Application of Remote Sensing and GIS Techniques in Land Use-Land Cover Change Study of Durg Block, District-Durg, Chhattisgarh India.

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Abstract: *Durg block is the most populous block of the durg district of the Chhattisgarh state. Districts headquarter situated in durg block. According to the census 2001 and 2011 population of the durg district increased relatively 997848 and 1126731. (Statistical booklet 2013-14). The growing population and increasing socio-economic necessities creates a pressure on LULC. This pressure results in unplanned and uncontrolled changes in LULC. (Seto et al, 2002). With the time lots of changes in land cover take place in the area. Land use and land cover is an important component in understanding the interactions of the human activities wi th the environment and thus it is necessary to be able to simulate changes. (Prakasam,C. (2010)).The current studies aims to find out the changes during 1989-2014(25 years), for this land use land cover map of 1989 and 2014 of the study area are prepared with the help of remote sensing and Quantum GIS Techniques. It is found that in last 25 years lots of changes has been occurred in the durg block ,agriculture land increased by 24.89%,built up area increased by 4.82%,forest area increased by 0.3%,waste land decreased by 31.01%,while the area which is covered by the water bodies increased by 0.99% .It is found that the most of waste land converted in built up (settlement area) and agriculture land, most of agriculture land converted in to built-ups(settlements)and waste land ,with the time forest (vegetation)increases, no. of small water bodies decreases due to increment of built up area but total area which is covered by water bodies increases.*
Keywords: *change detection, land use, land cover, LULC (Land use Land cover), GIS, Remote sensing.*


I. Introduction

Land use and land cover is an important component to understand global land status; it shows present as well as past status of the earth surface. Land use and land cover are two separate terminologies which are often used interchangeably (Dimyati et al1994).Land cover reflects the biophysical state of the earth's surface and immediate subsurface, thus embracing. The soil material, vegetati on, and water. Land use refers to man's activities on land which are directly related to the land. Land use and lan d cover are dynamic. (Prakasam,C. (2010)) .It means area which is covered by natural resources like forest, river soil, and grass land, wasteland known as land cover while the area which is covered by manmade features like buildings, roads, agriculture land is known as land use. As the population increases human activity on the earth surface also increases for the extraction of resources and survival. They need shelter, food, clothes and many more things and for all their needs human depends on the nature and he started to spoil the nature by cutting forest and by many ways without any previous planning and it causes a serious affect `on environment, as land use increases without any planning and management so problem is generated in the form of increasing water pollution, decline of water level, air pollution,soilpollutionetc. Now a day government and state agency prepare land use plan for betterment of the area, for land use plan land use land cover mapping is done with the help of remote sensing ,GIS, ERDAS imagine, by comparing 2 different time periods lands use land cover map of the same area change detection study can be done.

STUDY AREA

Durg district of Chhattisgarh state is classified in to 3 blocks Durg, Dhamdha and Patan. The study area is Durg block and it covers an area of 642.887 km^2, which comes in between Latitude 21° 02' 00" N and 21°22' 00" N and Longitude "81°08' 00" E and 81° 28' 00" E most of the area occupied by toposheet no. 64G/8 and partially by 64 G/3, 64 G/4 and 64 G/7.

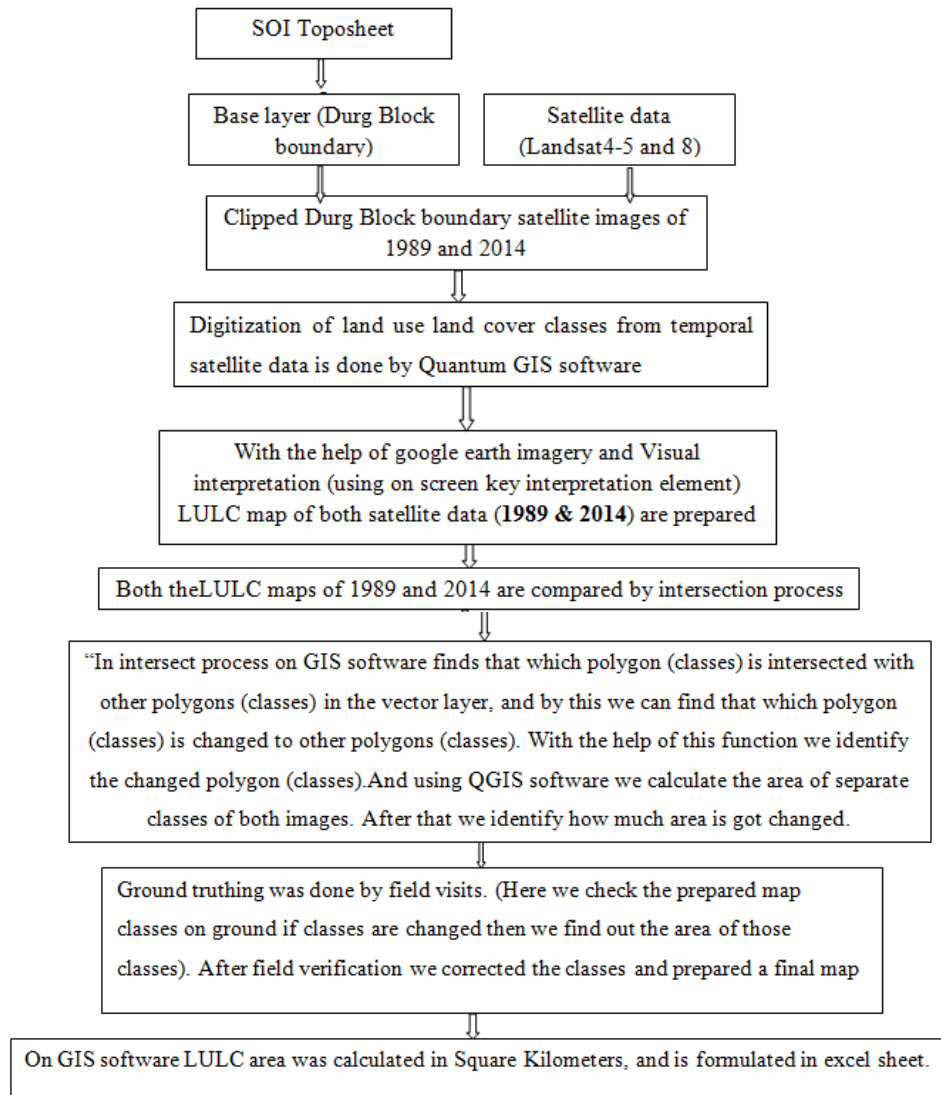**MAP NO. 1: LOCATION MAP OF THE STUDY AREA**
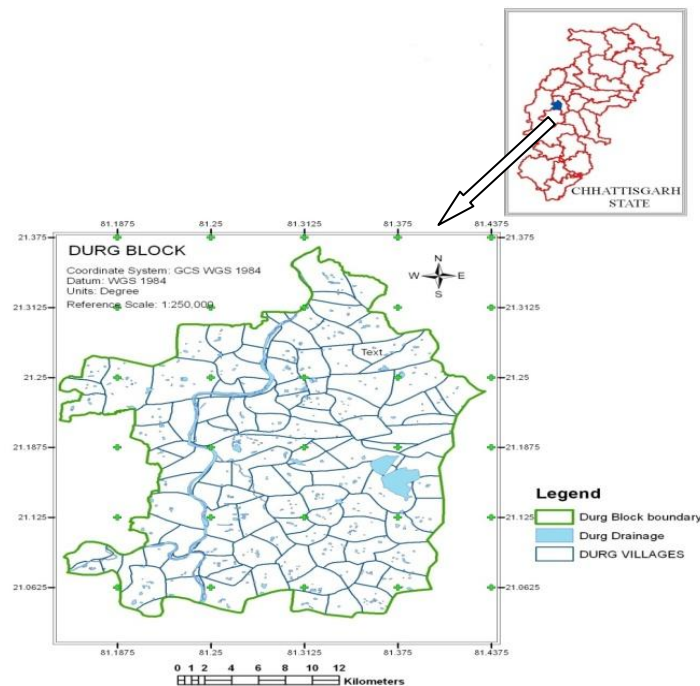
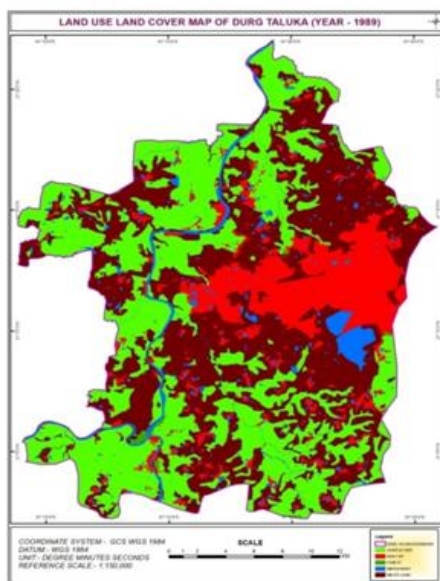**LAND USE LAND COVERS CLASSIFICATION AND MAPPING**:-
Application of remotely sensed data made possible to study the changes in land cover in less time, at lo w cost and with better accuracy (Kachhwaha, 1985) in addition with Geographical Information System (GIS). When raw satellite data (satellite images) is classified then the result is referred as land use land cover change data. Land use land cover categories are based on the return reflection value of satellite image. The image classification process required lots of time and intensive labor. But this study presents a very relevant method for determine the extents of various land uses and cover types, such as settlement(urban area), water ,forest, shrub land, agriculture, barren land etc. In the present study, 5 classification are taken in to consideration for preparing land use lands cover maps and change detection water body ,built ups, wasteland, agriculture and forest.
CHANGE DETECTION STUDY:-In the change detection study we recognize the changes in particular area during the particular period of time. As we know satellite imagery is essential to understand environmental change. Satellite imagery is becoming more valuable because now a day, new methodologies emerge to minimize change detection errors from sensor and seasonal variations so that we can understand the true change on the ground. Change detection is also used to update Land cover maps. In the present study, two cloud free images of Land sat 4-5 and 8 (30 m. resolution) of same season of different time period are taken in to consideration. With the help of these images in quantum GIS land use land cover map of the area are prepared and both maps are compared to find out the Land use Land Cover changes.
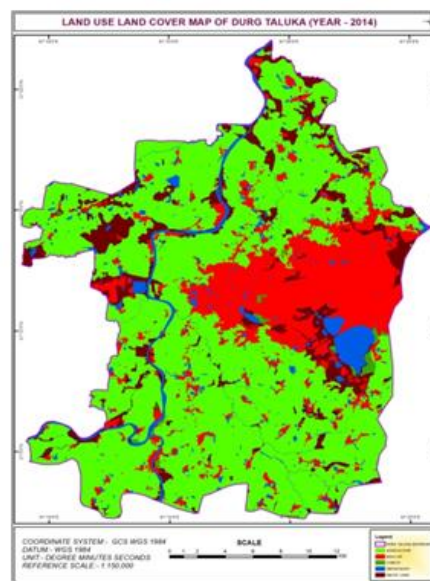**METHODS AND TECHNIQUES:** Flow chart showing methods and techniques which is applied for LULC change detection is as follows-
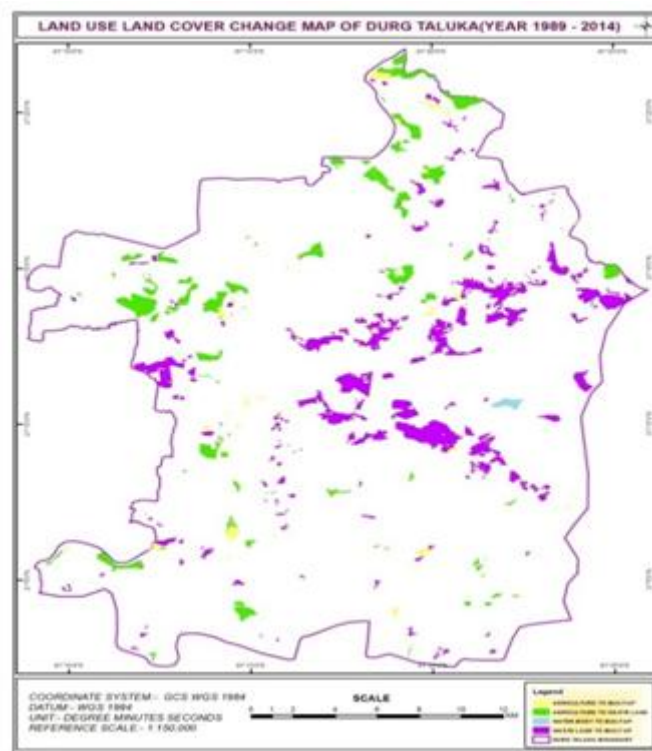
SOI Toposheet
⇓
Base layer (Durg Block boundary)   Satellite data (Landsat4-5 and 8)
⇓
Clipped Durg Block boundary satellite images of 1989 and 2014
⇓
Digitization of land use land cover classes from temporal satellite data is done by Quantum GIS software
⇓
With the help of google earth imagery and Visual interpretation (using on screen key interpretation element) LULC map of both satellite data (**1989 & 2014**) are prepared
⇓
Both theLULC maps of 1989 and 2014 are compared by intersection process
⇓
"In intersect process on GIS software finds that which polygon (classes) is intersected with other polygons (classes) in the vector layer, and by this we can find that which polygon (classes) is changed to other polygons (classes). With the help of this function we identify the changed polygon (classes).And using QGIS software we calculate the area of separate classes of both images. After that we identify how much area is got changed.
⇓
Ground truthing was done by field visits. (Here we check the prepared map classes on ground if classes are changed then we find out the area of those classes). After field verification we corrected the classes and prepared a final map
⇓
On GIS software LULC area was calculated in Square Kilometers, and is formulated in excel sheet.

MAP NO: 2 LULC MAP 1989   **MAP NO:3 LULC MAP 2014**

MAP NO:4 LULC CHANGE DETECTION MAP 1989-2014

TABLE NO.1: SHOWING LULC CHANGE INFORMATION FROM YEAR 1989 TO YEAR 2014 IN SQ. METERS WITH TYPE WISE CHANGE.

S. No.	LULC 1989	LULC 2014	CHANGE VALUE	AREA (SQ METER)
1	Agriculture	Built-up	Agriculture to Built-up	**3114604.91**
2	Agriculture	Wastelands	Agriculture to Wastelands	**15895434.26**
3	Wastelands	Built-up	Wastelands to Built-up	**29135578.10**
4	Water bodies	Built-up	Water bodies to Built-up	**578593.67**

TABLE NO 2: SHOWING LULC CHANGE INFORMATION FROM YEAR 1989 TO YEAR 2014 IN SQ.K.M.

S. No.	LU/LC TYPE	YEAR 1989 (SQ KM)	YEAR 2014(SQ KM)	CHANGE (IN SQ KM)
1	Agriculture	251.77	411.83	**+160.05**
2	Built-up	95.69	126.64	**+30.95**
3	Forest	1.54	3.50	**+1.96**
4	Wastelands	261.43	62.06	**-199.37**
5	Water bodies	32.57	38.97	**+ 6.40**

TABLE NO 3: SHOWING LULC CHANGE INFORMATION FROM YEAR 1989 TO YEAR 2014 IN PERCENTAGE

S. No.	LU/LC TYPE	YEAR 1989 (%)	YEAR 2014 (%)	CHANGE (IN %)
1	Agriculture	39.16	64.05	**+24.89**
2	Built-up	14.88	19.70	**+4.82**
3	Forest	0.24	0.54	**+0.3**
4	Wastelands	40.66	9.65	**-31.01**
5	Water bodies	5.07	6.06	**+0.99**

II. Discussion

By implementing above method, it is found that we can extract the land use land cover change information. Field visit and manual digitization are time taking task of this methodology but field visit is essential for ground truthing and manual digitization on raster images is essential to generate vector information. From the study it is observed that most of the land changes occurred in built ups. We can clearly see in table

no.1 that most of the agriculture land, waste land and water bodies converted in built ups(settlement) area. From table no.2 it is found that from 1989 to 2014 agriculture lands increased by 160.05 sq km, built up area increased by 30.95sq km, forest area increased by 1.96 sq km, waste land decreased by 199.37sq km, while the area which is covered by the water bodies increased by 6.40sq km .

III. Conclusion

Looking at the final result of this study, it is observed that in 25 years agriculture land increased by 24.89%, built up area increased by 4.82%, forest area increased by 0.3%, waste land decreased by 31.01%, while the area which is covered by the water bodies increased by 0.99% .we can see that percentage ratio of agriculture is reducing with time and it is replaced by man-made built ups .Most of agriculture land ,waste land and water body affected by urbanization and replaced by built ups and most of agriculture lands converted in waste land. As the population increases due to urbanization, condition of water resources is very difficult. The groundwater recharge will be affected due to concretization of the surface. It is very difficult to maintaining equilibrium between environment and human being if this scenario were continued. At present, the area suffering from negative effect of private building construction and housing boards projects. Therefore, a sustainable phase-wise management is required for the betterment of the area.

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