

Land Use Land Cover Mapping Of Hirehalli Village In Karnataka Using RS and GIS Technique For The Year 2012 and 2018

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Abstract

The LU/LC Vector Layer of 2012-2013 is overlaid over the CARTOSAT -1 and LISS -IV satellite image of 2016 in the ARC GIS Environment to create the LU/LC Map of Hirehalli G.P. for 2018 Visual Interpretation keys such as tone, texture, color, pattern, association etc. were used for creating the LU/LC Map. Ancillary data, legacy data, and ground truth were also used in finalizing the LU/LC Map of 2018.

The LU/LC Vector Layer of 2012 (NRSC Cycle-1) and the LU/LC Map of 2012-13 used to generated the Land use/land cover statistics of their respective times to analyses the changes in the area of the individual land use/land cover classes over a decade.

Keywords: Land use/Land cover analysis, Visual Image Interpretation, Satellite Images, Remote sensing and satellite.

1. Introduction

The input data for the LU/LC Mapping of Hirehalli gram Panchayath is the CARTOSAT-1 and LISS-IV data provided by NRSC (National Remote Sensing Centre) to KRSRAC. The pre-processing was done by KRSRAC and given for the current study. the CARTOSAT -1 LISS-IV Merged Images have a UTM projection and WGS 84 datum. Images have a UTM projection and WGS 84 datum. Post classification change detection technique is used to study the Land Use/Land Cover changes of Hirehalli G.P. over the (2012-2018). The Change matrix and area statistics were also derived The LU/LC Vector Layer of 2012-2013 is overlaid over the CARTOSAT -1 and LISS -IV satellite image of 2016 in the ARC GIS Environment to create the LU/LC Map of Hirehalli G.P. for 2018 Visual Interpretation keys such as tone, texture, color, pattern, association etc.

2. Data Used and Sources

The data pertaining to study area of Hirehalli Gram Panchayath used for the study have been obtained from various sources. The data set were used to create thematic layers and generated by using software Arc GIS version10.1. The layers were then geo processed and various Arc GIS tools were utilized to obtain the desired outputs from the data pertaining to Hirehalli gram Panchayath.

2.1 Field Data Collection.

Ground truth is a process of collecting the ground information with the help of GPS instruments, which acts as a reference for visual interpretation, usually ground truth points are collected at the roads, water body, school location, hospital etc.

2.2 Softwares Used.

The different software was used in the study mentioned below.

- Arc Map 10.1
- QGIS 2.12.0
- Microsoft Excel

2.3 Ground Truth Collection

The GPS map camera app used for the ground truth data collection, because of its various features such as photograph of location with latitude longitude information time of acquisition, location of place in Google maps etc

Table 1: Data Collected and Their Sources

Data	Sources
LISS-IV+Cartosat-1 Cadastral Map Toposhet Vector Data Set Carto DEM	Karnataka State Remote Sensing Applications Center Bangalore
School Attribute	PDO Hirehalli
Location Details Attribute Details	Field data collection and taluk Panchayath/G.P.
Road, Railway line, Vector Data:100000, LULC, Slope Map, Soil Map, Drainage, Geomorphology, Watershed.	SIS-DP project KSRSAC
Rainfall Data	KSNDMC
Census Data	www.censusindia.govt.in www.karnatakageoportal.in

3. Study Area

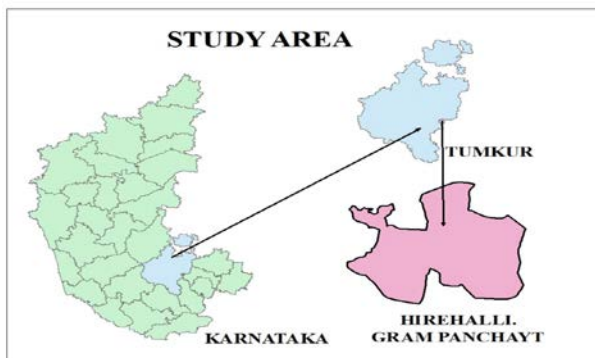


Fig 1: Study area of Hirehalli Gram Panchayath

The study area of the Hirehalli Gram Panchayath, Tumkur taluk Tumkur District, it lies between 13°28'12" latitude, 77°18'84" longitudes. According to Census 2011 information the location code or village code of Hirehalli

village is 611397. It is situated 12km away from Tumkur, which is both district & sub-district headquarter of Hirehalli village. Hirehalli has a total population 2435 peoples. As per 20011 statistics, Hirehalli village is a Gram Panchayath. The total geographical area of Hirehalli Gram Panchayath is 2405.50 hectares. The study area location map as shown in the Fig 1..

4. Methodology

Stage1. Collect the data from various departments that is thematic layers cadastral map high resolution satellite image of 0.6m resolution rainfall data and so on

Stage2. Geo Reference the thematic layer and prepare natural resource and asset mapping.

Stage 3. Over lay the satellite images and digitizing LU/LC. And comparison between the LU/LC changes

Stage 4. Filed data collection.

Stage 5. compare between the 2012 image to 2018 images identify the changes such as built up agriculture crop land road etc.

Stage 6. Identify the beneficiaries and infrastructure gap

Stage 7. Prepare the action plan for land resource and infrastructure development.

Stage8. Using 2018 image as base to build the action plan and to collect the assets to identify the gaps.

3.1 Land Use/Land Cover Classification Scheme for High Resolution Images

The LU/LC Classification scheme adopted for CARTOSAT-1AND LISS-IV merged images is as follows:

- a) Built-up: (includes settlements, industries, mining, roads, runway etc.)
- b) Water bodies: (includes lakes, reservoirs, etc.)
- c) Vegetation: (includes crop land, agricultural plantation, forest, grass land etc.)

5. Result And Discussion

The Hirehalli gram Panchayathit’s have 8villages they are Manchalkuppe, Pemmanahalli, Hirehalli, Nandihalli, Kolihalli, Dananayakanapura, Sangapura and Chikkahalli. The village boundaries indicating the different village following in Hirehalli G.P

5.1. Land Use/Land Cover mapping for 2012.

The geometrically corrected LISS IV & CARTOSAT -1 merged data, within the desired Framework is the initial input for LULC classification and mapping. Data on themes like wasteland, forest, vegetation etc. will create an important source of reference for LULC classification. Before using them these legacy layers may be required to be re-projected as per the current mapping specifications. The land use /land cover map of 2012 and 2018 is shown in fig 1 and fig 3 respectively.

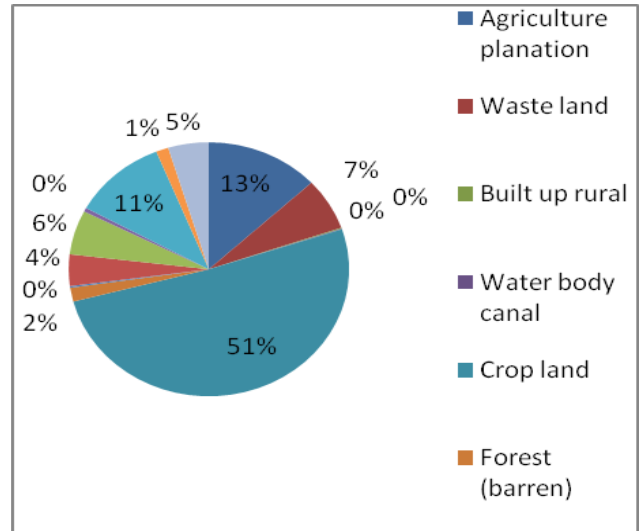


Fig 3: Percentage of Geographical area for the year 2012.

Table 2: Land use land/cover map of Hirehalli Gram Panchayath for 2012.

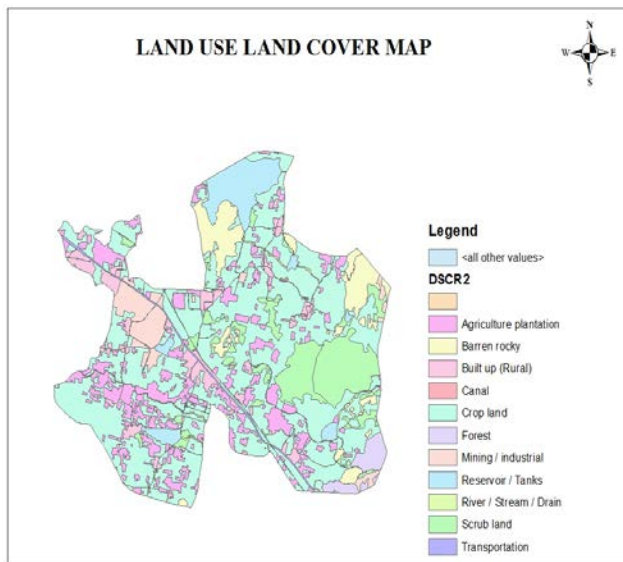


Fig 2: Land Use Land Cover Map for 2012.

The different land use/land cover classes indicate that major area covered in the agriculture, forest, and waste land. The proposed action plan prepared as the scientific input and feasibility/requirement in the location area Present land use and proposed land use of Hirehalli Gram Panchayath indicating the Different land use/land cover categories are Observed.

Sl no	Different Class	Area (ha)	%of geographical area
1	Agriculture	353.50	13.06
2	Waste land	179.30	6.62
3	Built up rural	3.38	0.12
4	Water body canal	2.27	0.083
5	Crop land	1380.14	51.00
6	Forest (barren)	47.997	1.77
7	Depressed house hold	5.58	0.20
8	Mining/industrial	108.50	4
9	Reservoir tanks	152.57	5.63
10	River stream	13.26	0.49
11	Scrub land	293.65	10.85
12	Transportation	38.92	1.43
13	Village rural	126.90	4.68
	Total	2705.96	99.93

The land use/land cover map for Hirehalli Gram Panchayath for the year 2012 shows that major area was

occupied by crop land (51%), agriculture plantation (13.06%), scrub land (10.85%), waste land (6.62%). The other categories includes built up rural, water body, canal, mining, reservoir, transportation etc. The detailed LU/LC categories were shown in Table2.

5.2 Land Use Land Cover Mapping For 2018:

The land use/land cover mapping of the year 2018 generated to study the change with respect to LU/LC of 2012. The map indicates that different color polygon shows different classes of LU/LC. The Land use/land cover details of Hirehalli Gram Panchayath Tumkur taluk in the year of 2018 shown in Fig3.

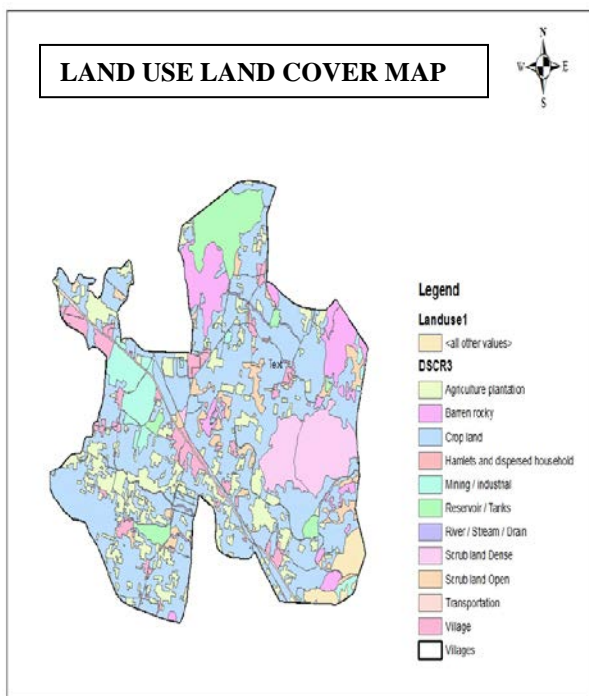


Fig 4: Land Use Land Cover Map for the year 2018.

The different land use/land cover classes in Hirehalli Gram Panchayath are mentioned below: Built Up (5.26%), Agricultural Land (13.82%), Wastelands (7.17%), mining (4%), crop land (51.51%) are some major categories. The different LU/LC categories and its area shown in figure 4 and table 3 respectively.

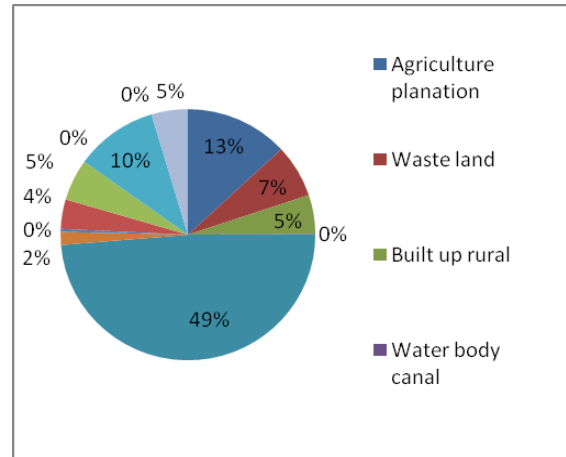


Fig 5: Percentage of Geographical area for the year 2018

The Land Use/Land Cover Analysis is done for the year 2012 and 2018. And the built up area is observed to be increased when compared to 2012, in future barren land and scrub land can be used for the built up area and agricultural land can be used for agriculture and vegetation.

Table 3: Land use land/cover map of Hirehalli Gram Panchayath for 2018.

Sl No.	Different Classes	Area (ha)	%Geographical area
1	Agriculture	374.27	13.82
2	Waste land	194.25	7.17
3	Built up rural	142.47	5.26
4	Water body canal	2.27	0.08
5	Crop land	1394.01	51.51
6	Forest (barren)	47.997	1.77
7	Depressed house hold	10.81	0.39
8	Mining/industrial	108.50	4.00
9	Reservoir tanks	152.57	5.63
10	River stream	236432	
11	Scrub land	300.31	10.85
12	Transportation	88588	1.4
13	Village rural	132.20	4.88

In Hirehalli Gram Panchayath the built-up area was 3.38% in the year 2012, it was increased to 5.26% in the year of

2018. The increase built up was due to rapid urbanization and industrialization took place in the Hirehalli Gram Panchayath. The existing built up during 2012-13 was 3.38ha, whereas the proposed built up area is 6.25ha.

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6. Conclusions

The study shows RS and GIS based on LU/LC mapping is very useful. It helps to change detection in the area. The proposed action plans of an area. The existing land use/land cover has been dynamic in nature from 2012 to 2018 Hirehalli Gram Panchayath Tumkur Taluk. The LU/LC change analysis of Hirehalli Gram Panchayath using CARTOSAT-1 merged with LISS-IV datasets change was done by comparing the LU/LC map of 2018 obtained by Visual interpretation techniques with the vector layer of 2012. LU/LC change analysis in the area it was found that the Built up class and agriculture plantation had increased by 3.38% to 5.26% and 13.6% to 13.82% from 2012 to 2018 respectively. Whereas water bodies' classes have decreased by 0.083% to 0.08% respectively. Identify the gap the rapid urbanization of Hirehalli Gram Panchayath Tumkur taluk was chosen as a study area to quantify the LU/LC pattern for the year of 2018.

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