Study on Land use diversification in Pynursla Block, East Khasi Hills District, Meghalaya

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TSERING DOLMA

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NORTH EASTERN SPACE APPLICATIONS CENTRE

to

MANASAGANGOTHRI

Course Coordinator, M.Sc. GIS

Centre for Geoinformatics Technology,

DOS in Geography,

Manasagangotri Campus,

University of Mysore,

Mysuru- 570006,Karnataka

Month 2019

Bonafide Certificate

This is to certify that the project report entitled "Land use diversification" submitted by Tsering Dolma as available on college records to the North Eastern Space Applications Centre, Umiam, Shillong and University of Mysore, Mysore, in partial fulfillment for the award of the degree M.Sc in Geographical Information System, is a bonafide record of the project work carried out by her under my supervision from start 07/01/2019 to 31/03/2019.

Name of Guide: Pratibha Thukuria Das
Designation of Guide
Department of Guide
North Eastern Space Applications Centre
Umiam, Shillong

Place: Umiam, Shillong

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Your name: Tsering Dolma
TR2019004
M.Sc in GIS
University of Mysore

Place: Umiam, Shillong

Date: DD/MM/YYYY

Acknowledgments

Abstract

Land use/ land cover is an important component in understanding the interactions of the human activities with the environment and thus it is necessary to monitor and detect the changes. In the present study, Land Use /Land Cover mapping and change detection analysis of Pynursla block was done using remote sensing data and GIS technologies. LISS-IV data and Google earth image has been used to map and monitor land use diversification during 2016 and 2018. ARCGIS played a major role to analyze land use and land cover changes. The result show that there is decrease in mixed plantation, kharif crop, bamboo grass, open forest and water bodies in area. On the other hand, the area like terrace cultivation land, Broom grass, dense forest, built-up, stony waste land and open scrub has increase in area. Mostly changes occurred in mixed plantation and open scrub land.

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CHAPTER-1

1.1. INTRODUCTION

The study on land use of a particular area gives us an idea about the existing stocks as well as the change in natural resources through time. Land use can be classified in various ways such as build-up, vegetation, water body, etc. Using remote sensing data, we can get the information of land cover and land use information. The knowledge we get from studying land use will help in developing plans to balance conservation, uses of resources and pressures of development. The study area of this report focuses on the diversification and analyzation of land use, and changes in the physical environment of the Pynursla Village, Meghalaya, India with the help of remote sensing and geographical information system (GIS) technique. The data used for conducting the analysis of land use are LISS-IV data of 2016 and Google Earth Image of 2018.

Land use

- Land use is basically the utilization of the physical land and its resources by humans for various purposes; land can be used for residential, commercial, business, industrial, agricultural recreational, and other relatively natural use. Land utilize application

Land cover

- land cover is the earth surface cover by vegetation's, settlements, water body, waste land etc.it is important to identifying, delineating and mapping land cover for global monitoring studies, resource management, and planning activities. Recognizable proof of land cover sets up the standard from which observing exercise can be performed, and gives the ground cover data to pattern topical maps.

Change detection

- Change detection is the process of identifying differences in the state of an object or phenomenon by observing it at different times.
- Timely and accurate change detection of earth's surface features provides the foundation for better understanding relationships and interactions between human and natural phenomena to better manage and use resources.

1.1.Objectives

1. To prepare the land use/land cover map using remote sensing and geographical information system technologies.
2. To identify the changes that happened in land use/land cover over the period of three years (2016 -2018).

1.2. STUDY AREA

Pynursla is a Block in East Khasi Hills District of Meghalaya State, India. The geographical coordinate for example latitude and longitude of Pynursla is 25.310075ºN, 91.902589ºE Pynursla Block Head Quarters is Pynursla Pyllun town. It is located 41 KM towards South from District headquarters Shillong. 39 KM from State capital Shillong towards North. There are 156 villages in Pynursla. Pynursla Block is bounded by Mawkynrew Block towards North, Khadarshnong-Laitkroh Block towards west, Amlarem Block towards East, Shella Bholaganj Block towards west. Pynursla consist of 22 Villages and 22 Panchayats. This Place is in the border of the East Khasi Hills District and Jaintia Hills Districts.
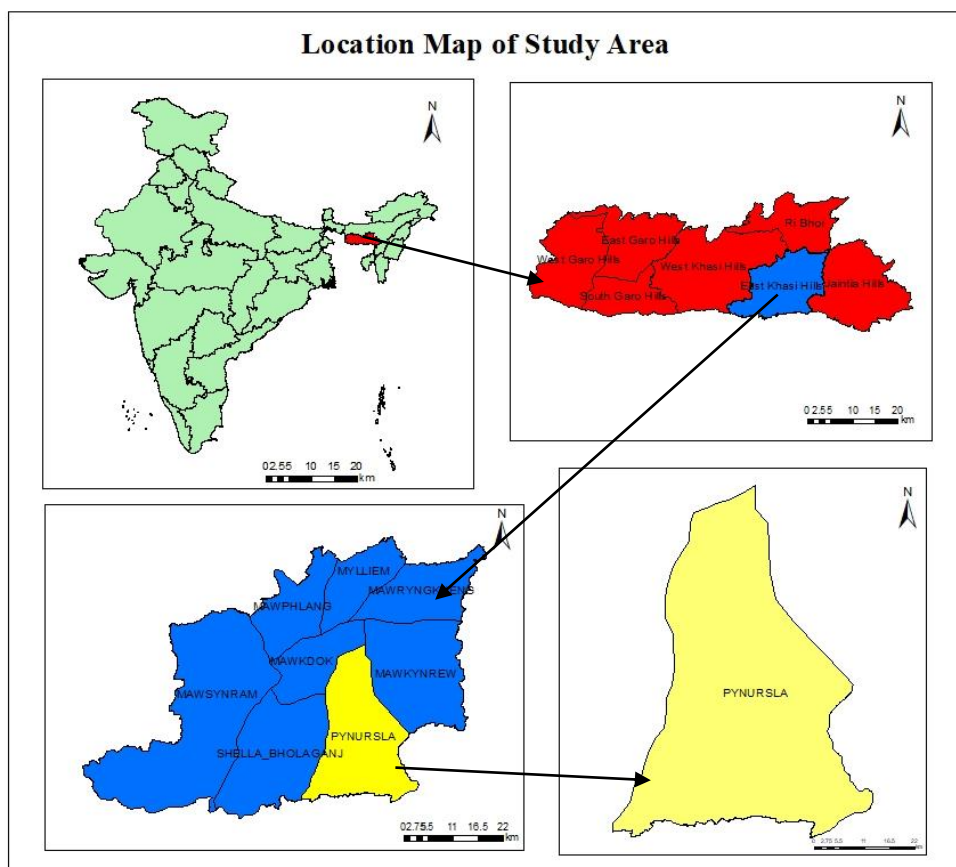
Figure. 1.1. Location Map of Pynursla Block

Demographics

English is the Local Language here. Also, People Speaks Khasi, Garo. The sub district is home to about 58 thousand people, among them about 29 thousand (49%) are male and about 29 thousand (51%) are female. 1% of the whole population are from general caste, 0% are from schedule caste and 99% are schedule tribes. Child (aged under 6 years) population of Pynursla community development block is 20%, among them 50% are boys and 50% are girls. There are about 11 thousand households in the sub district and an average 5 persons live in every family.

Pynursla Block	General	Schedule Caste	Schedule Tribe	Child	Total
Male	494	11	28,001	5,735	28,506
Female	268	0	29,096	5,800	29,364
Total	762	11	57,097	11,535	57,870

Growth of Population

Population of the sub district has increased by 2.5% in last 10 years. In 2001 census total population here were about 56 thousand. Female population growth rate of the sub district is 3.4% which is 1.7% higher than male population growth rate of 1.7%. General caste population has increased by 53%; Schedule caste population has increased by 120%; Schedule Tribe population has increased by 2.1% and child population has increased by 0.7% in the sub district since last census.

Pynursla Block	General	Schedule Caste	Schedule Tribe	Child	Total
Male	72.1%	120%	0.9%	-0.9%	1.7%
Female	27%	0%	3.2%	2.2%	3.4%
Total	53%	120%	2.1%	0.7%	2.5%

Sex Ratio- females pert 100 Male

As of 2011 census there are 1030 females per 1000 male in the sub district. Sex ratio in general caste is 543, and in schedule tribe is 1039. There are 1011 girls under 6 years of age per 1000 boys of the same age in the sub district. Overall sex ratio in the sub district has

increased by 17 females per 1000 male during the years from 2001 to 2011. Child sex ratio here has increased by 30 girls per 1000 boys during the same time.

Pynursla Block	General	Schedule Caste	Schedule Tribe	Child	Total
2001	735	0	1016	981	1013
2011	543	0	1039	1011	1030
Change	-192	0	23	30	17

Literacy

Total about 36 thousand people in the sub district are literate, among them about 18 thousand are male and about 19 thousand are female. Literacy rate (children under 6 are excluded) of Pynursla is 79%. 79% of male and 79% of female population are literate here. Overall literacy rate in the sub district has increased by 13%. Male literacy has gone up by 13% and female literacy rate has gone up by 13%.

Pynursla Block	Male	Female	Total
2001	66.2%	66%	66.1%
2011	78.6%	78.8%	78.7%
Change	12.4%	12.8%	12.6%

2. Data and Methods

a) Data Sources

- LISS-IV (source: NESAC)
- Google Earth image

Date	Satellite/Sensor	Resolution (in meter)	Projection
30.12.2016	LISS-IV	5.8	UTM WGS84 46

b) Software Used

ArcMap 10.5

It was used for manually digitising and for preparing maps of land use/land cover.

Topology correction has done using ArcMap.

Excel 2016

It was used for statistics generation

2.2. Methodology

The following segment consists of the methodologies used in the study, which includes data collection, data analysis, interpretation and the methods for data assessment and mapping.
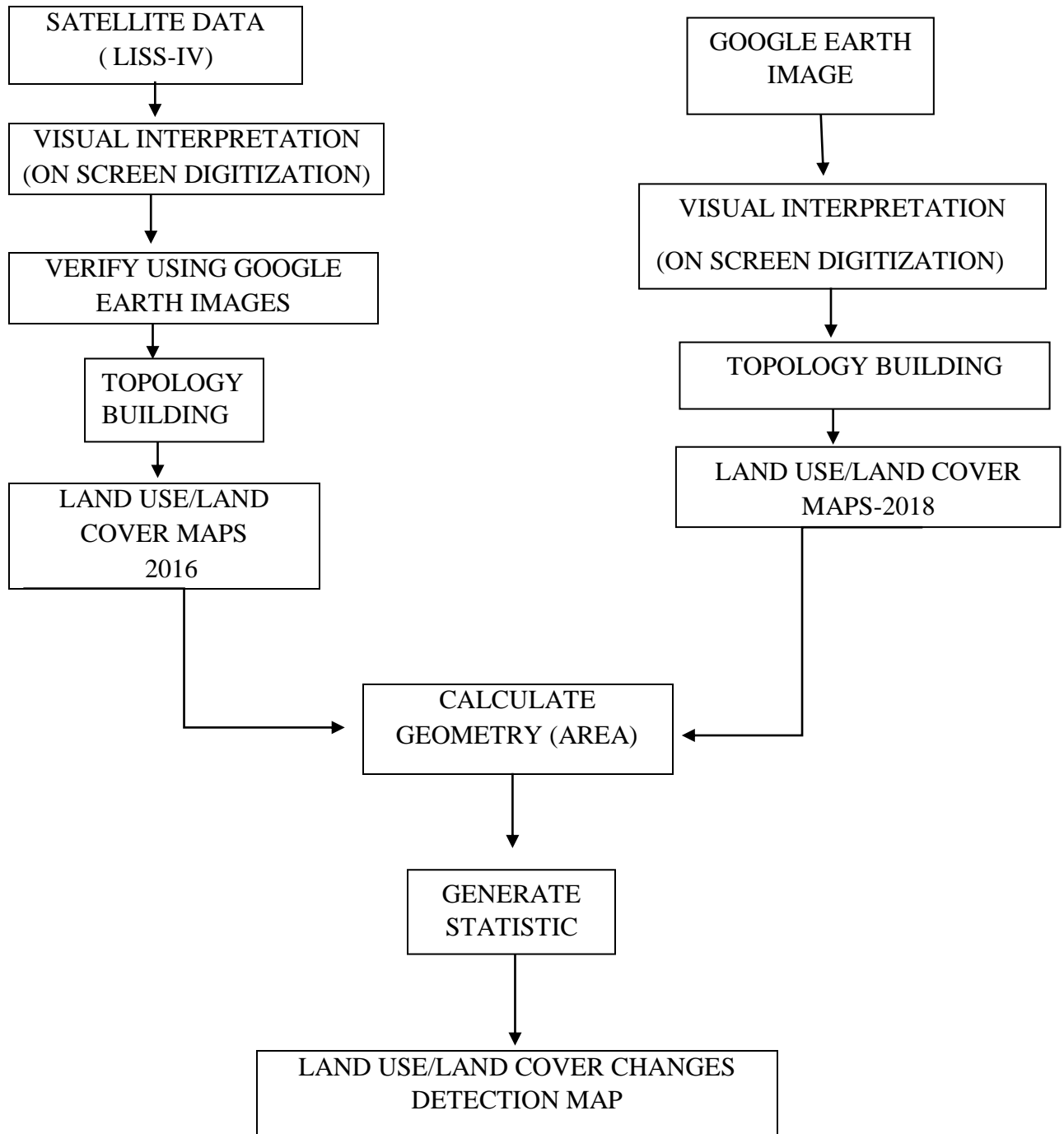
Methods for acquiring data from the sources available:
- The course of land use, land cover and changes in 2016 and 2018 was analysed using LISS-IV data and Google Earth Image.

Visual Image Interpretation:
- The land use / land cover maps are prepared by adopting the interpretation techniques. Image classification is done by using visual interpretation techniques.

The Flow Chart of Methodology is show figure 2.1.

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┌─────────────────────┐                          ┌─────────────────────┐
│   SATELLITE DATA     │                          │   GOOGLE EARTH      │
│    ( LISS-IV)        │                          │     IMAGE           │
└─────────┬───────────┘                          └─────────┬───────────┘
          │                                                 │
          ▼                                                 ▼
┌─────────────────────┐                          ┌─────────────────────┐
│ VISUAL INTERPRETATION│                          │ VISUAL INTERPRETATION│
│(ON SCREEN DIGITIZATION)│                        │(ON SCREEN DIGITIZATION)│
└─────────┬───────────┘                          └─────────┬───────────┘
          │                                                 │
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┌─────────────────────┐                          ┌─────────────────────┐
│  VERIFY USING GOOGLE │                          │  TOPOLOGY BUILDING  │
│    EARTH IMAGES      │                          └─────────┬───────────┘
└─────────┬───────────┘                                     │
          │                                                 ▼
          ▼                                      ┌─────────────────────┐
┌─────────────────────┐                          │ LAND USE/LAND COVER │
│     TOPOLOGY         │                          │    MAPS-2018        │
│     BUILDING         │                          └─────────┬───────────┘
└─────────┬───────────┘                                     │
          │                                                 │
          ▼                                                 │
┌─────────────────────┐                                     │
│  LAND USE/LAND       │                                     │
│  COVER MAPS          │                                     │
│  2016                │                                     │
└─────────┬───────────┘                                     │
          │                                                 │
          │        ┌─────────────────────┐                  │
          └───────▶│     CALCULATE        │◀─────────────────┘
                   │  GEOMETRY (AREA)     │
                   └─────────┬───────────┘
                             │
                             ▼
                   ┌─────────────────────┐
                   │     GENERATE         │
                   │     STATISTIC        │
                   └─────────┬───────────┘
                             │
                             ▼
          ┌──────────────────────────────────┐
          │ LAND USE/LAND COVER CHANGES       │
          │      DETECTION MAP                │
          └──────────────────────────────────┘
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3. Result and discussion

LISS-IV data of Pynursla block from two different image for Land use and land cover are analysis by using remote sensing data and GIS techniques. By analyzing the two different images of different time helps us to identifying changes that took place in different classes of land use and land cover. ARCGIS played a major role to analyze land use and land cover changes, CUT POLYGON in ARCGIS used to do onscreen digitize or divide and grouped into eleven classes on the basis of land use and land cover, geometric calculation has done to calculated area in hectares and generated statistics to show the changes in Pynursla block in 2016 and 2018.
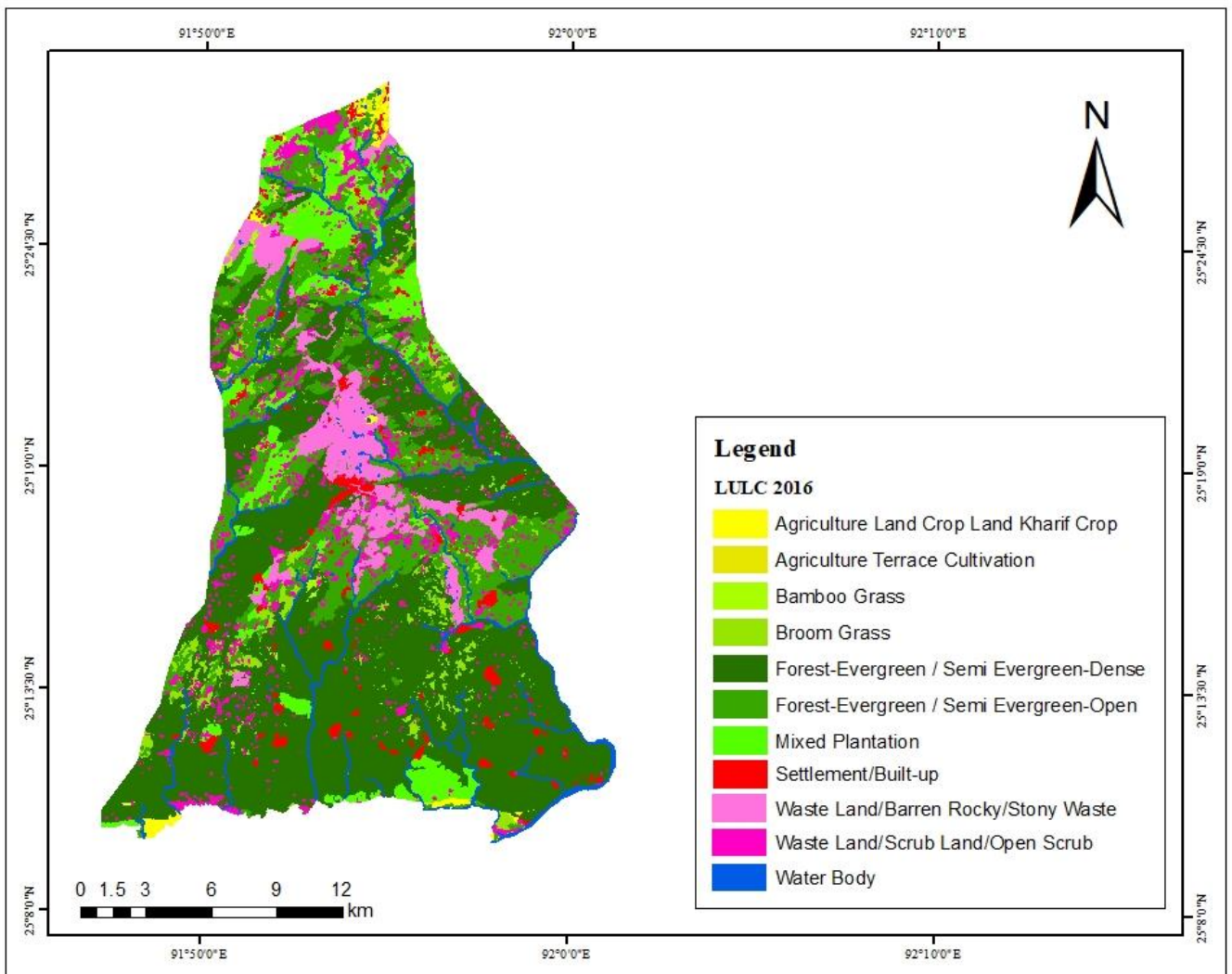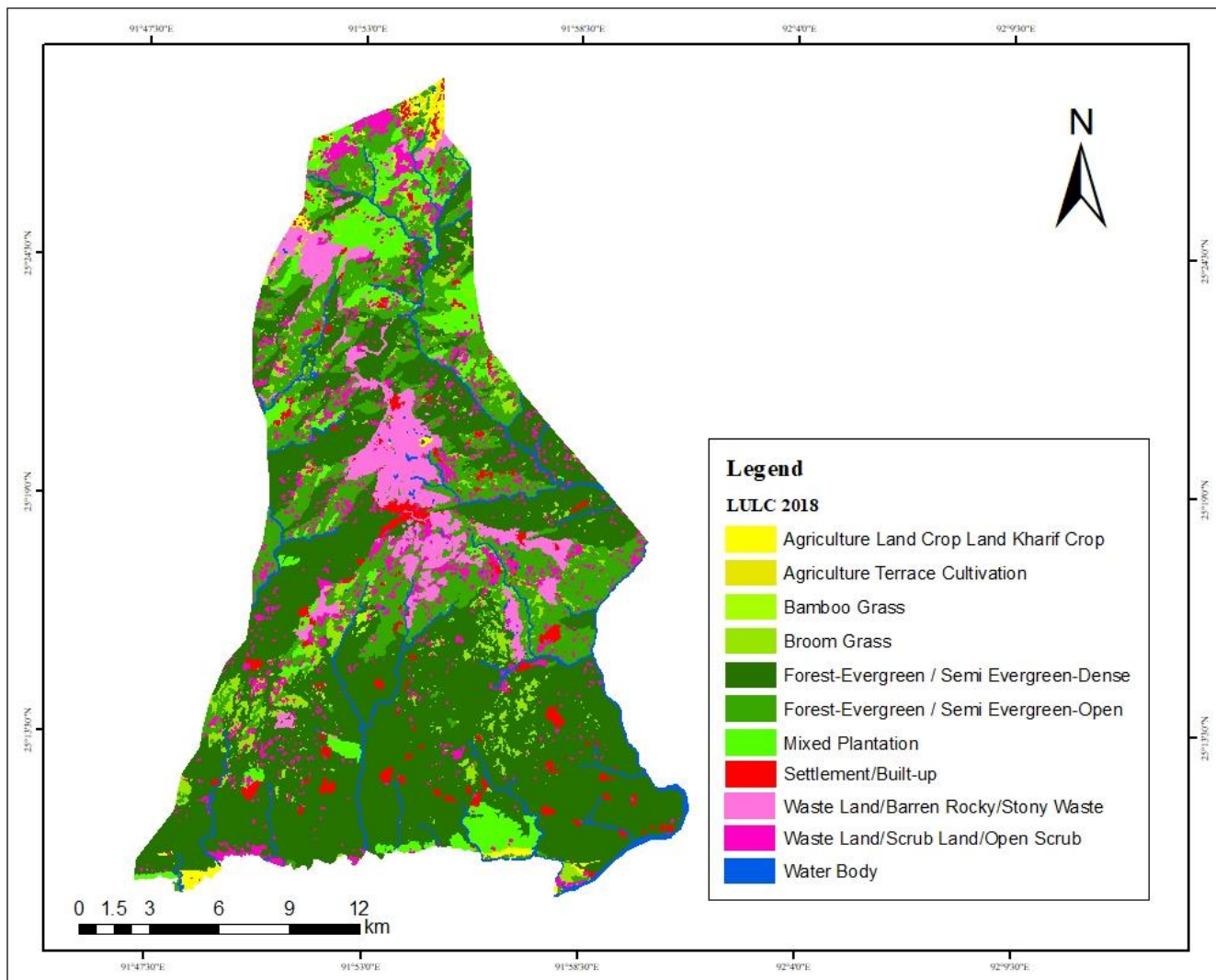

Fig 4.1. LULC Map Pynursla block, East Khasi Hill District 2016

Fig 4.2. LULC Map Pynursla block, East Khasi Hill District 2018.

Analysis of Land use and land cover changes in 2016 to 2018

Table 4.1. land use land cover changes

Land use/Land Cover classes	2016-AREA (IN HECTARES)	2018-AREA (IN HECTARES)	Changes
Agriculture Land Crop land Kharif Crop	738.36	734.12	-4.25
Agricultural Land Terrace Cultivation	29.45	33.42	3.97
Bamboo Grass	421.96	408.36	-13.6
Broom Grass	5698.97	5719.32	20.7

Forest-Evergreen / Semi Evergreen-Dense	21554.36	21559.29	4.93
Forest-Evergreen / Semi Evergreen-Open	8106.79	8103.74	-3.09
Mixed Plantation	2347.05	2290.43	-56.62
Built-up	605.72	610.87	5.15
Waste Land/Barren Rocky/Stony Waste	2094.06	2104.40	10.34
Waste Land/Scrub Land/Open Scrub	924.00	962.92	38.92
Water Body	493.10	486.66	-6.44

The main objective of this study was to prepared map of land use/land cover and to detected changes over Pynursla Block from 2016 and 2018 using remote sensing and geographical information system technologies.

The land use/land cover from the study area between years 2016 and 2018 with regard to various feature indicated significant changes in feature classes shown in the table 4.3. The area under kharif crop has been reduce from 738.36 area in the year 2016 to 734.12 area in the year 2018. -4.25 area under kharif crop are reduce. Due to the area increased in terrace cultivation and built-up area.

Terrace cultivation land in the year 2016 was 29.45 whereas the area shown increase to 33.42 in the year 2018. Kharif crop land and open forest land has become terrace cultivation. 3.97 area has increased in terrace cultivation.

The area under bamboo grass has reduced from 421.96 area in the year 2016 to 408.36 area in the year 2018. Some area under bamboo grass turn into open scrub land.

Broom grass has increased from 5698.97 area in the year 2016 to 5719.32 area in the year 2018. Open forest and mixed plantation area become broom grass. 20.7 area has increased in broom grass

In Forest area slight increase in dense forest from 211554.36 to 21559.29 in the year 2016 and 2018 respectively. Only 4.93 area has been increased in dense forest. On other hand open forest has been decreased from 81016.79 area in the year 2016 to 8103.74 area in the year 2018. The reason for decreased in open forest was clearing forests for agriculture land and broom grass.

The study area shown noticeable decreased in mixed plantation from 2347.05 Area in the year 2016 to 2290.43 Area in the 2018. Mixed plantation with two plants or three plants at one time. Mixed plantation like areca nut and orange plantation. Areca nut has reduced -2.63 area and orange has reduced -29.93 Area within 3 years. The reason for decreased in mixed plantation is because of the area in dense forest and broom grass has increased.

In 2016 the total area of built-up is 605.72 has increased to 610.58 Area in 2018. Because area under kharif crop and open forest has been decreased. May be the demand for shelter has been increased due to growth of population.

Stony waste land has increased from 2094.06 area to 2104.40 area in the year 2016 & 2018 respectively. Because the area under water bodies become dry and that area turn into stony waste land. The table 4.3 shown drastic increased in open scrub land from 924.00 area to 962.92 area in the year 2016 & 2018 respectively. These indicate that 38.92 area has increased within three years. Agriculture and open forest area become open scrub land.

There are small changes in water body area. Mostly water bodies areas transformed to stony waste land. Water become dry year by year due to the climate change. Under water bodies area -6.44 area become stony waste land.

Land use land cover chart as well as change maps are shown in figure 4.4 and figure 4.5 respectively.
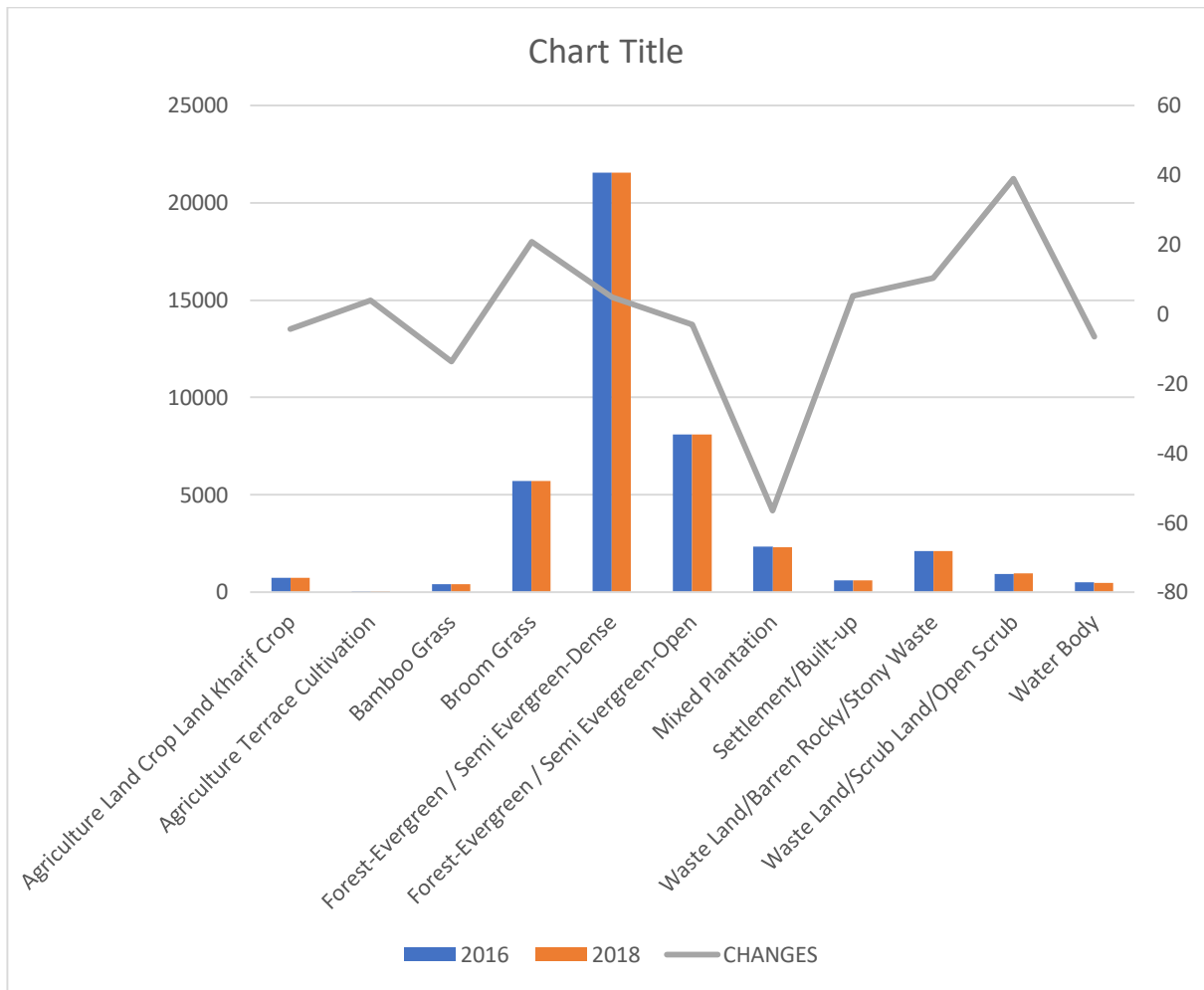
Figure 4.4. line and bar graph diagram of Land use/Land cover Changes in Pynursla Block (2016-2018)
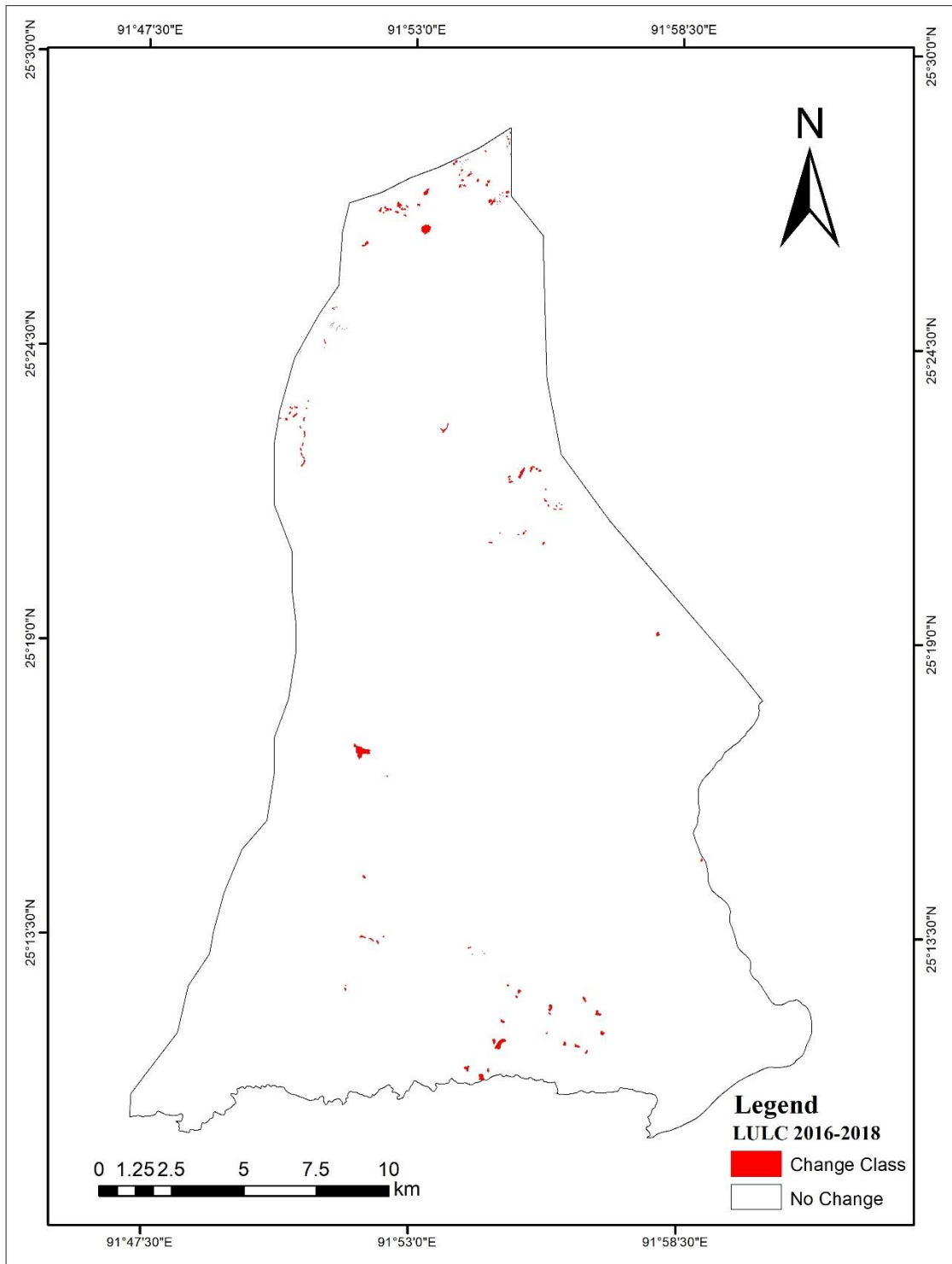
Fig 4.5. Map of Land use/Land cover changes in Pynursla Block, East Khasi Hill District (2016-2018)

5.Conclusions

In this study, using LISS-IV data of 2016 and google earth images of 2018 land use/land cover changes were analysis in Pynursla block using remote sensing technology. Mapping and analysis of land use/land cover is important for many management and planning activities as it is considered as an important element for understanding the earth and its whole system. Updating the information of LULC using GIS and RS is helpful for development of human society. The result show that there is decrease in mixed plantation, kharif crop, bamboo grass, open forest and water bodies in area. On the other hand, the area like terrace cultivation land, Broom grass, dense forest, built-up, stony waste land and open scrub has increase in area. The result showed that there was drastic change in mixed plantation during the period of 2016 and 2018. The second most change in the area is open scrub land due to the deforestation. There was no much changes in Pynursla block due the both images have different resolution and only 3 years' gaps. Accurate Land use/land cover information is necessary for understanding main factors causes and environmental consequences of such changes.

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