

An Analysis of LULC Change Detection using GIS; A Case Study of Peri Urban Bengaluru

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Abstract: *Kanakapura Taluk is one among the eight peri urban clusters of Bengaluru. At present peri urban area is the area beyond 198 wards of BBMP. Kanakapura Taluk witnessed gradual expansion as result of rapid growth of Bengaluru city. For the past decade the Taluk has been known relatively large in its population and size. Kanakapura Taluk is known for its connectivity , Physical Infrastructure ,Social Infrastructure and Affordable housing and industrial developments. Therefore it is paramount to detect the lulc changes in order to determine its direction of future expansion. To achieve that Landsat 7 image of 2000 , Landsat 5 image of 2005, Landsat 5 image of 2010 and Landsat 8 image of 2017 is used. A supervised classification is used to facilitate land use change detection. Kanakapura Taluk shows a gradual change in the lulc pattern.*

Keywords: Peri –Urban , Land Use Land Cover , Supervised Classification , Change Detection

1. Introduction

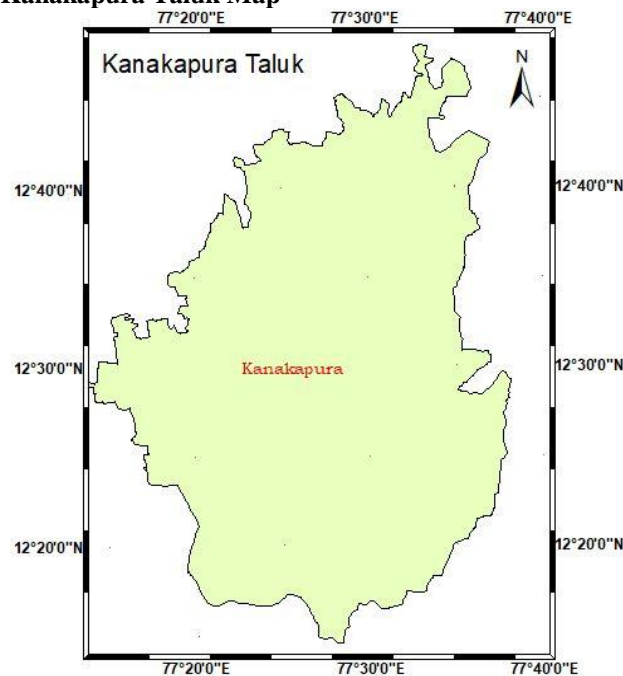
Peri urban areas are transition zones. The transition sets forth in the form of transition in the usage of land as a resource. The major land use changes include include industrial residential and commercial use. Land use changes leads to several other changes. The major urban land uses which find their way into this zone are roads, industries, power stations, urban recreational amenities, amusement parks, residential complexes and even dumping grounds and treatment plants for urban wastes. The land use change analysis could bring forth the peri urban transition. A wide variety of literature shows the spatial and temporal changes in the peri urban transition process.

Studies on various countries examined the process of peri urban transition, Browder et al. (1995). Literature shows that peri-urban metropolitan fringe as dynamic zones linked to both rural and urban areas, where divergent activities would stimulate economic growth. Fringe areas are transitional economic and social spaces, articulated to both rural and urban economies and as such, stimulating growth in rural urban sectors

2. Study Area

Kanakapura Taluk is situated 56 km away from the city is well connected to Outer Ring Road, Banashankari, JP Nagar and Uttarahalli. This area is also easily accessible from other suburbs such as Bannerghatta Road, Electronic City and Jayanagar. Connectivity and strong infrastructure has fueled the growth of real estate in Kanakapura Road.

Kanakapura Taluk Map



Kanakapura Taluk is considered as Southern periphery. The peri urban influence of Kanakapura Taluk is mainly because of the Bengaluru city influence. It is located in the south west part of the Bangalore Metropolitan Region .The total extent of the LPA is 412.78sqkm and consists of 86 settlements consisting of 85 villages and Kanakapura TMC. The Bangalore Mysore Infrastructure Corridor passes in close proximity to the LPA on the north –east which increases its development potential¹. There are four important growth nodes in the LPA- Kaggalipura, Harohalli, Kanakapura and Sathanur. Kanakapura is the Taluk headquarter of the Kanakapura Taluk and is also a Town Municipal as per Census. The area is mainly residential with few institutional buildings to cater to the civic needs. The Kanakapura LPA lies in the Cauvery basin.

¹ Master Plan (2031) Kanakapura LPA Final Master plan Report and Zoning Regulations

The main tributary of Cauvery ,river Arkavathy, flows in the LPA. LPA is covered by the sub basin Arkavathy and drains southwards. The climate in the region is hot, moist, semi arid Ecological Sub Region with length of growing period of 150-180 days. The Kanakapura Local Planning Area belongs to the Eastern Dry Agro-Climatic Zone. The LPA experiences pleasant weather almost all throughout the year. March, April and May are the predominant summer while December and January constitute winter.

Kanakapura situated to the (56 km from Bangalore) South of Bangalore .The place was originally under the Gangas and later under the Cholas, who administered it as a part of Kilalainad. Later, the Hoysalas made it a major headquarters of province. Its name was changed as Kanakapura from its original Kanakanahalli. The LPA comprises of parts of the Kanakapura Taluk and the Bangalore South Taluk. It consists of 86 villages and one TMC and has a total population of 1.81 lakhs. The Total urban population in the LPA is 54,021 while the rural population in 1.27 lakhs. Kanakapura Taluk is known for its connectivity, Physical Infrastructure, Social Infrastructure and Affordable housing

3. Methodology

To assess the extent and pattern of Land use changes in the peri urban area , peri urban clusters beyond area beyond 198 wards of BBMP is selected .In this research a selection of multispectral and multi temporal images are used for the study. Adopting a time interval of 5 years suggested by GIS experts and a spatial resolution of 30m , the investigation is carried out. In this study ERDAS software is used at different stage for analysis and map production. A supervised classification is used to facilitate land use change

detection. The time period for the analysis is 2000 to 2017 Kanakapura.

Change Detection

In order to facilitate land use change detection in this research , five classes of land uses were generated Habitation, Water body, Agriculture ,Vegetation and Others which include Fallow Land or Waste Land .Level 1 of classes will be used to generate change statistics.

Land Use Land Cover Map Kanakapura from 2000-2017

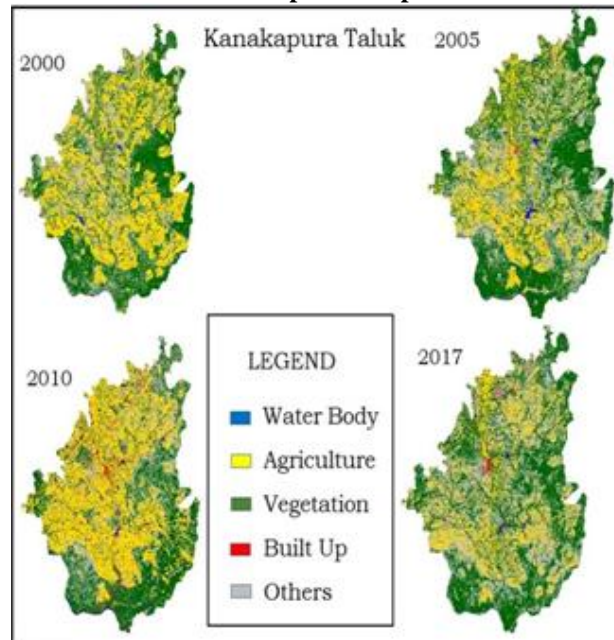


Table 1: Change Detection statistics - Kanakapura Taluk, area in hectares

Lulc	2000		2005		2010		2017		2000-2005	2005-2010	2010-2017
	Area	%	Area	%	Area	%	Area	%	%	%	%
Water body	676.26	0.424	1925.84	1.2	2039	1.27	1818.8	1.14	0.776	0.07	-0.13
Agriculture	73916	46.36	69652.34	43.68	67661	42.44	62237	39	-2.67	-1.22	-3.44
Vegetation	45263	28.39	46263	29.01	46263	29	46263	26.5	0.61	-0.01	-2.5
Built Up	704.74	0.442	1724.82	1.08	2585	1.62	2674	1.67	0.63	0.54	0.05
Others	38866	24.37	39858	25	40878	25.64	46433.2	29.1	0.63	0.64	3.46
Total	159426	100	159426	100	159426	100	159426	100	0	0	0

The above table shows the land use changes in Kanakapura Taluk from 2000 to 2017. There is change in the land use pattern over 17 years. Kanakapura Taluk has **159426** hectares of land. In 2000 major portion of it was farm land, 73916 ha. That is **46.36** % of the total land use. However the waste land or fallow land constituted , 38866 Ha. It is **24.37** % of total land use. But over a period of 17 years the agrarian land is converted to different other purposes. By the year 2017 farm land was reduced to 62237 that is **39** % where as the built up land has increased to 2674, it is **1.67** % of the total land use and waste land is 46433.2 that is

29.1% of the total land use. There is small variation in the water body and vegetation from 2000 to 2017. However there is considerable decrease in the agricultural land and increase in built up and waste land. The increase in the waste land is more than the increase in the built up land. It can be concluded that there is change in the land use land cover pattern in the Kanakapura Taluk. The following figure shows the trend in the lulc pattern of Kanakapura Taluk from 2000 to 2017.

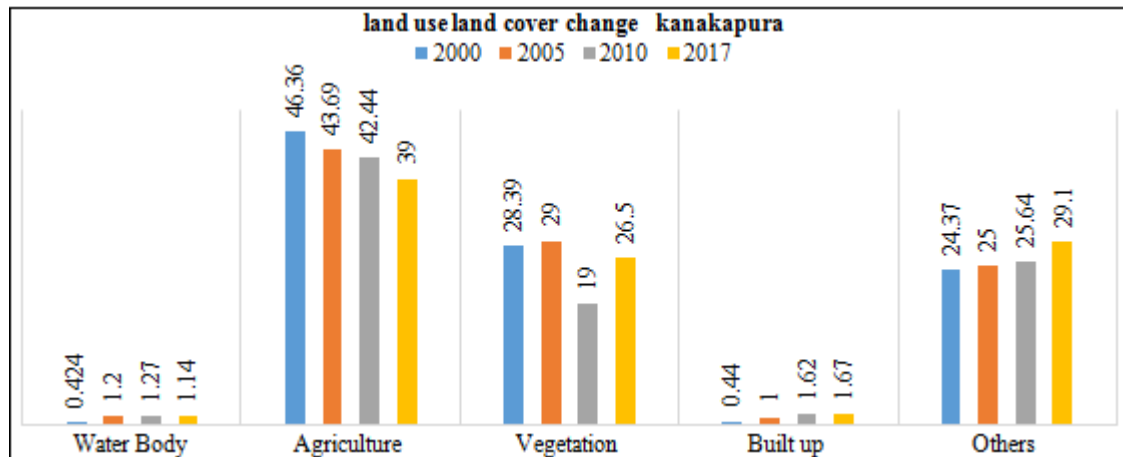


Figure 1

There are five land covers taken for the lulc analysis , Land covers such as vegetation and water bodies do not shows much changes in the change detection analysis. However land covers such as Agriculture ,built up and other land category such as built up shows a considerable change. Kanapura Taluk has more of green cover , agricultural land ,over a period of 17 years there is a gradual transition .The agricultural land is gradually changed for other purposes. The reasons of this transition are as follows.

The South Bengaluru is a growing commercial and residential space. Kanakapura is 56 km from Bengaluru city, however the peri urban growth is due to Bengaluru city influence says Experts. The key drivers of growth include upcoming Metro line, NICE road connectivity , widening of National Highway 209 etc. Kanakapura Taluk has significant development due to industrial and manufacturing units within Kanakapura .As a peripheral location it has gained attention because of influence of Bengaluru. Land Use pattern has changed mainly because of significant infrastructural changes, changing industrial commercial and residential land uses. At present South Bengaluru has a high residential supply, however the places like Bennarghetta, Jaya Nagar are expensive, but Kanakapura road is known for affordable housing. This transformation of Kanakapura into the residential markets is to the Puravankara, Sobha Developers, Mantri Developers, Nitesh Estates, Brigade Enterprises and Chartered Housing.

4. Conclusion

The utilization of GIS tools were helpful in detecting the magnitude of LULC change that has taken place in Kanakapura Taluk over the span of 17 years. The study also revealed a gradual expansion of Taluk . All LULC classes except vegetation and water bodies have showed gradual changes. Over the years agricultural land has reduced 7% from 2000 to 2017.Built up area has increased from 0.44 % to 1.67%. Other land category has increased 11% from 2000 to 2017%. Kanakapura is known for it greenery and gradual transition. Lulc change detection shows there is a gradual transition in the lulc pattern. The peri urban development is mainly because of the Bengaluru city and the infrastructural developments in the recent past.

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