolving trends and patterns of land use in Balagarh block, Hugli District; over the past two decades, providing a comprehensive understanding of the driving forces and consequences of these changes.*

Keywords: *Land, Remote-Sensing and GIS, Satellite Images, Land management.*

INTRODUCTION:

Land is the essential natural resource that gives habitat and sustenance to living organisms and is a major source of economic activities (UNEP report, 2001). Land use of an area depends upon the anthropogenic activities on the land which is very much important to formulating developmental planning of that particular area. Land use planning is an activity for finding technically, ecologically, economically and socially sound infrastructure of land (Jurgens, 1994). Land use changes allude to the fascination of the area spread starting with one class, then on to the next classification and alteration of condition inside a class. (Padoch et al., 2007). The distinctive classes of the area spreads are water bodies, meadows, woodland, developed areas, and so on. Land utilize and arrive spread is discrete terms;

they are frequently utilized reciprocally (Dimyati et.al, 1996).

Hugli district is characterized by a diverse landscape comprising urban areas, agricultural fields, forests, water bodies, and industrial zones. However, rapid urbanization, industrialization, population growth, and agricultural practices have exerted pressure on the district's land resources, leading to significant transportation in its land use and land cover patterns (Turner et al., 1995). The period from 1991 to 2021 witnessed a transformation in the Hugli district's LULC dynamics. Satellite imagery from sensors, such as Landsat, has been utilized to derive land cover classifications and monitor changes over time. Geospatial tools and software, including geographic information systems (GIS), have facilitated spatial analysis and mapping of LULC dynamics. This background study highlights the significance of understanding the LULC changes in the Hugli district from 1991 to 2021.

In this paper, changes in land use transformation were shown by preparing a land use map in Balagarh block, in Hugli district over the last three decades. It underscores the need for comprehensive research and monitoring to evaluate the drivers, impacts, and implications of these changes on the block's environment, biodiversity, and socio-economic conditions. Such knowledge will support effective land management strategies, conservation efforts, and sustainable development planning in the region.

STUDY AREA:

Balagarh Block is a part of the Hooghly district, located in Jirat, which is situated in the southern part of West Bengal. The CD Block has an area of 202.15 km2. It has 1 panchayat samiti, 13 gram panchayats, 183 gram sansads (village councils), 135 mouzas and 129 inhabited villages. Balagarh police station serves this block. The headquarters of this CD Block is at Patuligram, Jirat. The district has a rich historical and cultural heritage, with several notable landmarks and attractions. The Hooghly River flows through the district, adding to its geographical and economic significance. As per the 2011 Census of India, Balagarh CD Block had a total population of 228,998, of which 200,810 were rural and 28,188 were urban. Most of the Balagarh block is part of the Gangetic Alluvial Plain, where most of the rice paddy fields were cultivated. Sreepur Panchayat area has been famous for its boat industry since ancient times.

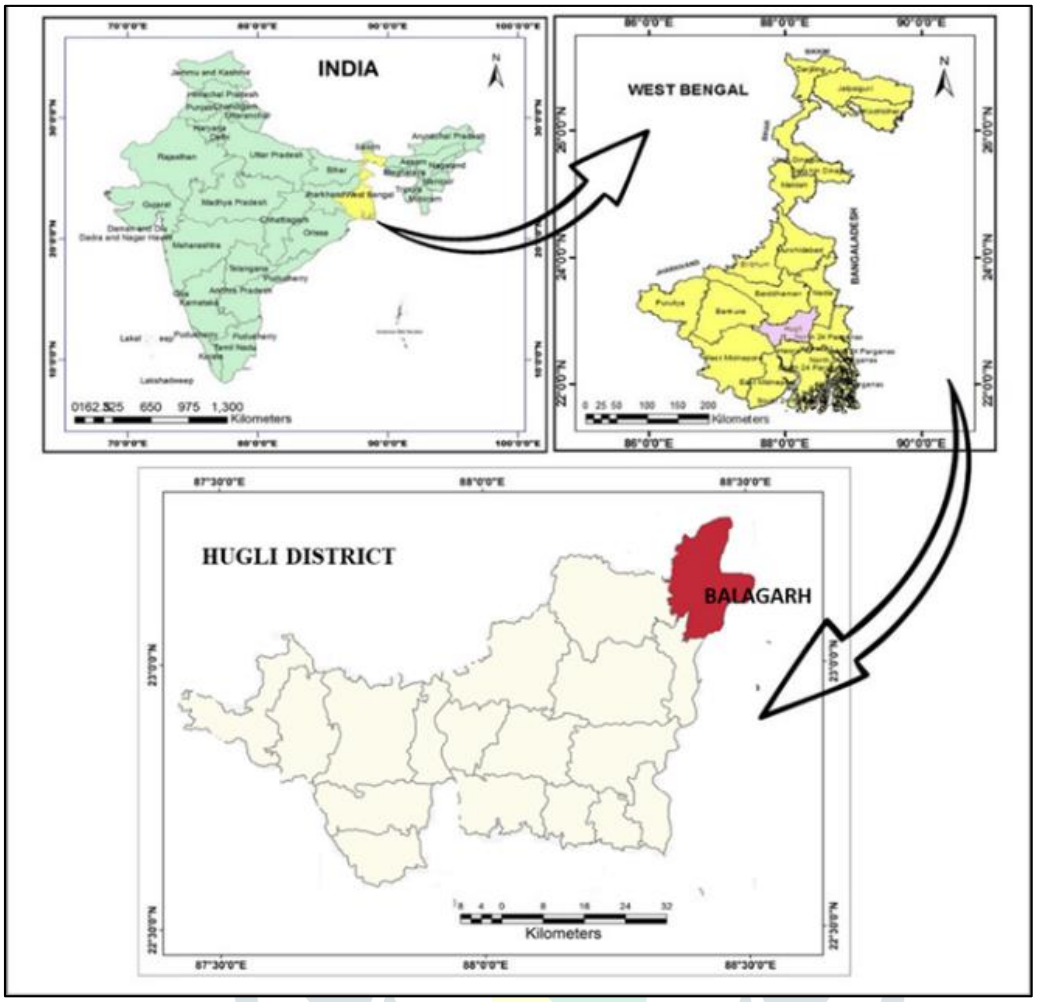


Figure 1: Location of the Study Area.

OBJECTIVES:

The main objectives of this paper are:

1. To explain the present land use pattern of the Block.
2. Detection of the change within a particular time phase.
3. To suggest measures to achieve the desirable land use pattern of the Block.

METHODOLOGY

The methodology for land use changes in Balagarh Block, Hugli District, and West Bengal from 1991 to 2021 can be described as follows:

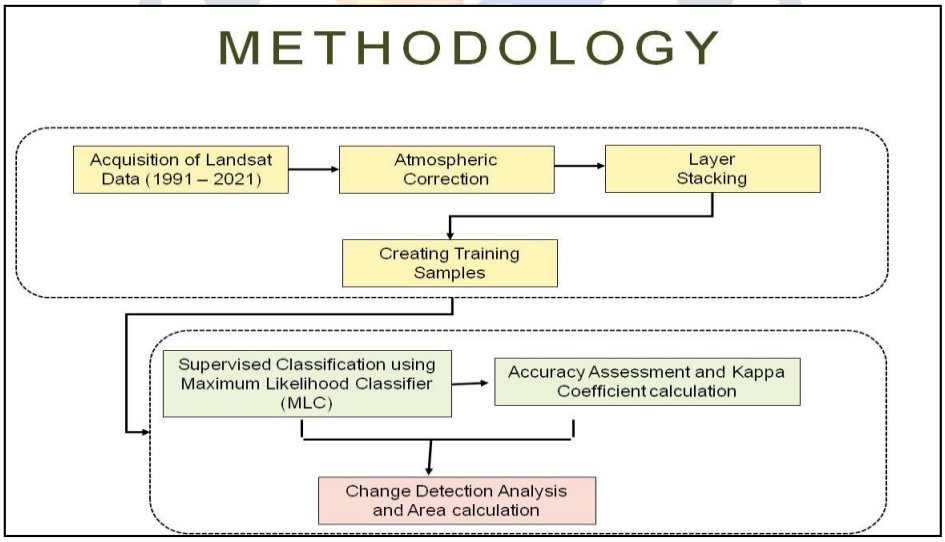
- **Data Collection: -** Acquire satellite imagery from different sensors, such as Landsat, Sentinel, and MODIS, covering the study area for multiple periods (1991, and 2021). Gather additional data

such as topographic maps, administrative boundaries, and field survey data for reference and validation purposes.

- **Pre-processing of Satellite Imagery: -** Atmospheric correction, Radiometric and geometric correction and Image mosaicking. Image segmentation Feature extraction, and Training data collection. Use supervised classification algorithms, such as Maximum Likelihood, Support Vector Machines, or Random Forest, to classify the segmented image regions into different land cover classes. Assess the accuracy of the land cover classification by comparing the classified results with the ground truth samples using accuracy metrics.

By following this methodology, the study will provide valuable insights into the land use and land cover changes in Balagarh Block, Hugli District over the specified period, contributing to a better understanding of the landscape dynamics and supporting sustainable land management practices.

Figure 2: Flow chart of Methodology



Source: Computed by author.

Result and Discussion

Table 1: LULC area and relative change (1991-2021)

1991	2021					
	Waterbody	Vegetation	Agricultural Land	Settlement	Barren Land	Total
Waterbody	0	0.74478	5.21347	2.97912	0	85.64996
Vegetation	7.44782	0	27.55694	32.02563	0	187.6851
Agricultural Land	5.95825	16.38521	0	37.98389	1.48956	1396.467
Settlement	0	3.72391	5.21347	0	0	320.2564
Barren Land	2.23434	2.97912	5.95825	3.72391	0	23.83303
Total	96.82169	144.48776	1379.33681	388.03157	11.17173	

In Balagarh block, there has been a change of 0.74478 square kilometres (sq. km) from Water body to Vegetation. This suggests that certain areas previously covered by water bodies have experienced a transition and are now covered by vegetation. This change may be the result of natural processes or human activities that have led to the growth of vegetation in these areas.

Additionally, there has been a change of 5.21347 sq. km from the Water body to Agricultural Land. This indicates a significant conversion of waterbodies into agricultural land over the specified period. Human interventions such as land clearing and irrigation may have played a role in facilitating this transformation. However, there has been a change of 27.55694 sq. km from Vegetation to Agricultural Land. This implies the expansion of agricultural activities into areas previously covered by vegetation. Additionally, there has been a change of 32.02563 sq. km from Vegetation to Settlement, indicating the encroachment of human settlements into vegetated areas.

There have been no observed changes from Agricultural Land to water bodies, indicating that areas under agriculture have not transformed into water bodies. However, there has been a change of 16.38521 sq. km from Agricultural Land to Vegetation, indicating a decrease in agricultural land and a corresponding increase in vegetated areas.

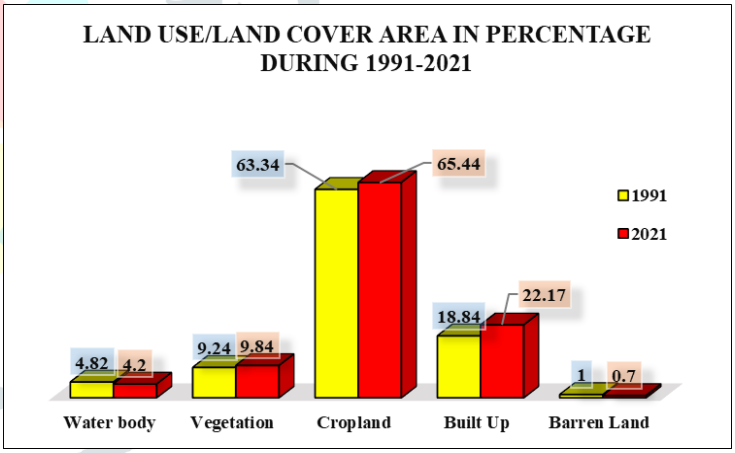
Moreover, there has been a change of 37.98389 sq. km from Agricultural Land to Settlement, suggesting the conversion of agricultural land for human settlement. Lastly, there has been a change of 1.48956 sq. km from Agricultural Land to Barren Land, indicating a small portion of agricultural land becoming barren over time. There has been a change of 3.72391 sq. km from Settlement to Vegetation, implying the expansion of vegetation within previously settled areas. Additionally, there has been a change of 5.21347 sq. km from Settlement to Agricultural Land, indicating the conversion of settlements into agricultural areas.

There has been a change of 2.97912 sq. km from Barren Land to Vegetation, suggesting the growth of vegetation in areas previously categorized as barren land. Moreover, there has been a change of 5.95825 sq. km from Barren Land to Agricultural Land, indicating the conversion of barren land into agricultural areas.

Table 2: Land use and land Cover change between 1991 to 2021 (Area in percentage)

Class	1991 (%)	2021 (%)	Relative Change (1991-2021)
Waterbody	4.82	4.20	-0.62
Vegetation	9.24	9.84	+0.6
Cropland	63.34	65.44	+2.1
Built-Up	18.84	22.17	+3.33
Barren Land	1.00	0.70	-0.3

Figure 3: Land use/Land cover Change between 1991 to 2021 (Area in percentage)



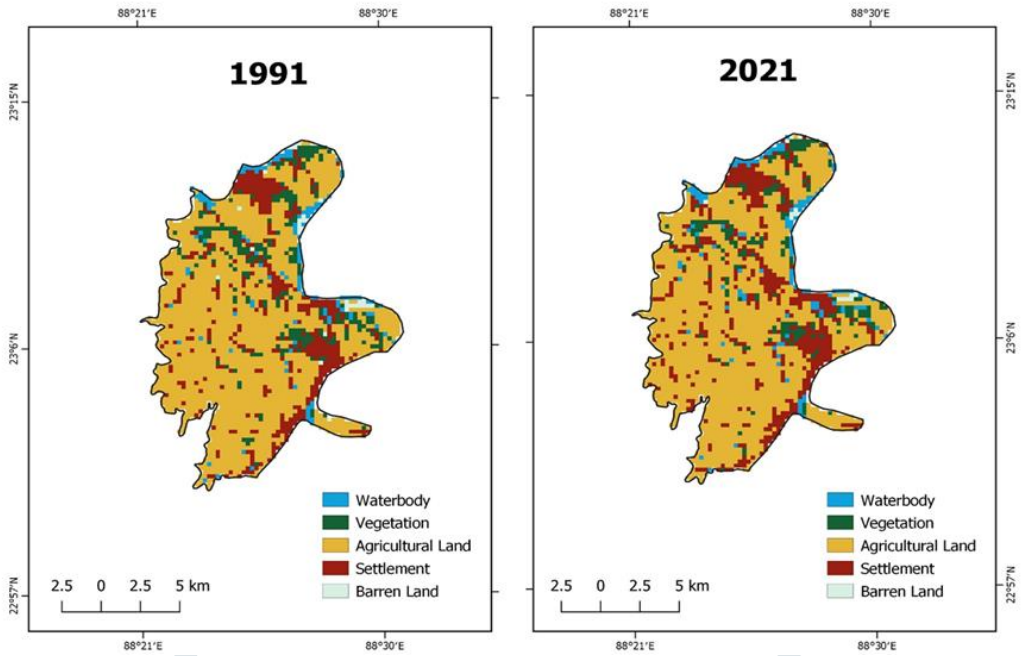


Figure 4: land use and land cover change in between 1991 to 2021.

Conclusion:

The last 2 decades have seen a shift towards more sustainable and integrated land use practices. The most positive changes have been observed in the built-up area (+3.3%) and the increasing amount of crop plants (+2.1%) due to increasing population pressure and increasing demand for food. The change of paddy fields to nurseries with urbanization indicates the change in the transformation of land use of the study area. However, challenges pursued and the future will likely require even greater collaboration between Government communities and organizations to address the complex interplay of factors influencing land use patterns. Continuous monitoring of technology innovations and adaptive governance will be crucial in shaping a more sustainable future.

Reference

- UNEP, "Land Degradation," State of the Environment in Bangladesh, 2001.
- Turner, B. L., Skole, D., Sanderson, S., Fischer, G., Fresco, L., & Leemans, R. (1995). Land-use and land-cover change: science/research plan. *[No source information available]*. Adhikari, S, *Political Geography*, Rawat publication, 1994.
- Chatterjee, S. P, *Land Utilization Survey of Howrah District*, Geographical Review of India, Calcutta, Vol. – 14, No – 3. 1952
- Hunter, W. W, *A Statistical Account of Bengal, Hugli & Howrah, Government of West Bengal*, K. R. Biswas, IAS, State Editor, West Bengal District Gazettes, 1997.
- Mallick, S, Betal, H. R, *Impact of some socio-economic factors on population density in Hugli*, West Bengal, Symposium on Environmental Management, Allahabad, 1982.
- Padoch, C., Coffey, K., Mertz, O., Leisz, S. J., Fox, J., & Wadley, R. L. (2007). The demise of swidden in Southeast Asia? Local realities and regional ambiguities. Geografisk Tidsskrift-Danish Journal of Geography, 107(1), 29-41.

Nirupama Bairagi, Assistant Teacher, Geography, Durgapur polymangal Balika Vidyamandir, Research Scholar, Jadavpur University. Kolkata -700056, West Bengal, India

Email id: nirupamaduttageography@gmail.com