VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"Jnana Sangama", Belgaum-590 014

A Dissertation Project Report on

"LAND USE CHANGE DETECTION USING QGIS-A CASE STUDY ON MYSURU DISTRICT"

Submitted in partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING IN

CIVIL ENGINEERING

BY

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2019-2020

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Department of Civil Engineering

Certificate

This is to certify that the project Work entitled ***"LAND USE CHANGE DETECTION-A CASE STUDY ON MYSURU DISTRICT"*** *has been successfully completed by Mr. DARSHAN RAMESH RAICHUR (USN 1CR16CV014), Mr. PRAVEER CHANDAN (USN 1CR16CV061), Mr. SACHIN KUMAR K (USN 1CR16CV053) and Mr. SHRAVAN KUMAR (USN 1CR16CV061), bonafide students of CMR Institute of technology in partial fulfilment of the requirement for the award of degree of Bachelor of Engineering in Civil Engineering of the* ***"VISVESVARYA TECHNOLOGICAL UNIVERSITY",*** *Belgaum during the academic year 2019-20. It is certified that all corrections indicated for internal assessment has been incorporated in the Report. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed for the said Degree.*

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DECLARATION

We, **Mr. Darshan Ramesh Raichur Mr. Praveer Chandan, Mr. Sachin Kumar K and Mr. Shravan Kumar**, bonafide students of CMR Institute of Technology, Bangalore, hereby declare that dissertation entitled **"Land use change detection using QGIS-A case study on Mysuru District"** has been carried out by us under the guidance of **Dr. Lakshmi Srikanth, Professor**, Department of Civil Engineering, CMR Institute of Technology, Bangalore, in partial fulfillment of the requirement for the award of degree of Bachelor of Engineering in **Civil Engineering** of the Visvesvaraya Technological University, Belgaum during the academic year 2019-2020. The work done in this dissertation report is original and it has not been submitted for any other degree in any university.

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ABSTRACT

Effective utilization of natural resources is very important for environmental sustainability. It is very essential to monitor land-use and land-cover changes to control unplanned and uncontrolled changes on earth's surface to avoid mismanagement of natural resources, deforestation and land degradation. This project investigates the land-use variations in Mysuru District for a two time periods, using topographic sheet and satellite data.

Topographic map is obtained from Survey of India, Nakshe portal and the Satellite image is obtained from Sentinel-2 satellite in earth explorer i.e USGS portal.. This Project mainly determines the changes related to land usage in the particular locality. The Problem is analysed using Quantum Geographical Information System (QGIS). Through QGIS we can study the land characteristics and analyse the changes in land-cover by comparing the data collected in different time intervals.

Identification of land-use changes will help in better management of natural resources and improved decision making. The land use change of Mysore taluk between the years 2006 to 2019 is determined. The conservation of natural resources can be done from the results obtained from this project.

Keywords - Topography map , QGIS, Satellite imagery, Land-use .

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CHAPTER 1
INTRODUCTION

Land is a precious part of any individual which provides the chance for his survival by usage of the Land area to a good use. Land user characteristics is about the type of usage of the given particular area. The Land usage should be maintained and checked from time to time so that because Land is a Limiting factor which cannot be replenished again.

Land use classification includes urban, agriculture, forest land, wetland, water, barren land and range lands. The main usage of land is for the development of urban areas so that it occupies the pieces of land adjoining to the area till it was previously developed. Urban areas consist of large population density. Therefore the development of urban areas is essential. But other than that the land is primarily and earlier used for Agriculture, But due to the extension of urban areas and occupying of agricultural lands for city development indirectly results to the deforestation of forest lands and occupying it for agricultural purposes.

Then the land which consists of natural water bodies is a permanent land for that respective usage only, For example if there is a river flowing through the site then the site can only be used as a river throughout its life time. But the obstructions built across the river, lakes ,streams such as dams, reservoirs, weirs are taken as the land use for the irrigation and agricultural purpose.

Therefore in safeguarding of the natural land area we must restrict ourselves in limiting usage of land area for the urban development. QGIS software plays a significant role to analyse and determine the usage of land area and identify and quantify the changes in landuse patterns. Such studies help landuse planners and policy makers in decision making process.

1.1 STUDY AREA:-

Mysore is a taluk located in Mysore district of Karnataka. It is one of 7 taluks of Mysore district. There are 140 villages and 10 towns in Mysore Taluk. As per the 2011 Census India, Mysore Taluk has 2,99,853 households, population of 12,81,768 of which 6,45,316 are males and 6,36,452 are females.

Description	
City	Mysore
Government	Municipal Corporation
Urban Agglomeration	Mysore Metropolitan
State	Karnataka

Mysore City	Total	Male	Female
City + Out Growths	920,550	461,042	459,508
City Population	893,062	446,676	446,386
Literates	708,130	365,233	342,897
Children (0-6)	85,346	43,582	41,764
Average Literacy (%)	87.67 %	90.61 %	84.75 %
Sexratio	999		
Child Sexratio	958		

Fig 1.1 : Mysore 2011 Census data

The location consists of several villages, river tributaries, lakes, forest. It also consists of several valleys and hills.

1.2 ABOUT QGIS :-

QGIS (Quantum Geographic Information System) is a system designed to capture, store, manipulate, analyze, manage and present all types of geographical data. The key word to this technology is geography that means that some portion of data is spatial. In other words, data that is some way referenced to locations on the earth.

Coupled with the data is usually tabular data known as attribute data. Attribute data is usually tabular data known as additional information about each of the schools is the spatial data.

QGIS functions as geographic information system (GIS) software, allowing users to analyze and edit spatial information, in addition to composing and exporting graphical maps. QGIS supports both raster and vector layers; vector data is stored as either point, line, or polygon features. Multiple formats of raster images are supported, and the software can georeference images

QGIS supports shapefiles, geodatabases, dxf, MapInfo, PostGIS, and other formats. Web services, including Web Map Service and Web Feature Service, are also supported to allow use of data from external sources.

QGIS integrates with other open-source GIS packages, including PostGIS, GRASS GIS, and MapServer. Plugins are written in Python or C++ extend QGIS's capabilities. Plugins can geocode using the Google Geocoding API, perform geoprocessing functions similar to those of the standard tools found in ArcGIS, and interface with PostgreSQL/PostGIS, SpatiaLite and MySQL database.

QGIS is freely available on Windows, Linux, MacOS X, BSD, and Android. It is recommended installing the packages of the released software. To evaluate the upcoming release and to allow non-developers to support development also provides testing packages. In the feature frozen phase preceding a release these packages are effectively pre-releases, which we strongly urge users to test.

QGIS offers the following:

- Digitizing tools for OGR-supported formats and GRASS vector layers.
- Ability to create and edit shapefiles and GRASS vector layers.
- Geo-referencer plugin to geocode images.
- GPS tools to import and export GPX format, and convert other GPS formats to GPX or down/upload directly to a GPS unit (On Linux, usb: has been added to list of GPS devices.).
- Support for visualizing and editing OpenStreetMap data.
- Ability to create spatial database tables from shapefiles with DB Manager plugin.
- Improved handling of spatial database tables.
- Tools for managing vector attribute tables.
- Option to save screenshots as georeferenced images.
- DXF-Export tool with enhanced capabilities to export styles and plugins to perform CAD-like functions.

There are various versions of soft wares that can be used for the project.

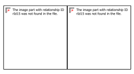
1.2	Daphnis	1 September 2009	[41] [42]
1.3	Mimas	20 September 2009	[43] [44]
1.4	Enceladus	10 January 2010	[45] [46]
1.5	Tethys	29 July 2010	[47]
1.6	Copiapó	27 November 2010	[48] [49]
1.7	Wrocław	19 June 2011	[50]
1.8	Lisboa	21 June 2012	[51] "Mojibake" in Japanese environment.
2.0	Dufour	8 September 2013	New vector API, integration of SEXTANTE geoprocessor, symbology and labeling overhaul. Renamed to *QGIS*. [52]
2.2	Valmiera	22 February 2014	2.2 changelog[22]
2.4	Chugiak	27 June 2014	2.4 changelog
2.6	Brighton	1 November 2014	2.6 changelog
2.8 LTR	Wien	20 February 2015	2.8 changelog
2.10	Pisa	26 June 2015	2.10 changelog
2.12	Lyon	23 October 2015	2.12 changelog
2.14 LTR	Essen	29 February 2016	2.14 changelog; latest point release = 2.14.22 from 20 January 2018
2.16	Nødebo	8 July 2016	2.16 changelog
2.18 LTR	Las Palmas	21 October 2016	Final release in the 2.x series.[23] Based on Qt4, Python 2.7. Latest point release = 2.18.28 from 18 January 2019. 2.18 changelog
3.0	Girona	23 February 2018	Based on Qt5, PyQt5, and Python 3.[24] Latest point release = 3.0.3 from 18 May 2018. 3.0 changelog
3.2	Bonn	22 June 2018	3.2 changelog
3.4 LTR	Madeira	26 October 2018	3.4 changelog
3.6	Noosa	22 February 2019	3.6 changelog
3.8	Zanzibar	21 June 2019	3.8 changelog
3.10 LTR	A Coruña	25 October 2019	3.10 changelog
3.12	București	21 February 2020	3.12 changelog
3.14	Pi	19 June 2020	A special name has been given by the community to this version. Bug fix versions are adding more decimals to the Pi number.
3.16 LTR	*[to be determined]*	23 October 2020	
3.18	*[to be determined]*	19 February 2021	

Fig 1.2 : Different QGIS Versions

For this project QGIS version 3.8 Zanzibar is used.

1.3 ABOUT TOPOGRAPHY MAP :-

Topography concerns the shape and character of the Earth's surface and maps were amongst the first artifacts to record these observations. In modern mapping, a topographic map or topographic chart is a type of map characterized by large-scale detail and quantitative representation of relief, usually using contour lines (connecting points of equal elevation), but historically using a variety of methods. Traditional definitions require a topographic map to show both natural and man-made features. A topographic survey is typically based upon systematic observation and published as a map series, made up of two or more map sheets that combine to form the whole map. A topographic map series uses a common specification that includes the range of cartographic symbols employed, as well as a standard geodetic framework that defines the map projection, coordinate system, ellipsoid and geodetic datum. Official topographic maps also adopt a national grid referencing system.



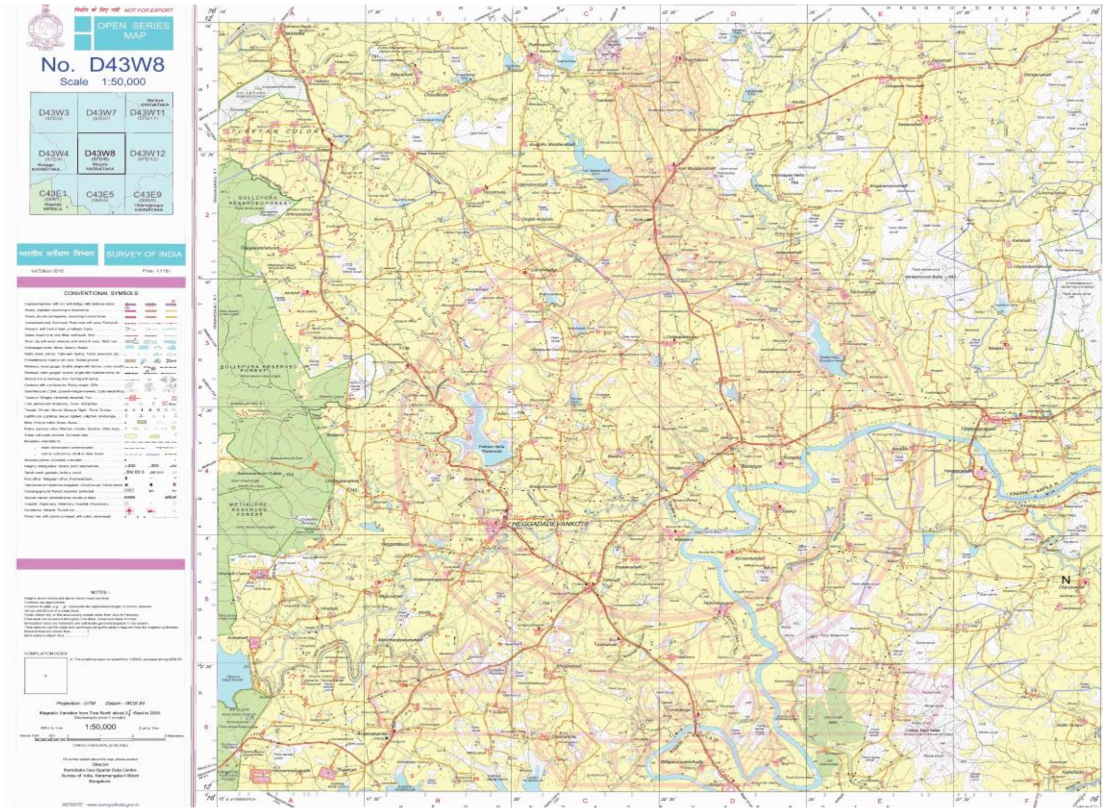


Fig 1.3 Topographic map obtained from Survey of India website

The Survey of India is responsible for all topographic control, surveys and mapping of India.

1.4 SATELLITE IMAGE :-

Satellite imagery (also Earth observation imagery or space-borne photography) are images of Earth or other planets collected by imaging satellites operated by governments and businesses around the world. Satellite imaging companies sell images by licensing them to governments and businesses such as Apple Maps and Google Maps.

It has uses in meteorology, oceanography, fishing, agriculture, biodiversity conservation, forestry, landscape, geology, cartography, regional planning, education, intelligence and warfare. Images can be in visible colors and in other spectra. There are also elevation maps, usually made by radar images. Interpretation and analysis of satellite imagery is conducted using specialized remote sensing software.

There are four types of resolution when discussing satellite imagery in remote sensing: spatial, spectral, temporal, radiometric and geometric. Campbell (2002)[5] defines these as follows:

- spatial resolution is defined as the pixel size of an image representing the size of the surface area (i.e. m^2) being measured on the ground, determined by the sensors' instantaneous field of view (IFOV);
- spectral resolution is defined by the wavelength interval size (discrete segment of the Electromagnetic Spectrum) and number of intervals that the sensor is measuring;
- temporal resolution is defined by the amount of time (e.g. days) that passes between imagery collection periods for a given surface location
- Radiometric resolution is defined as the ability of an imaging system to record many levels of brightness (contrast for example) and to the effective bit-depth of the sensor (number of grayscale levels) and is typically expressed as 8-bit (0–255), 11-bit (0–2047), 12-bit (0–4095) or 16-bit (0–65,535).
- Geometric resolution refers to the satellite sensor's ability to effectively image a portion of the Earth's surface in a single pixel and is typically expressed in terms of Ground sample distance, or GSD. GSD is a term containing the overall optical and systemic noise sources and is useful for comparing how well one sensor can "see" an object on the ground within a single pixel. For example, the GSD of Landsat is ≈30m, which means the smallest unit that maps to a single pixel within an image is ≈30m x 30m. The latest commercial satellite (GeoEye 1) has a GSD of 0.41 m. This compares to a 0.3 m resolution obtained by some early military film based Reconnaissance satellite such as Corona.

The resolution of satellite images varies depending on the instrument used and the altitude of the satellite's orbit. For example, the Landsat archive offers repeated imagery at 30 meter resolution for the planet, but most of it has not been processed from the raw data. Landsat 7 has an average return period of 16 days. For many smaller areas, images with resolution as high as 41 cm can be available.

The satellite image can be obtained from the Indian Satellites such as Cartosat-3, Insat or G-sat satellites or it can be obtained from American satellites such as Landsat, Sentinel, Aster or Meteo-sat satellites.

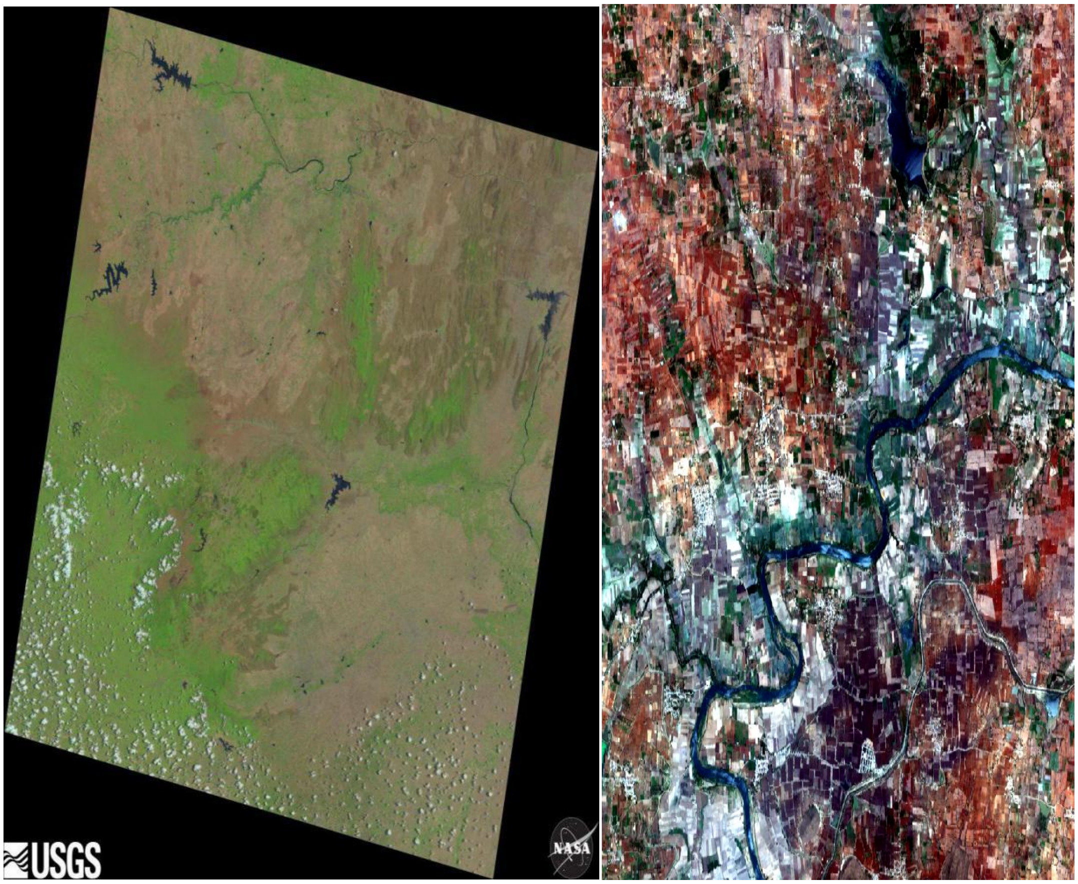


Fig 1.4 : Satellite image of Sentinel 2 and Landsat 8

1.5 OBJECTIVES :-

The main objective of this project is to determine the land use changes in the area under study from 2006 to 2019.

- ❖ To understand the various functionalities used in QGIS.
- ❖ To apply various tools of QGIS to map, identify and analyse the changes between two time periods.

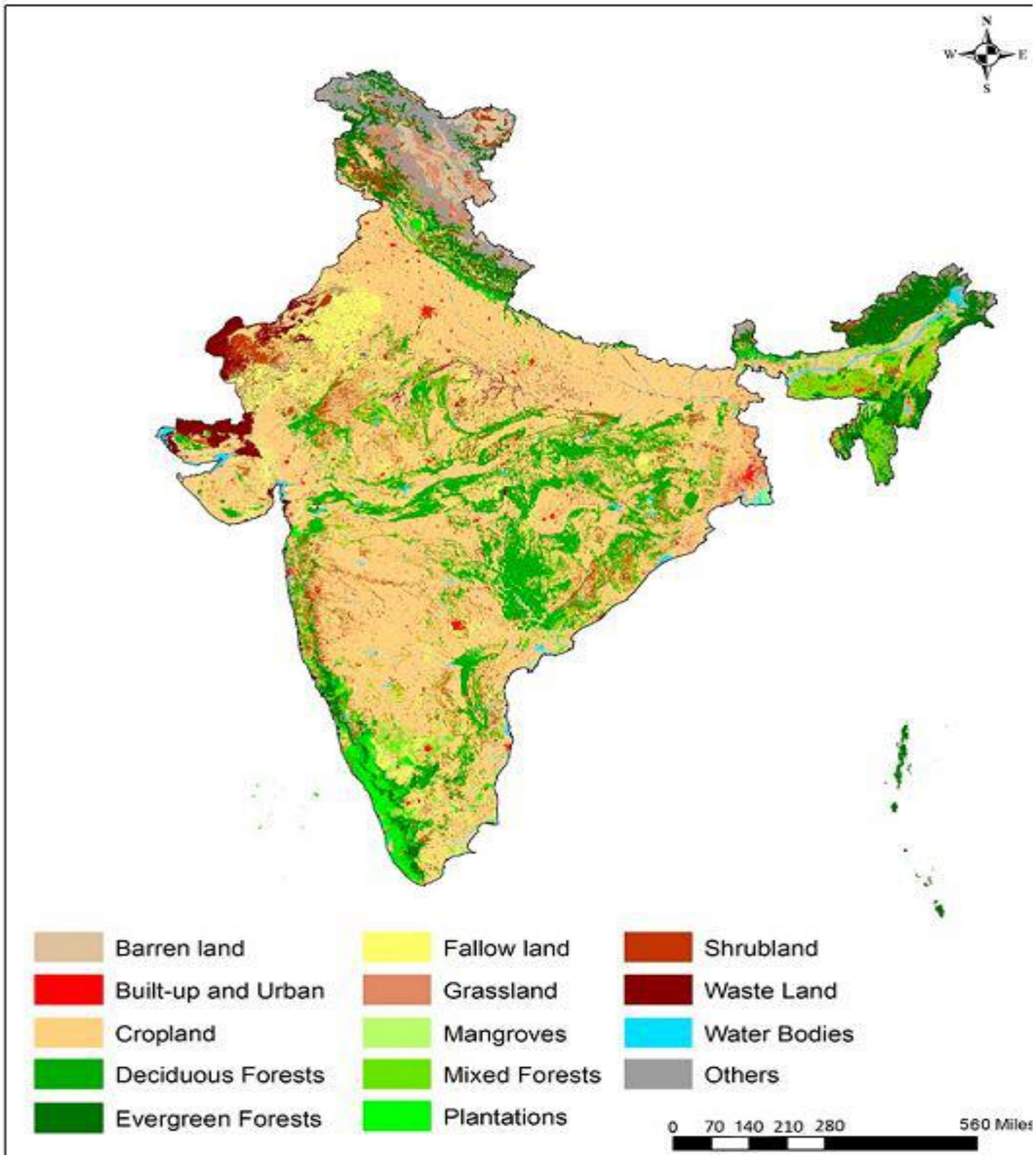


Fig 1.5 : Land use changes detection example

CHAPTER 2
LITERATURE SURVEY

2.1 LAND USE CHANGES AND CLASSIFICATION

Praveen Kumar et al in 2013, presented a review on land use/land cover (LU/LC) changes determined in an urban area, Tirupati, from 1976 to 2003 by using Geographical Information Systems (GISs) and remote sensing technology. These studies were employed by using the Survey of India topographic map 57 O/6 and the remote sensing data of LISS III and PAN of IRS ID of 2003. The study area was classified into eight categories on the basis of field study, geographical conditions, and remote sensing data. The comparison of LU/LC in 1976 and 2003 derived from toposheet and satellite imagery interpretation indicates that there is a significant increase in built-up area, open forest, plantation, 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 urbanization of the study area. No mining activities were found in the study area in 1976, but a small addition of mining land was found in 2003.

Zahra Hasan et al, in 2016. This article presented that one of the detailed and useful ways to develop land use classification maps is use of geospatial techniques such as remote sensing and Geographic Information System (GIS). It vastly improves the selection of areas designated as agricultural, industrial and/or urban sector of a region. In Islamabad city and its surroundings, change in land use has been observed and new developments (agriculture, commercial, industrial and urban) are emerging every day. Thus, the rationale of this study was to evaluate land use/cover changes in Islamabad from 1992 to 2012. Quantification of spatial and temporal dynamics of land use/cover changes was accomplished by using two satellite images, and classifying them via supervised classification algorithm and finally applying post-classification change detection technique in GIS. The increase was observed in agricultural area, built-up area and water body from 1992 to 2012. On the other hand forest and barren area followed a declining trend. The driving force behind this change was economic development, climate change and population growth. Rapid urbanization and deforestation resulted in a wide range of environmental impacts, including degraded habitat quality.

Akthar Alam et al, in 2019, presented such that land use and land cover (LULC) change has been one of the most immense and perceptible transformations of the earth's surface. Evaluating LULC change at varied spatial scales is imperative in wide range of perspectives such as environmental conservation, resource management, land use planning, and sustainable development. This work aims to examine the land use and land cover changes in the Kashmir valley between the time periods from 1992–2001–2015 using a set of compatible moderate resolution Landsat satellite imageries. Supervised approach with maximum likelihood classifier was adopted for the classification and generation of LULC maps for the selected time periods. Results reveal that there have been substantial changes in the land use and cover during the chosen time periods. In general, three land use and land cover change patterns were observed in the study area: (1) consistent increase of the area under marshy, built-up, barren, plantation, and shrubs; (2) continuous decrease in agriculture and water; (3) decrease (1992–2001) and increase (2001–2015) in forest and pasture classes. In terms of the area under each LULC category, most significant changes have been observed in agriculture (−), plantation (+), built-up (+), and water (−); however, with reference to percent change within each class, the maximum variability was recorded in built-up (198.45%), plantation (87.98%), pasture (− 71%), water (− 48%) and agriculture (− 28.85%). The massive land transformation is largely driven by anthropogenic actions and has been mostly adverse in nature, giving rise to multiple environmental issues in the ecologically sensitive Kashmir valley.

2.2 LAND USE CHANGE DETECTION USING QGIS

Luca Congedo et al, 2014 proviede a tutorial for the land cover classification of cropland. In particular, we are going to classify a Landsat image acquired over the US state of Kansas, near the city of Ulysses, using the new version 2.3.2 of the Semi-Automatic Classification Plugin for QGIS.

Louis Leroux et al, in 2016, stated that land cover mapping relies mainly on the classification of satellite images using supervised techniques. The European Space Agency (ESA's) Sentinel-2 (S2) images available since 2015 and providing images at a high temporal and spatial (10 m) resolutions, offer new opportunities for land cover monitoring using remote sensing in Africa. This chapter presents a methodology for land cover mapping based on S2 and the semi-automatic classification plugin (SCP) for quantum geographic information system (QGIS). SCP is a free and open-source plugin developed by Luca Congedo allowing the implementation of SCP based on a variety of satellite images such as MODIS, Landsat or S2. After having the overall workflow for the land cover classification from satellite images, it proposes an example of application in QGIS, taking as a case study the region of Yilou, located in the province of Bam, in Burkina Faso for the year 2016.

Mohamad Hanif et al,in 2019 published that remotely sensed data is considered one of the main sources of information about the earth's cover. Land Use/ Land Cover (LU/LC) mapping is the earliest application of remote sensing technique. Since many years remotely sensed data has been used for LU/LC mapping in various parts of the India. LANDSAT–8 (OLI) data acquired on January 2018 has been downloaded and used for identification and classification of major LU/LC classes of Chopda Taluka, Dist: Jalgaon. On screen visualization and image classification were used to delineate the various LU/LC classes. Image classification is carried out in QGIS software. The various categories of LU/LC in the area recognized are forest, agricultural land, built up area, waste land, water bodies, fallow land. LU/LC mapping is very essential in finding out the soil erosion in any specific area, because; the vegetation cover has significant impact on soil erosion.

ALGhaliya Nasser Mohammed Al-Rubkhi et al, in 2017 published issues of land use/land cover changes and the direct or indirect relationships of these changes have drawn much attention in recent years. This research is an attempt to examine the use of QGIS Open source software integrated with GIS techniques to detect, evaluate, and analyze LULC change between 2000 and 2010, to project the future of LULC. MOLUSCE plugin was used for produced the map of area change between study period, and provide transition matrix the represented the replacement from one to others landuse. Finally to detect the future of LULC for 2025 by used Cellular Automata Simulation. As expected, the results showed an increase in urbanization (residential, public building and transport area) while decreasing in agriculture. In the term of projected LULC, the result also suggests a significant increase in residential and public building area. Meanwhile, predictions suggest the agriculture will be reduced by 1.49% in 2025. In conclusion this technique was to be a powerful tools for monitoring and modeling land use and change in land cover.

Usha et al, in 2012 published that this study examines the use of image processing and remote sensing in landuse changes mapping for Palladam Taluk between 1972(Topographic sheets) and 2011(satellite images). The layers of landuse map (1972) were digitized by heads-up digitization method in Quantum GIS (QGIS) software environment. Similarly the layers of landuse map (2011) were developed by supervised classification of satellite imagery. The training site was created by referring ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) satellite imagery with help of GPS (Global Positioning system) coordinates in QGIS environment. Supervised classification technique was adopted to classify the satellite image in SAGA GIS (System for Automated Geo-scientific Analyses) software environment. The classified image was converted into vector format and estimated the total area of each class by using geometry tools of QGIS software. The landuse changes between 1972 and 2011 compared and displayed in geographical or map format in 1:50000 scale.

2.3 QGIS APPLICATIONS AND USAGE

Bailey Hansen et al, (2017) statedthat a projection is a way to translate the curved surface of the earth (3D) onto a flat map (2D). The challenge is that every map projection has distortion because the spherical nature of the globe cannot be perfectly represented in a two dimensional map. The picture below illustrates similarities and differences of three map projections. This image powerfully demonstrates the importance of defining the projection. For example, if you were working with data in Washington State you may have very different results working in Mercator or Lambert Conformal Conic. Knowing the projection of your data is important especially when working with data that is part of a dataset that is larger than just your county or state. This tasksheet will cover how to change the projection of an existing file as well as enabling on the fly projection in QGIS.

Suraj Kumar et al, in 2016 presented a study on generating land-use/land-cover (LULC) map using standard (FCC) satellite imagery of IRS P6 LISS III for Samastipur District (India). Multi temporal IRS satellite images acquired during three crop growing seasons viz., Kharif (July-November), Rabi (December-March) and Zaid (April-July) were used to map the spatial and temporal variability in cropping pattern and other land use and land cover classes using visual interpretation technique. Among the various classes of landuse/ land cover, agricultural land is the predominant category occupying 2276.58 sq km (85.02 %) of the area. Among agricultural land, agricultural land-two crop area comprising (32.13%) and agricultural land-rabi crop (29.88%) constitute the dominant categories. It is estimated that built up constitutes 219.65 sq km comprising 8.20% of the total area. Based on selective field checks, the overall classification accuracy of the LULC map derived from the satellite image was 90% with the Kappa coefficient of 0.83. Therefore, integrated geospatial approach, incorporating remote sensing and GIS techniques, is a powerful technique for mapping and evaluating the LULC categories

Pjevoic et al, (2014) provided **a**pplication of the open source software when resolving geodetic issues provides limitless possibilities. The present paper will showcase a methodology for setting out of engineering projects through a combination of GIS (Geographic Information System) software QGIS and R software environment. The link between QGIS and R had been established using Sextante toolbox, which significantly extends possibilities for a QGIS application, by establishing link to the other 'powerful' tools, such as R. Test example of land expropriation project shows the possibilities of the QGIS application for analytical elaboration of an expropriation zone, and R software package for automating setting out accuracy calculation.

Anders et al, in 2017,developed a new Water Ecosystems Tool (WET), a workflow implemented (as a plugin) in QGIS, for application and evaluation of aquatic ecosystem models. WET provides a Graphical User Interface (GUI) for the coupled one-dimensional hydrodynamic-ecosystem model GOTM-FABM-PCLake. WET is unique as it enables a standardized and easy-to-use workflow for an otherwise complex model application and is readily applicable to any individual lake and reservoir in the world. WET integrates a platform for model experimentation through scenario simulations – currently encompassing changes in climate and nutrient loads. WET also includes a link to the SWAT (Soil & Water Assessment Tool) watershed model, which can be used to simulate how land use changes affect aquatic ecosystems. The tool is open source and may therefore be readily expanded and adapted for additional model experimentations.

Lia Duerta et al, (2018) discussed the importance of Earth observation (EO) data and remote sensing technologies that are used to address the sustainable development goals. An important step for a full exploitation of this technology is to guarantee open software supporting a more universal use. The development of image processing plugins, which are able to be incorporated in Geographical Information System (GIS) software, is one of the strategies used on that front. The necessity of an intuitive and simple application, which allows the students to learn remote sensing, leads us to develop a GIS open source tool, which is integrated in an open source GIS software (QGIS), in order to automatically process and classify remote sensing images from a set of satellite input data. The application was tested in Vila Nova de Gaia municipality (Porto, Portugal) and Aveiro district (Portugal) considering Landsat 8 Operational Land Imager (OLI) data.

CHAPTER 3
MATERIALS AND METHODS

3.1 METHODOLOGY

The following methodology is adopted in this project:

- Installation of latest version of QGIS software i.e QGIS 3.8 Zanzibar.
- Collection of topographic map and satellite image from Sentinel/Landsat satellites of the desired study area.
- Geo-referencing of topographic map in QGIS.
- Creation of different layers in topography map, the layers include forest area, lake area, built up land, agricultural land, rivers and reservoirs.
- Projection of the layers such that area can be determined from the layers.
- Satellite images which is collected is geo-referenced and the different layers are then created from that image using interpretation keys.
- The created layers from the satellite image is projected.
- The comparison in area between the areas of satellite image layers and topography map layers is determined.
- Land use changes is then determined from the comparison in area.

The details of experimental process are presented in the form of a flowchart as shown in the Fig 3.1.

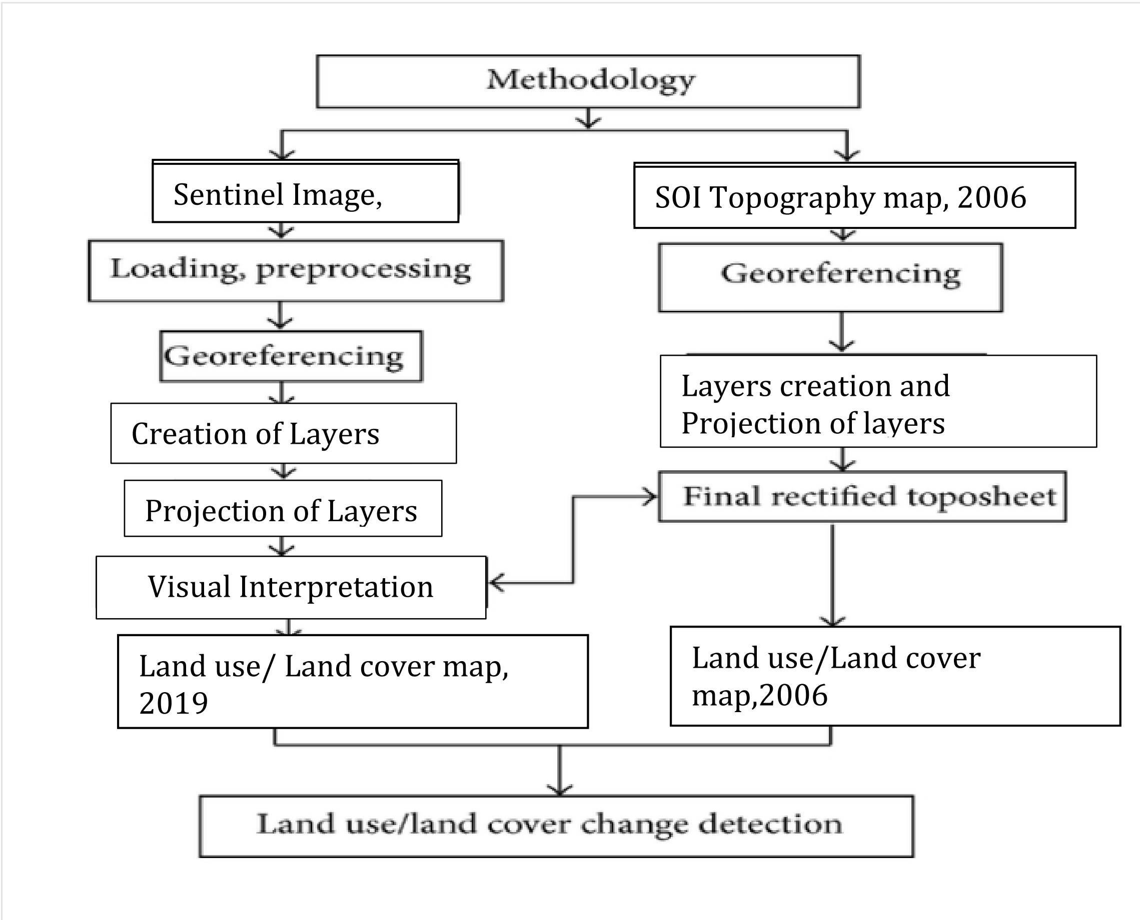


Fig 3.2 Flowchart showing the methodology

3.2 SOFTWARES USED

3.2.1 PDF TO JPG CONVERTER

The pdf file, obtained from SOI portal is converted into image format. This conversion facilitates to import the data into QGIS.

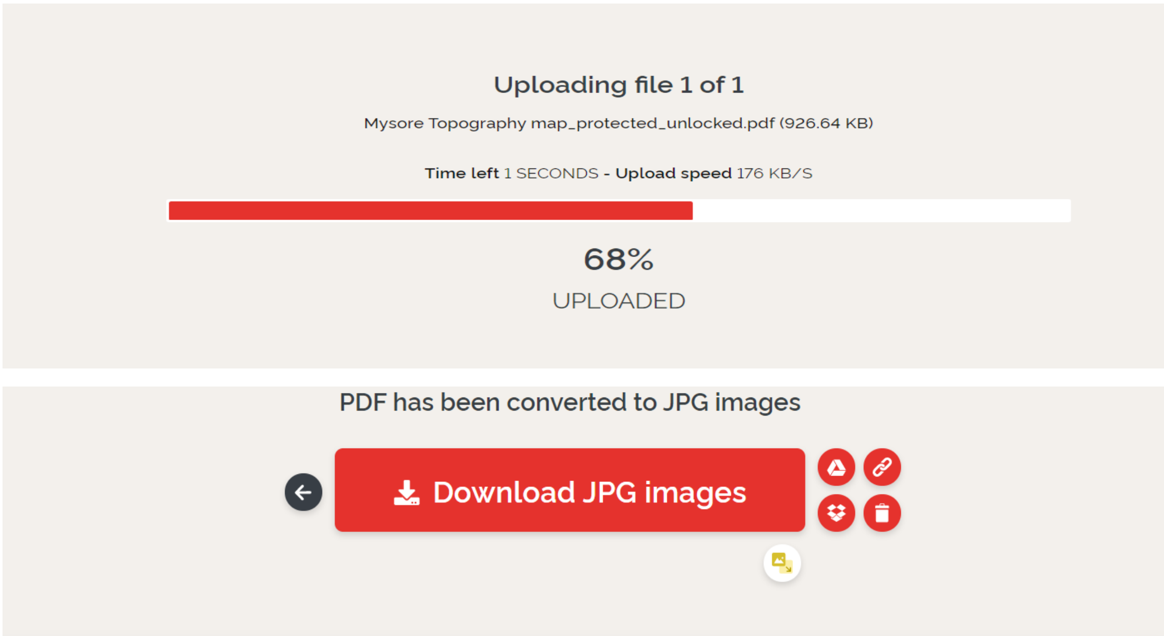


Fig 3.3.2 : Pdf to jpg converter

3.3 MATERIALS COLLECTION

3.3.1 INSTALLATION OF QGIS

- Create a folder on your C:/ drive computer called QGISlab by right clicking on the C: drive and navigating down to the New / Folder.
- Go to QGIS download page and download the latest 64bit version of QGIS for windows which is QGIS 3.8.4 'Zanzibar' by clicking once. If you have a 32 bit machine or using another operating system search the bottom of the page for your operating system and download the correct operating system version of QGIS.
- The browser will download the file to the browsers default download directory. By pressing the control key and the letter J at the same time a popup window will show you the folder where the QGIS file has been downloaded. The QGIS file will be called: QGIS-OSGeo4W-2.18.12-1-Setup-x86_64.exe.
- Move or copy the above file to your C:/QGISlab folder and o double click on the file osgeo4w-setup-x86_64.exe. There will be a popup window with a security warning. Hit the run button to start the installation process and follow the prompts. There is no need

to install the data sets suggested by QGIS.

- Once QGIS has completed installing click the Windows Start icon at the bottom left of your screen and double click on the QGIS desktop icon to open QGIS.
- QGIS is finally installed.

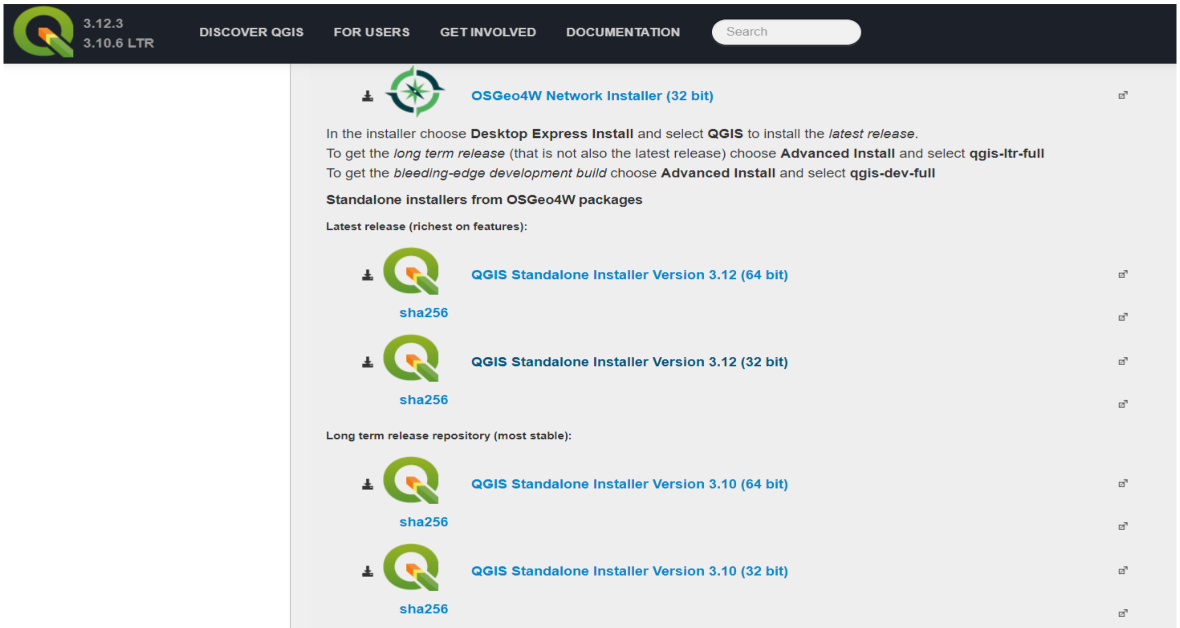


Fig 3.3.1.1 : QGIS installation launcher

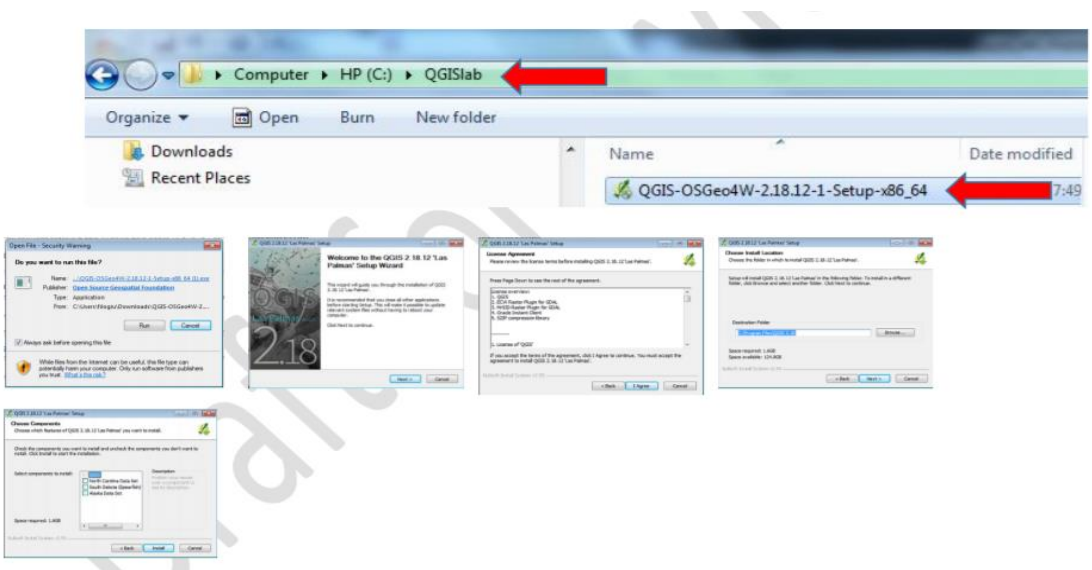


Fig 3.3.1.2 : QGIS installation window

3.3.2 TOPOGRAPHIC MAP COLLECTION

The topographic map is obtained from survey of India website and procedure to download the topographic map is explained below:

- ❖ First, open NAKSHE portal and provide personal details in it.
- ❖ Then, we have to provide the details of the study area location i.e Mysore,Karnataka.
- ❖ Later go through the Metadata of the location and accept the privacy policy thus the topographic map is ready to download. It is in pdf format.
- ❖ Then pdf file is converted to image (JPG) format for the use in QGIS as file can only be used when it is in TIFF or JPG format.

Fig 3.4.2.1 : Survey of India web page

The topographic map number D43W8 is obtained.

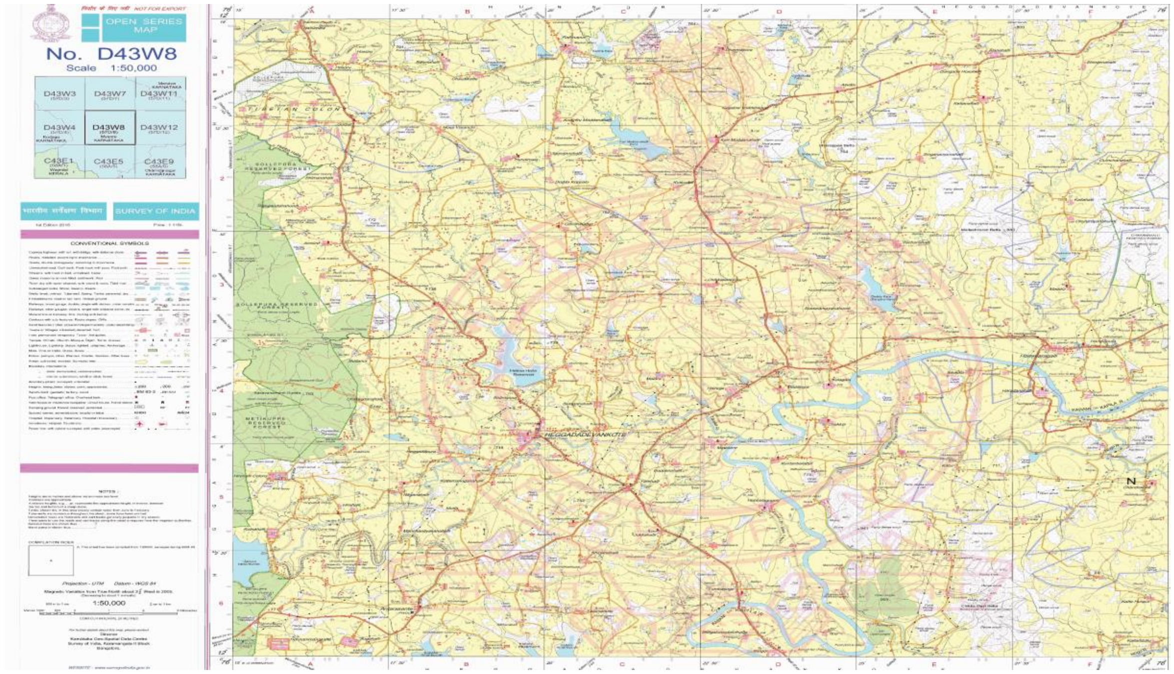


Fig 3.4.2.2 : Topography map D43W8

3.3.3 SATELLITE IMAGE COLLECTION

The satellite image can be collected by either American satellites or Indian satellites. The American satellites include Landsat-8, Metero-sat, the satellite image of these satellites can be obtained from USGS portal. The Indian satellites are LISS-3, Cartosat-3, INSAT satellites and the images from these satellites are obtained from BHUVAN website.

For this project we preferred Sentinel-2 image and steps to download the satellite image is as follows:

- ❖ We have to decide which satellite image we have to download.
- ❖ We can obtain the satellite images from USGS portal or BHUVAN portal. If we have to obtain satellite image through Indian satellite we can obtain it through BHUVAN portal and for united states satellite we can obtain it through USGS portal.
- ❖ For now we will try to obtain satellite image of Sentinel 2 satellite. For that we need to login to USGS portal i.e Earth explorer.
- ❖ Then in Earth explorer we have to provide the data sets of study area location and provide the date intervals for obtaining required seasons satellite image.
- ❖ Then obtain the satellite image through TIFF format for further use.

❖ The date of acquisition and the resolution of the satellite is provided in the table below:

Data	Date of acquisition	Bands/Color	Resolution (m)
Landsat 7-ETM	14- 1-2001	Band 4 Near-Infrared Band 3 Red Band 2 Green	30
Sentinel 2A	23-03-2019	Band 4-Red Band 3-Green Band 2-Blue	10

Satellite data

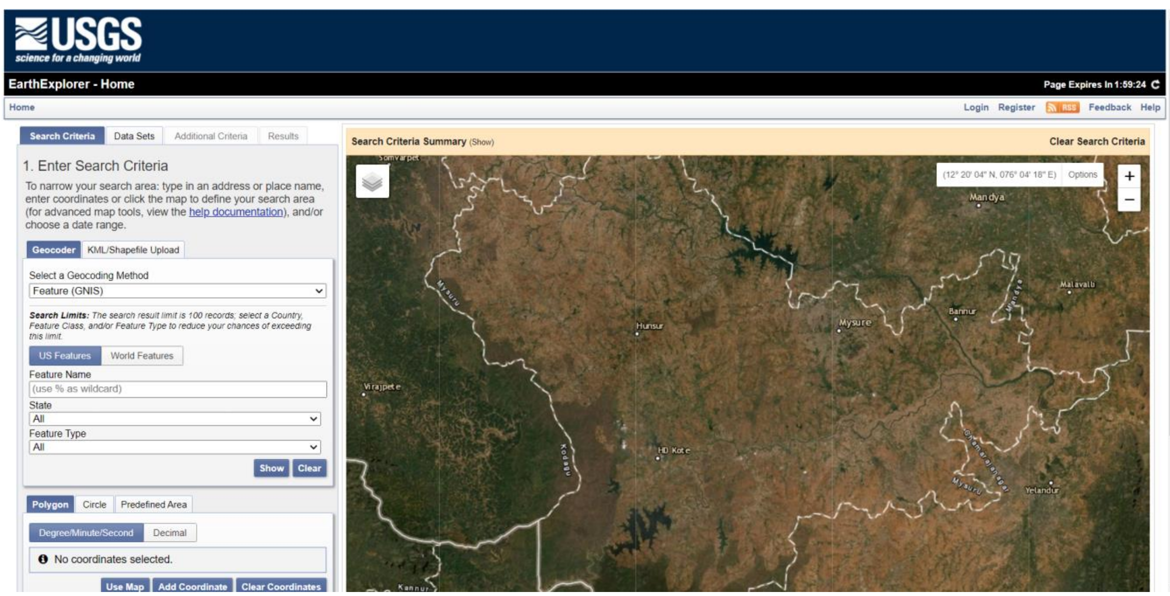
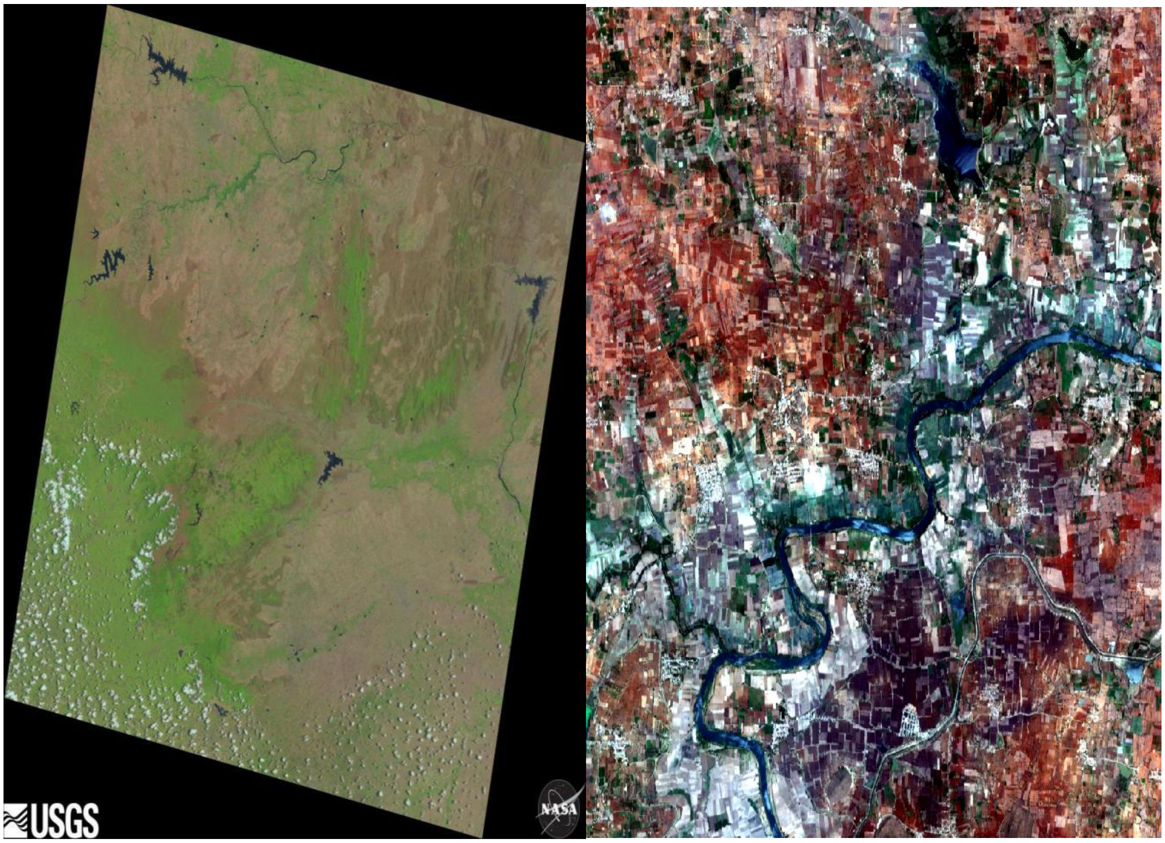


Fig 3.3.3.1 : USGS Earth explorer

The satellite image thus obtained will be obtained like this:



(a) (b)

Fig 3.3.3.2 : Satellite image of Landsat 8 (a) and Sentinel 2 (b)

CHAPTER 4

QGIS WORKING PHASE

4.1 GEOREFERENCING OF TOPOGRAPHIC MAP

- **G**eo-referencing is the process of locating ground control points onto the map,image or aerial photo. By geo-referencing any feature can be identified on the map.
- Geo-referencing can be done in QGIS by installing georeferencer plugin.

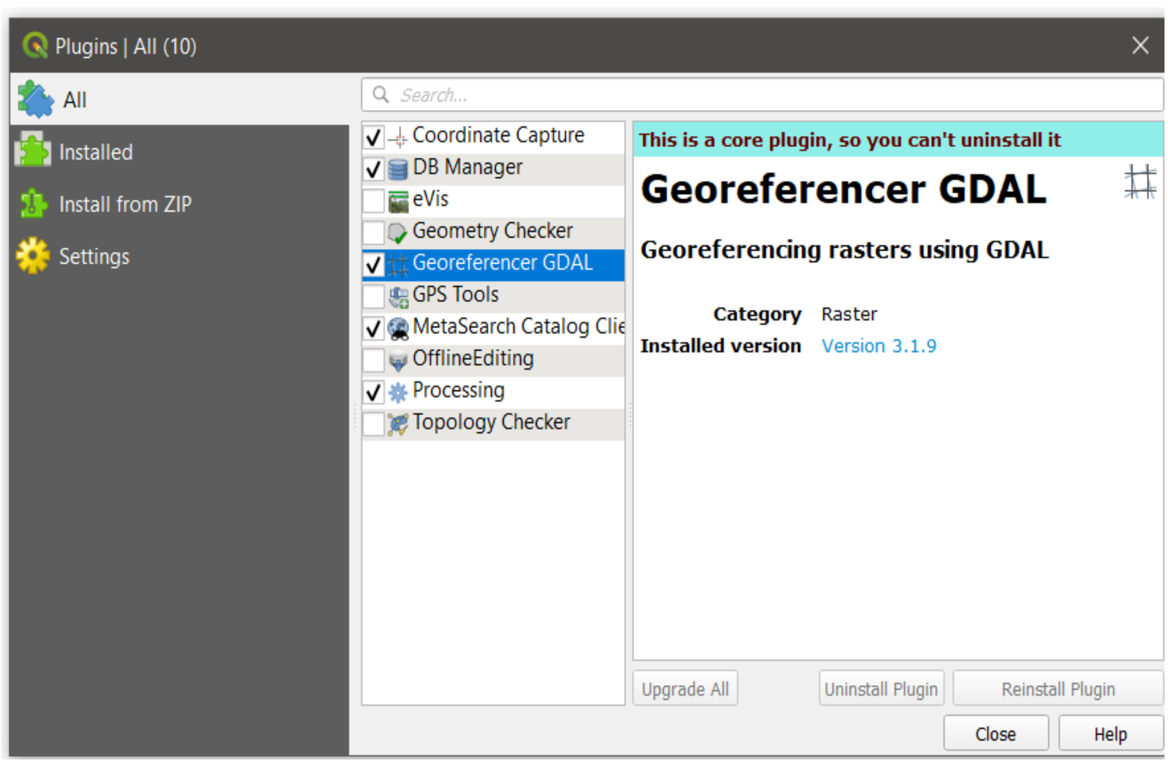


Fig 4.1.1 : Georefencer installation in QGIS

- Then open the Geo-referencer window and add the required topographic map which is to be Geo-referenced.
- After adding the topographic map into georeferencer window, add the points on all the

four corners of the topographic maps by adding co-ordinates mentioned on all four sides respectively.

- ❖ Then start the procedure of georeferencing the Topographic maps.

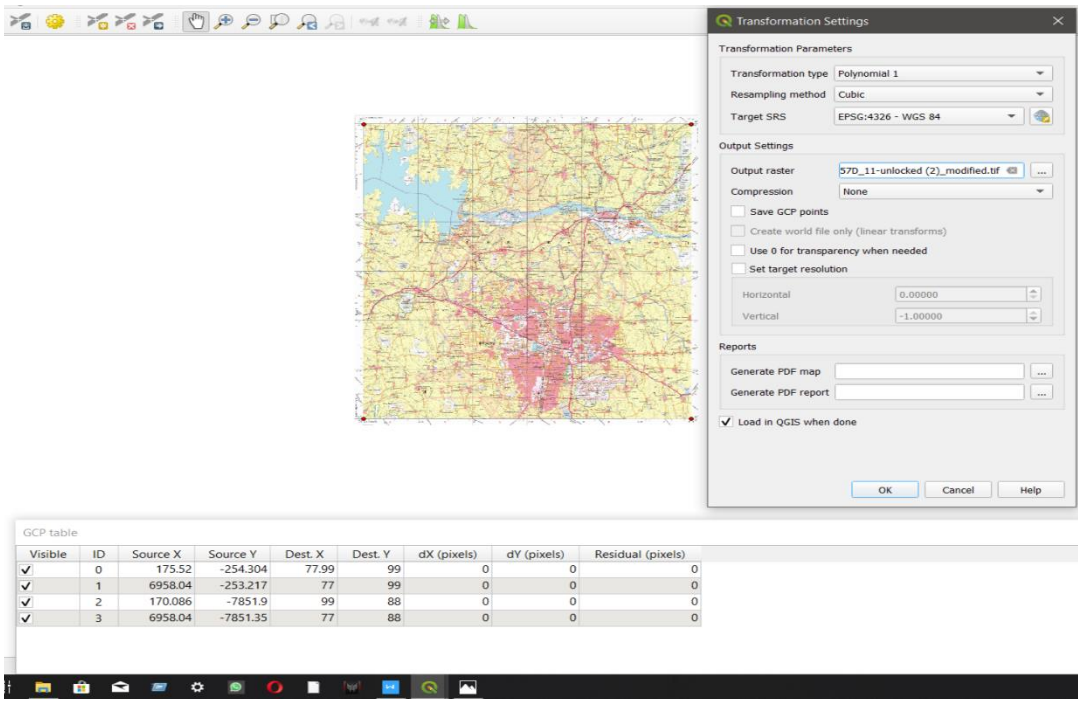


Fig 4.1.2 : Georeferencing of topographic map

- ❖ Thus geo-referenced topographic maps are obtained.

4.2 CLIPPING OF TOPOGRAPHIC MAP

The topographic map after geo-referencing should be clipped to extents for accuracy.

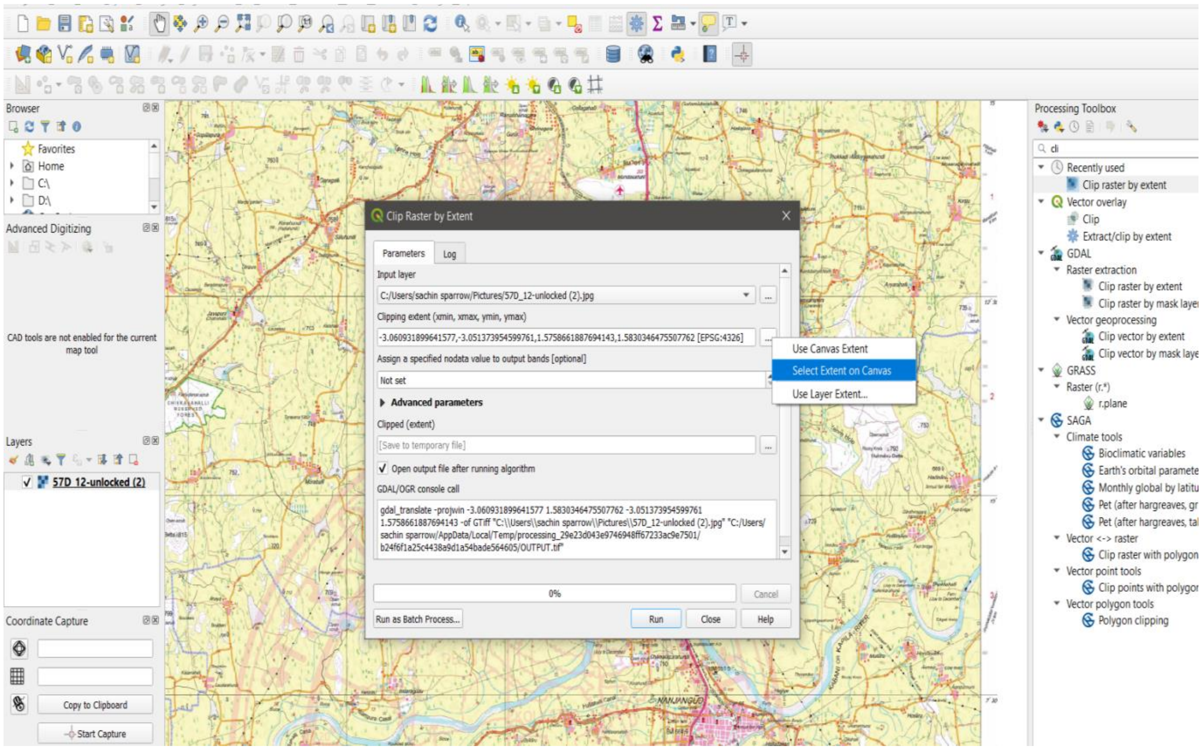


Fig 4.2.1 : Clipping of topographic map

4.3 CREATION OF SHAPE FILE LAYERS

❖ For creation of Vector layer, there are certain tools. These tools includes adding of polygon feature, copying the polygon, adding a part to polygon, splitting a polygon, reshaping the polygon.

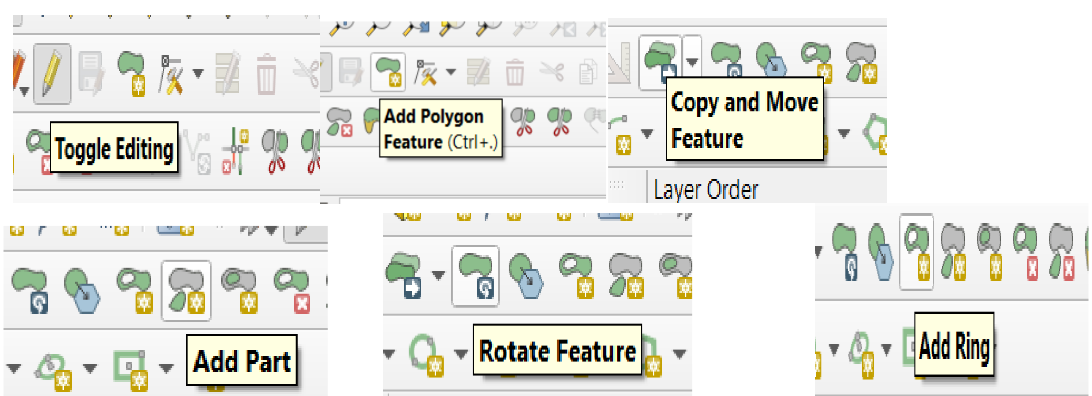


Fig 4.3.1 : Tools for creation of shapefiles

❖ From these tools, we can create a new vector layer by tracing the boundary of required study area.

- The shapefile of forest area, water bodies, scrub area, urban area, rivers are done using these vector tools. Different layers are used for different type of shapefile.
- Thus shapefile of required study area is obtained.

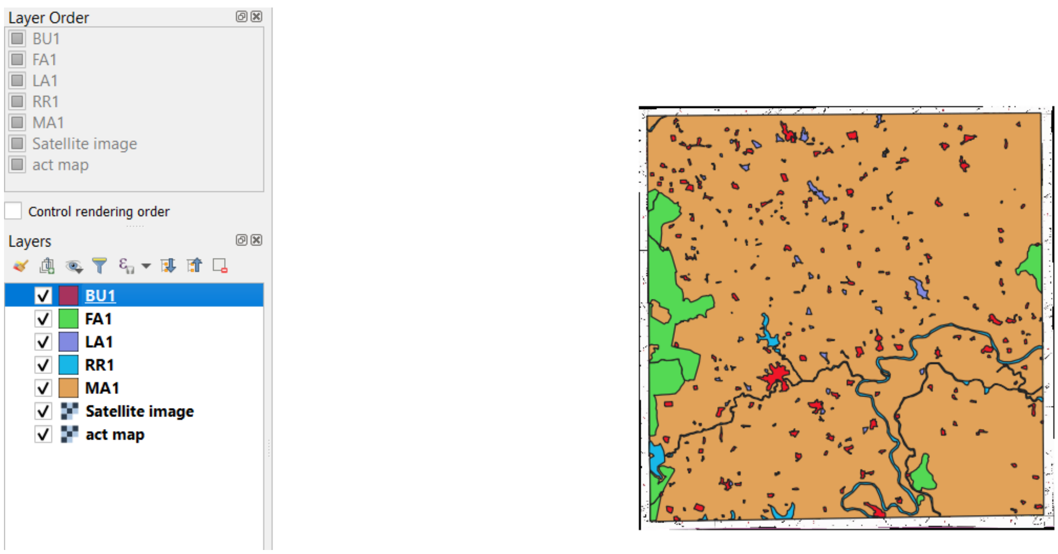


Fig 4.3.2 : Creation of different layers

4.4 PROJECTION OF LAYERS

- After creation of required area shapefile the obtained vector layer should be projected so that the further functions can be carried out.
- Projection is done because the vector layer can be measured.

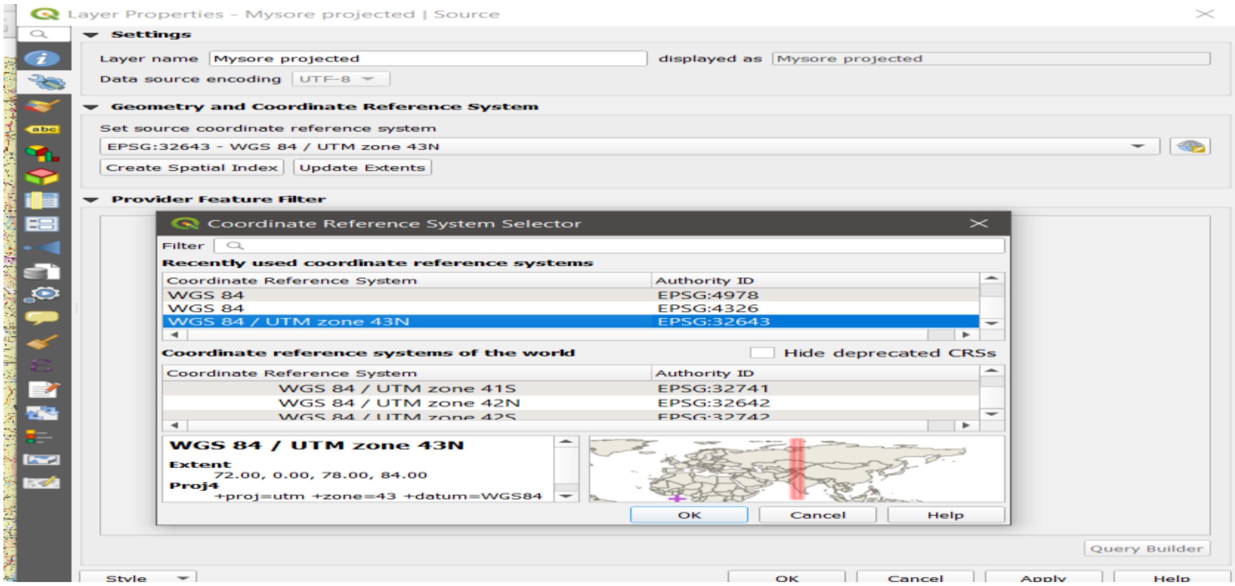


Fig 4.4 : Projection of Vector layer

- ❖ As Mysuru region lies in UTM 43N zone, thus the projection is done for that co-ordinate reference system.
- ❖ A spatial reference system (SRS) or coordinate reference system (CRS) is a coordinate-based local, regional or global system used to locate geographical entities. A spatial reference system defines a specific map projection, as well as transformations between different spatial reference systems.
- ❖ Thus the shapefile is projected for the required zone.

4.5 VISUAL INTERPRETATION OF SATELLITE IMAGES

Visual perception, i.e. looking at the environment, is an everyday experience for most of us. This ability has to be used for remote sensing as well. Image objects and structures have to be recognised and interpreted.

Interpretation keys are very useful for visual interpretation of satellite image.

Elements of visual Interpretation:

- **Tone** : Measure of electromagnetic radiation emitted/reflected by terrain.
- **Texture** : Smoothness/Coarseness of the terrain.
- **Shape** : Geometric arrangement of Image feature.
- **Size** : Dimension of Image feature.
- **Pattern** : Spatial arrangement of objects.
- **Shadows** : Advance Interpretation capability of surface.
- **Association** : Feature helps to narrow down the possible class of the terrain.
- **Site or location** : Helps to identify certain objects in the location.

Through below image we can interpret the satellite image the red circle shows the urban area or built up area, green circle represents the vegetation or agricultural land and the blue circle represents the reservoir.

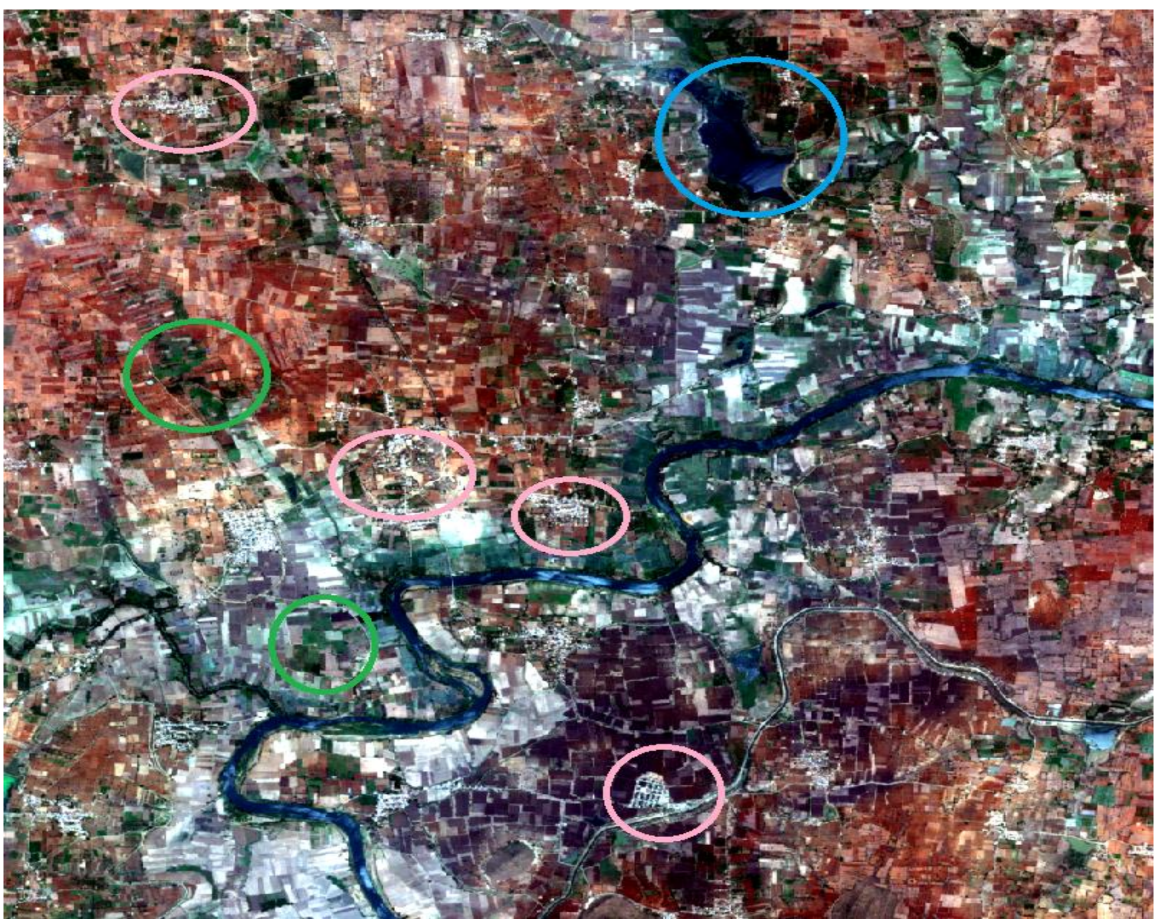


Fig 4.5 : Visual Interpretation of Satellite image

4.6 GEOREFERENCING AND CREATION OF LAYERS IN SATELLITE IMAGE

- ❖ The satellite image collected should be geo-referenced as same as the topography layer co-ordinates.
- ❖ The geo-referenced satellite image is ready for further process, i.e the creation of new layers is possible.
- ❖ The layers are created using the same tools used to create layers of the topography map.

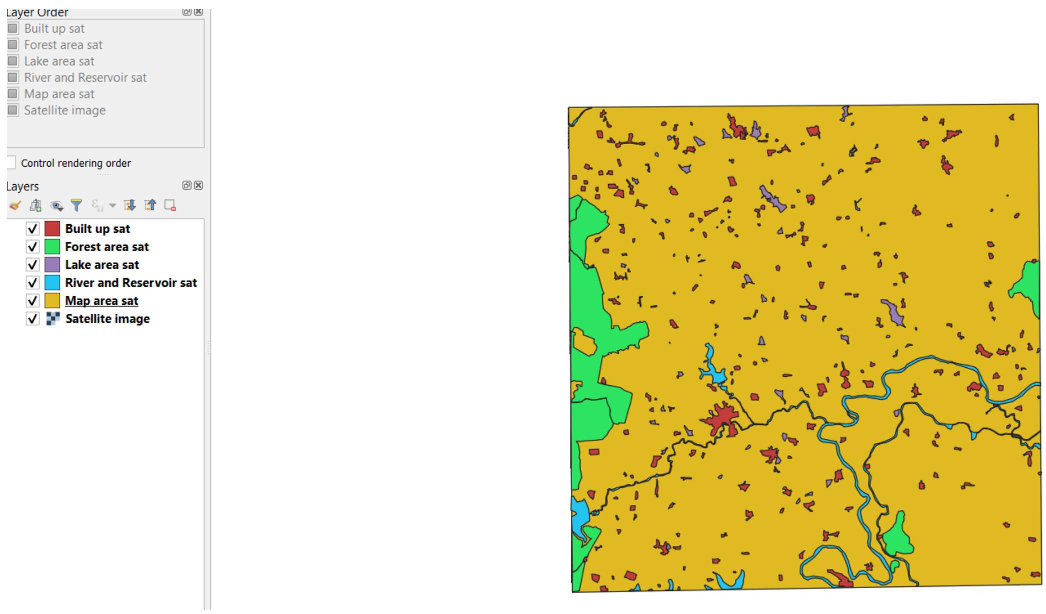


Fig 4.6 : Layers created from satellite image

4.7 PROJECTION OF SATELLITE IMAGES

- ❖ Projection of satellite image is done same as to that of projection of topography layers.
  - ❖ Projection of satellite image is done for WGS-84 UTM zone 43N.

CHAPTER 5
RESULTS AND DISCUSSIONS

5.1 AREA CALCULATION FROM OPENING OF ATTRIBUTE TABLE

- The change of area detection is determined by taking the attribute data of the layers created in QGIS.
- The attribute data can be taken as shown in figure below

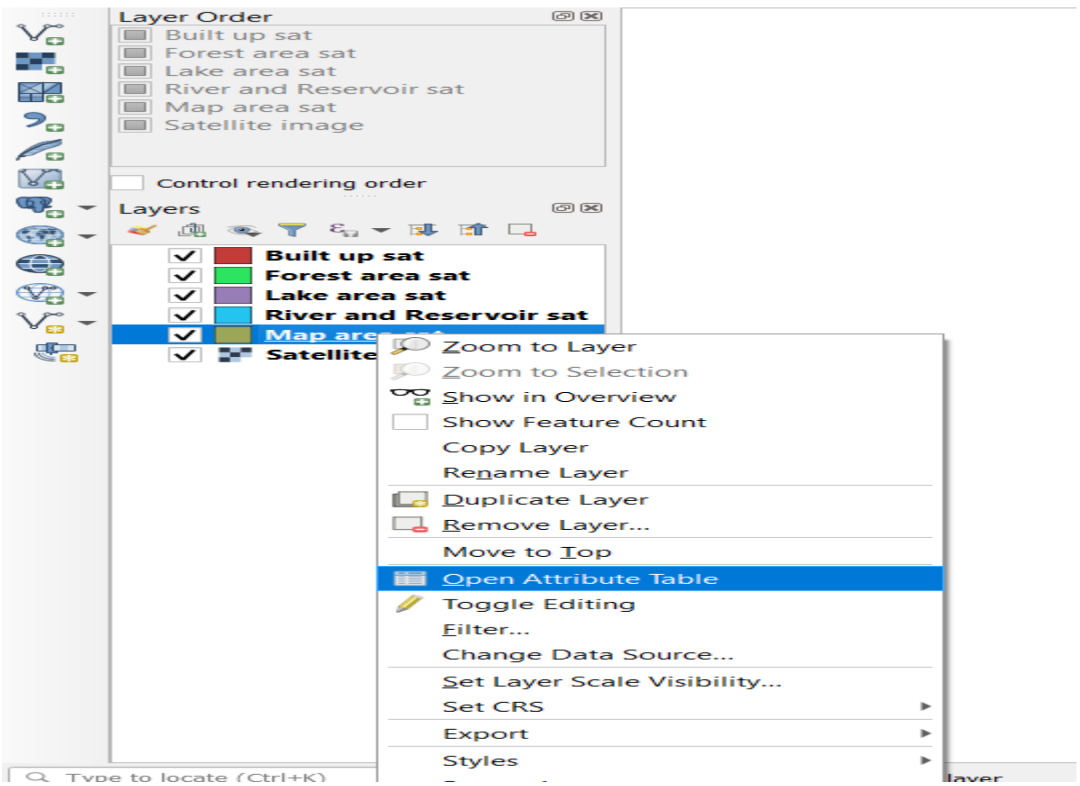


Fig 5.1.1 : Opening of Attribute table

- The attribute table can be opened by right clicking the layer and click ‘open attribute table’.
- In attribute table, click ‘open field calculator’ as shown in figure.

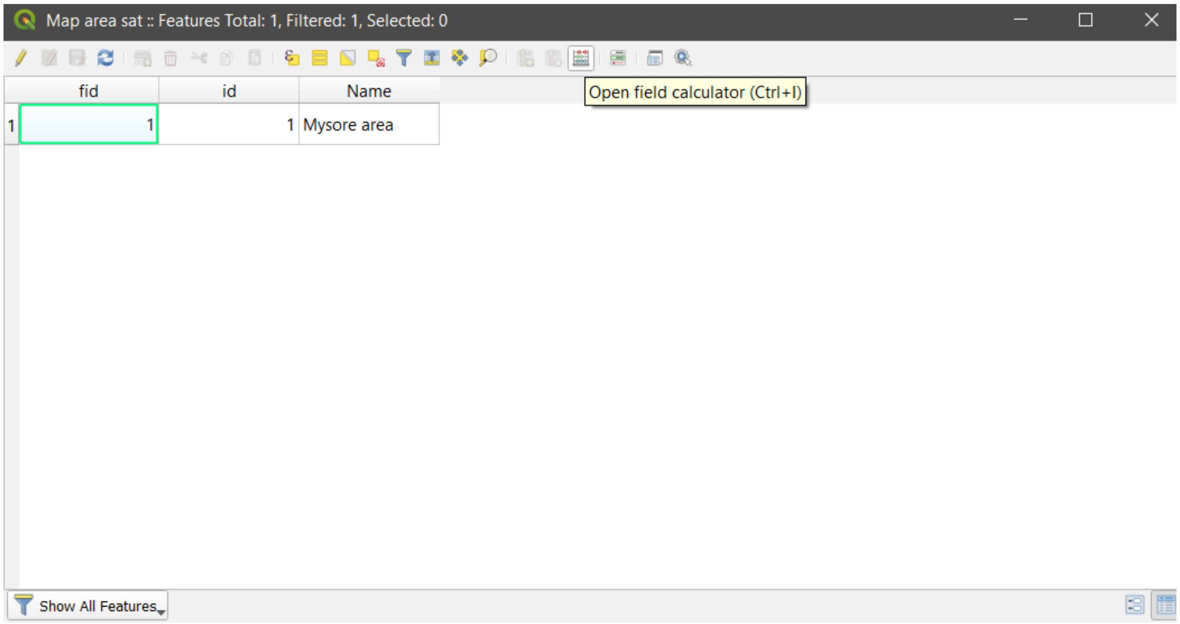


Fig 5.1.2 : Opening of field calculator

❖ After opening field calculator the area can be calculated by clicking the '$area' option as shown in figure.

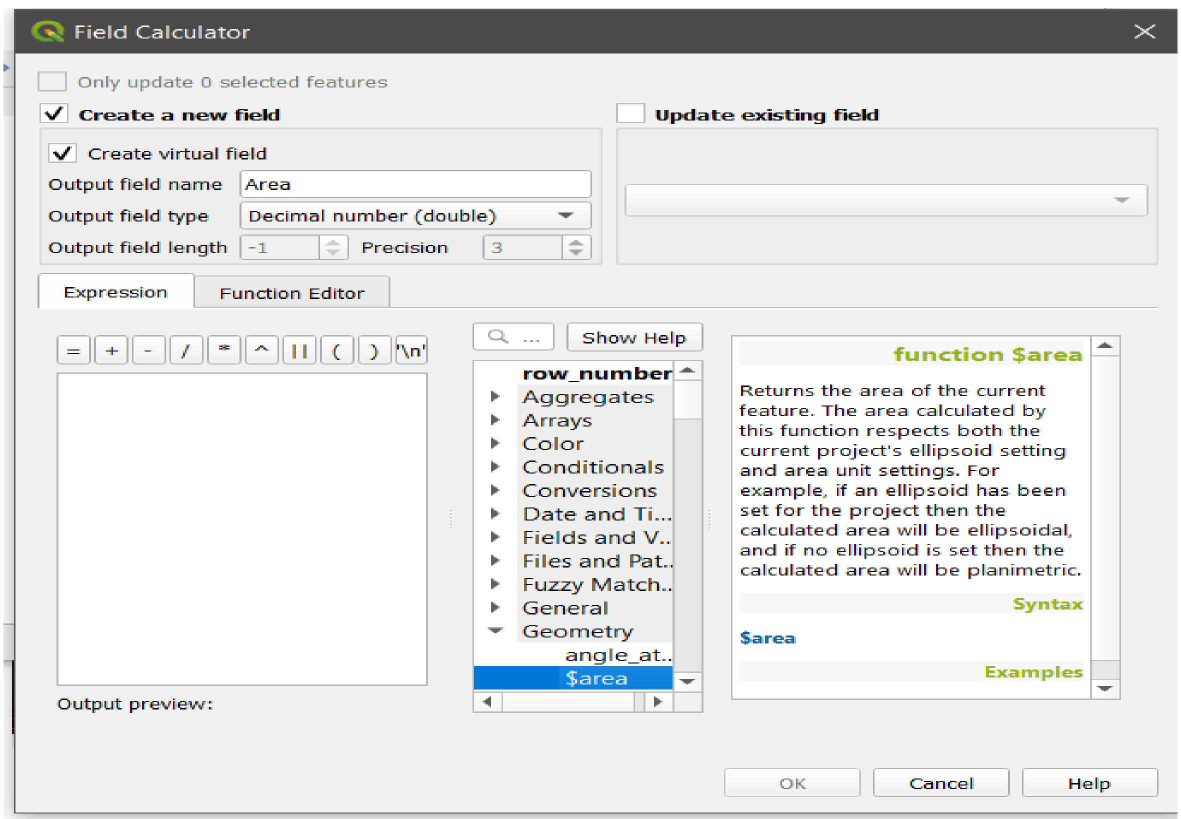


Fig 5.1.3 : Area option in field calculator

❖ The area of the layers can be seen as shown in figure.

Merged :: Features Total: 636, Filtered: 636, Selected: 0

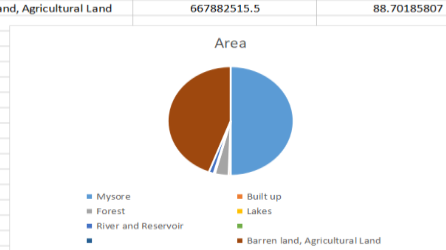
	fid	id	Name	layer	path	Area
1	1	1	Nallurpala			66842.2842653...
2	2	2	Nallurpala			27344.2566908...
3	3	3	Nalurpala			40143.6428490...
4	4	4	Minakshipura			113058.851727...
5	5	5	Kurubara Hosah...			59228.0698338...
6	6	6	Hosuru			221548.350080...
7	7	7	Kalenahalli			42885.5399488...
8	8	8	Colony B			45708.9315493...
9	9	9	Monastery			80966.5240539...
10	10	10	Colony I			49125.8959736...
11	11	12	Colony J			57051.2255735...
12	12	12	Colony H			46743.1332184...
13	13	13	Colony J			37976.6370765...

Show All Features

5.2 CHANGE ASSESSMENT FROM COMPARSION OF LAYERS FROM SATELLITE AND TOPOGRAPHIC MAP

❖ Change of area is calculated in excel by taking the attribute table data of two years of topography map and satellite image.

Topographymap Data			Satellite data		
Region	Area	Percentage of land area	Region	Area	Percentage of land area
Mysore	752952114	100	Mysore	752952308.5	100
Built up	8013464.268	1.064272763	Built up	19503914.01	2.590325283
Forest	52641633.47	6.991365386	Forest	39171843.11	5.202433497
Lakes	5013216.914	0.6658082	Lakes	4759052.864	0.632052364
River and Reservoir	19401283.88	2.576695586	River and Reservoir	19289932	2.561906217
Barren land, Agricultural Land	667882515.5	88.70185807	Barren land, Agricultural Land	670227566.5	89.01328264



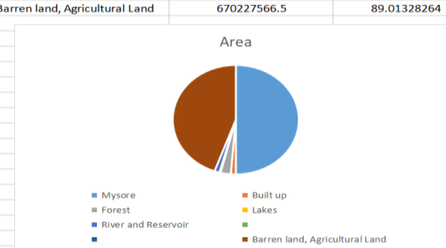


Fig 5.2 : Area detection from comparison of 2 layers

- In the figure, there is difference in the area data. In topography map data the built up land is about 1 % but in satellite data it is about 2.6 %, this infers that built up land is increased about 1.6 times.
- The forest area in topography map is almost 7 % but due to increase in built up land, deforestation and increase in agricultural land the percentage of forest area is reduced to 5.2 %.
- The lake area is almost the same in the datas of both the years.
- The same is about the river and reservoir data, it is same as both the years.

CHAPTER 6

6.1 CONCLUSIONS

- This project helps to understand the land use changes that has been undergone throughout the years and helps in safeguarding the natural resources such as river, lakes, forest area.
- It helps to understand the amount of development happened in the span of previous years and now.
- It determines the amount of land changes happened for various field such as agricultural land, built up land.
- Since forestry and agriculture are the predominant user of land, their quality (soils) and quantity (area) is directly related to the nature of landforms. This data would ultimately help to identify limiting resources as also the environmentally critical areas which can be delimited as hot spots for conservation or remediation. The evaluation of resources would also lead to understand the impacts of various developmental activities on these resources on the one hand and the planning process on the other.

6.2 SCOPE OF WORK

- Land use and land cover change mapping will help to take up clear strategies for managing natural resources and monitoring environmental changes
- Urban expansion has brought serious losses of agriculture land, vegetation land in the recent years. The improper study of the urban land expansion is responsible for a variety of urban environmental issues like decreased air quality, increased runoff and subsequent flooding, increased local temperature, deterioration of water quality, etc.
- Land and Water Resources Management will imply utilization of land and water resources for optimal and sustained production with the minimum hazard to natural

resources and environment.

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