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Land Use/Land Cover analysis of Bahuda River basin Andhrapradesh, India by using Remote sensing and GIS.

Lokeswara Rao Neyyala[1], Prof.Byragi Reddy.T[2], Sridhar.B[3], Maneesha.R[4],Satyaveni.K[5],

[1,2,4,5] Department of Environmental Sciences,Andhrauniversity,Visakhapatnam-530 003,

[3] Department of Geo-engineering, Andhrauniversity, Visakhapatnam-530 003.

Abstract:

Land use/land cover (LULC) changes were determined in Bahuda River, Srikakulam district in Andhrapradesh from 1985, 1995 and 2005 by using Geographical Information System (GIS) and remote sensing technology. These studies employed by using the Survey of India topographic maps and the remote sensing data of Senthil. The study area was classified into different categories on the basis of field study geographical conditions, and remote sensing data. The comparison of LULC in 1985 and 2005 derived from topo sheet and satellite imagery interpretation indicates that there is a significant increase in built-up area, open forest and other lands. It is also noted that substantial amount of agriculture land, water spread area, and dense forest area vanished during the period of study which may be due to rapid floods of the study area. There are small Bricks industries locating around and nearby river Bahuda. in 2018 the study area fully flooded by the TITLI Cyclone. Most of Agriculture land washout during this cyclone.

Key words : Land use/Land cover, Remote Sensing, GIS, Bahuda River

1. Introduction

In River environment natural and human-induced environmental changes are of concern today because of deterioration of environment and human health [1]. The study of land use/land cover (LULC) changes is very important to have proper planning and utilization of natural resources and their management [2]. Traditional methods for gather demographic data, censuses, and analysis of environmental samples are not adequate for multi complex environmental studies [3], since many problems often presented in environmental issues and great complexity of handling the multidisciplinary data set. we require new technologies like satellite remote sensing and Geographical Information System (GIS). These technologies provide data to study and monitor the dynamics of natural resources for environmental management [4].

Remote sensing has become an important tool for developing and understanding the global, physical processes affecting the Earth Surface [5]. Recent development in the use of satellite data is to take advantage of increasing amounts of geographical data available in conjunction with GIS to assist in interpretation [6]. GIS is an integrated system of computer hardware and software capable of capturing storing retrieving manipulating, analyzing, and displaying spatial information for the purpose of aiding development-oriented management and decision-making processes [7]. Remote sensing and GIS have covered wide range of applications in the fields of Agricul- ture [8], environment [9], and integrated eco-environment assessment [10]. Several researchers have focused on Land use Land cover studies because of their adverse effects on ecology of the temporal changes [11–14].

Present study area rapid development during past decades in terms of urbanization, industrialization, migration and also population increase substantially. The main objective of this article/paper is to detect and quantify the LULC around Bahuda river (Figure 1), from 1981 to 2005 using satellite images and topo sheets. net increase of 22.54 km^2. In 1976 no mining activities were found in the study area, but a small addition of 0.13 km^2 mining land was

found in 2003.

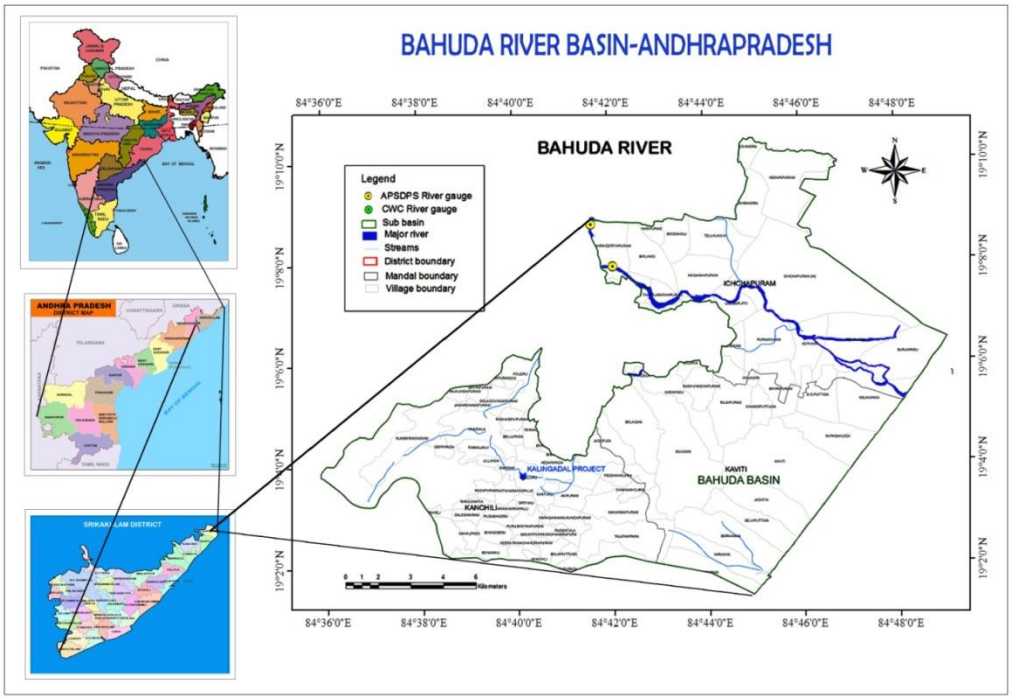

Figure 1: Location of the study area, Bahuda River Basin, Andhrapradesh

2. Study Area Description

Bahuda River originates from Jarada hills in the Orissa State at an elevation of +975.650Mts. This is a minor river basin that drains the area between the Eastern Ghats and Bay of Bengal and lies between Rushikulya and Mahenddra tanaya river basin. The river runs 54 Km in Orissa state and enters A.P.State at Boddabada village, Ichapuram Mandalam Srikakulam District and finally the river empties in Bay of Bengal near Donkuru village in the same Mandalam after traveling a stretch of 12.00Km in A.P. Territory. The inter state river having a total catchment area of 1147 Sq.Km, out of which 194 Sq.Kms catchment area lies in Andhra Pradesh state. The main tributaries of the Bahuda river are Pochandanala, Kantajorrinala and Baginala which are joins at up stream of Arakaubhadra village. Another two tributaries' named Bheemasamudram gedda and Padmapuram gedda joins Bahuda river at Bellupada and Edupuram villages respecitvely.Bahuda river flows from odisha to Andhra Pradesh state within only Icchapuram mandal in Srikakulam district.most of agriculture lands depends on Bahuda river.Twenty eight revenue villages and twenty one Grampanchayats under icchapuram mandal. Rice is main crop around this river basin. Mysapuram, Birlangi, Thotur, Telukunchi, Haripuram (Icchapuram Maandal), Loddaputti, Jagnadhapuram, Nowgam, Patrapuram and Rattakanna villages fully depends on Agriculture.Total cropped are 5446 and 54.70% in geographical area.

3. Data and Methodology

In the present study we have used mainly two types of data. These are topographic map and remote sensing data. The remote sensing data of geo-referenced and merged data of USGS (earth Explorer) and Google earth images of different seasons used. The spatial

resolutions of LISS III is 23.5 meters, and spectral resolutions are 4 respectively.

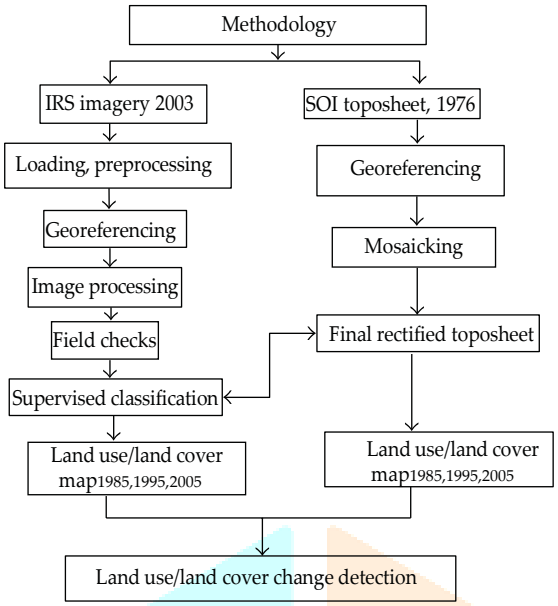

Fig.2 Flow chart of methodology for land use/land covers andchange detection

Population			
Year	1991	2001	2011
Rural	36,233	44,085	52,472
Urban	29,654	32,662	36,493
Total	65,887	76,747	88,965

Table.1 Study area population

The topographic map is obtained from the Survey of India, Hyderabad, which was surveyed and prepared in 1976; it is converted to digital mode using scanning. The topographic map is geo-referenced with longitude and latitudes using the ArcGIS software spatial analyst tools and demarcated the boundary of study area. A supervised classification extraction with the maximum algorithm was developed to classify the digital data of IRS 1D geo-referenced and merged LISS III for land use land cover mapping for the year 1985. Before the pre-processing and classification of satellite imagery began, an extensive field survey was performed throughout the study area using Global Positioning System (GPS) for locations of study area. This survey was performed in order to obtain accurate location point data for each land use and land cover class included in the classification scheme as well as for the creation of training sites and for signature generation. The satellite data was enhanced before classification using histogram equalization in ERDAS Imagine 9.3 to improve the image quality and to achieve better classification accuracy. In supervised classification, spectral signatures are developed from specified locations in the image. These specified locations are given the generic name "training sites" and are defined by the user. Generally a vector layer is digitized over the raster scene. The vector layer consists of various polygons overlaying different land use types. The training sites will help to develop spectral signatures for the outlined areas.

The land use maps pertaining of three different periods were used for post classification comparison, which facilitate the estimation of changes in the land use category and dynamism with the changes. Post classification comparison is the most commonly used quantitative method of change detection [15–17] with fairly good results. Post classification comparison is sometimes referred to as "delta classification" [18]. It involves independently produced spectral classification results from different data sets, followed by a pixel-by- pixel or segment by-segment comparison to detect changes in the classes. The detailed methodology adopted was given in Figure 2.

4. Results and Discussion

Knowledge about land use-land cover has become important to overcome the problem of bio geochemical cycles, loss of productive ecosystems, biodiversity, deterioration of envi-ronmental quality, loss of agricultural lands, destruction of wetlands, and loss of fish and wildlife habitat. The main reason behind the LULC changes includes rapid population growth, rural-to-urban migration, reclassification of rural areas as urban areas,

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lack of valuation of ecological services, poverty, ignorance of biophysical limitations, and use of ecologically incompatible technologies.

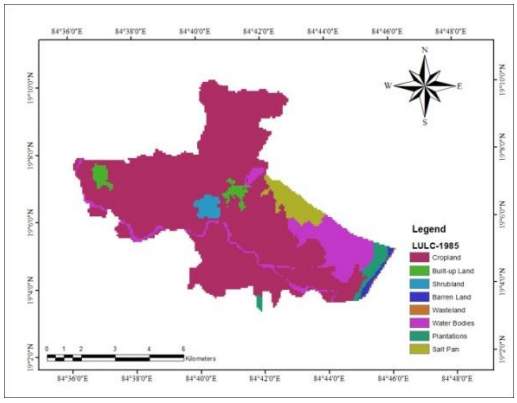

Fig.3 Land use/Land Cover-1985

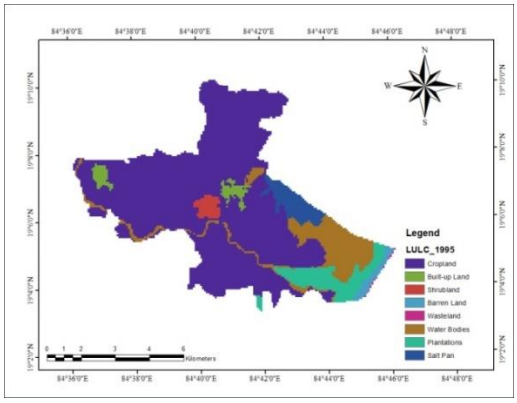

Fig.4 Land use/Land cover-1995

Present study area Bahuda river basin is a flood affecting and is a main source of agriculture. Five to six villages nearby River Bahuda with radius 500 mts.These villages are occurring with floods frequently due to very nearby to river basin.During the past few decades, the study area has witnessed substantial increase in population (Table 1), economic growth, and industrialization, and bricks making activities have negative impact on the environmentalhealth of the region.

Due to involvement of multiple data sets, we used latest technologies like remote sensing and GIS to quantify LULC. On the basis of interpretation of remote sensing imagery, fieldsurveys, and existing study area conditions, we have classified the study area into eight categories, that is, agriculture, built-up area, barren land, waste land,water bodies, other land, plantation, and water spread area (Figures 3 and 4). The study area covers entire icchapuram mandal and LU/LC changes were estimated from 1985 to 2005.

Table 2 gives the statistical results of LULC changes.It is evident from Table 2 that the LULC changes were of highest amount in agriculture built-up area, plantation, other land, and dense forest from 1985 to 2005. Comparison of LULC in 1985, 1995 and 2005 derived from toposheet and satel- lite imagery interpretation indicates that the built-up area, comprising human habitation developed for non agricultural uses like building, transport, and communications is largely broadened from 1985 to 2005. This is due to urban expansion and population increase in this study area during the study period.

The agricultural lands which are used for paddy and production of food, vegetables, and other mixed varieties like mango, coconuts and other homestead trees are largelydecreased from 1985 to 2005.

The study area witnessed large amount of agriculture land converted into settlements and brick making industry. Water spread area, both man-made and natural water features such as rivers/streams, tanks, and reservoirs, also decreased from 1985 to 2005. Water spread area decrease is occurred due to the gradual conversion of water spread area into built-up area or human developmental area as the population increased and flow of river water sinking due to high temperature and illegal sand mining during the past decades. This is attributed to conversion of agriculture lands into urban areas and other development activities like bricks industry etc.

The plantation land which includes agri- cultural tree crops and other horticulture nurseries also increased from 1.94 km^2 (1985) to 7.78 km^2 (2005. The other land consisting of roads, mostly link roads, joining the village settlement and barren land with or without scrub and sandy area is largely broadened from increasing 1985 to 2005. From 2005 onwards no sand mining activities were found in the study area because government of Andhra Pradesh they are strictly following rules and regulations on illegal sand mining.

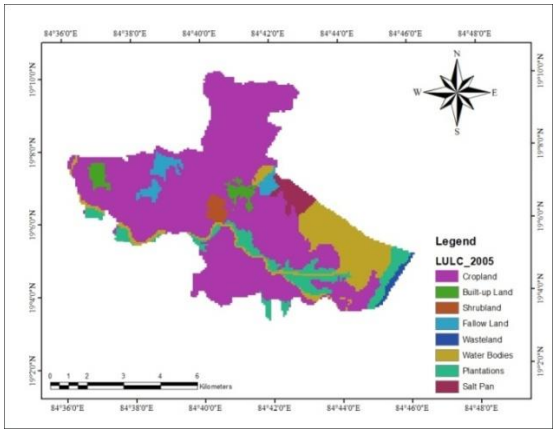

Fig.5 Land use/Land cover-2005

S.No	Name	1985 Area Km²	1985 % of Area	2005 Area Km²	2005 % of Area	Change Area Km² 2005-1985	Change Area Km² % 2005-1985
1	Cropland	77.18	78.07	69.27	70.07	-7.91	8
2	Built-up Land	1.98	2.00	2.17	2.20	0.19	0.2
3	Shrub land	1.47	1.49	1.47	1.49	0	0
4	Barren Land	0.64	0.65	2.68	2.71	2.04	2.06
5	Wasteland	0.86	0.87	0.73	0.74	-0.13	-0.13
6	Water Bodies	10.93	11.06	12.95	13.10	2.02	2.04
7	Plantations	1.94	1.96	7.78	7.87	5.84	5.91
8	Salt Pan	3.86	3.90	2.14	2.16	-1.72	-1.74
	Total	**98.86**	**100.00**	**98.86**	**100.00**		

(−) indicates decrease

Table 2. Land use/Land cover change from 1985-2005

5. Conclusions

his paper focuses on LULC changes in Bahuda rive basin,Icchapuram mandal,Srikakulam district in Andhrapradesh,India using remote sensing data and GIS technology. Our results clearly show that LULC changes were significant during the period from 1985 to 2005. There is significant expansion of built-up area noticed. On the other hand there is decrease in agricultural area, water spread area,and forest areas. This study clearly indicates the significant impact of population and its development activities on LULCchange. This study proves that integration of GIS and remotesensing technologies is effective tool for River floods and management. The quantification of LULC changes of Bahuda river basin is very useful for environmental management groups, policy makers and for public to better understand the surrounding.

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