INDUSTRY PROJECT PRESENTATION
ON
REMOTE SENSING & GEO-SPATIAL ANALYSIS

GROUP ID : A-3

GROUP MEMBERS

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Introduction

Forests give a few biologically, monetarily and social point of view capacities to life viz., water supplies, soil preservation, supplement cycling, species and ozone harming substances guideline. Expanding anthropogenic pressing factors, for example, land use/land cover changes, air, water and soil contamination, debasement of soil quality and misfortunes in organic variety are some significant dangers to profitability of biological systems at provincial and worldwide scales. Current situation shows that farming practices have been a significant factor for land change in this world. A lot of this rural land has been made to the detriment of regular woodlands, fields and wetlands that give important living spaces to species and administrations for humanity. Today, around half of the initial forests have disappeared. As the pace of living space and species annihilation keep on rising, the requirement for preserving the natural variety turned out to be progressively basic during the most recent years. It is a troublesome errand to gain such data based on field evaluation and observing. Forest cover changes at local to worldwide scales requires a methodology dependent on distant detecting.

OBJECTIVES

- Objective 1: Classifying features on map using supervised learning in qgis

- Objective 2: Detecting Deforestation and Afforestation in Madhya Pradesh

- Objective 3:Change Detection between January,2016 - January 2021

- Objective 4: Publishing in web application

RELATED BACKGROUND

Remote sensing provides a systematic, synoptic view of earth cover at regular time intervals and useful for changes in land cover and to reveal aspects of biological diversity directly. Satellite image classification, change analysis and econometric modelling are extensively used to identify the rates and drivers of deforestation in global hotspots of biodiversity and tropical ecosystems..

TOOLS AND TECHNOLOGY

- Data from USGS

- QGIS

- R Programming

- Geoserver

- OpenLayers

- Extjs

- PostGIS

MODULES AND EQUIVALENT DATA SOURCES

Change Detection

Location	Date
Near Bhopal	January 2016,February 2017,February 2018,February 2019,February 2020 and January 2021

OBJECT CLASSIFICATION

Location	Date	Operations
Ahmedabad	10-9-20	Band Combination
Near Ahmedabad (For land and river)	16-1-21	Supervised Classification

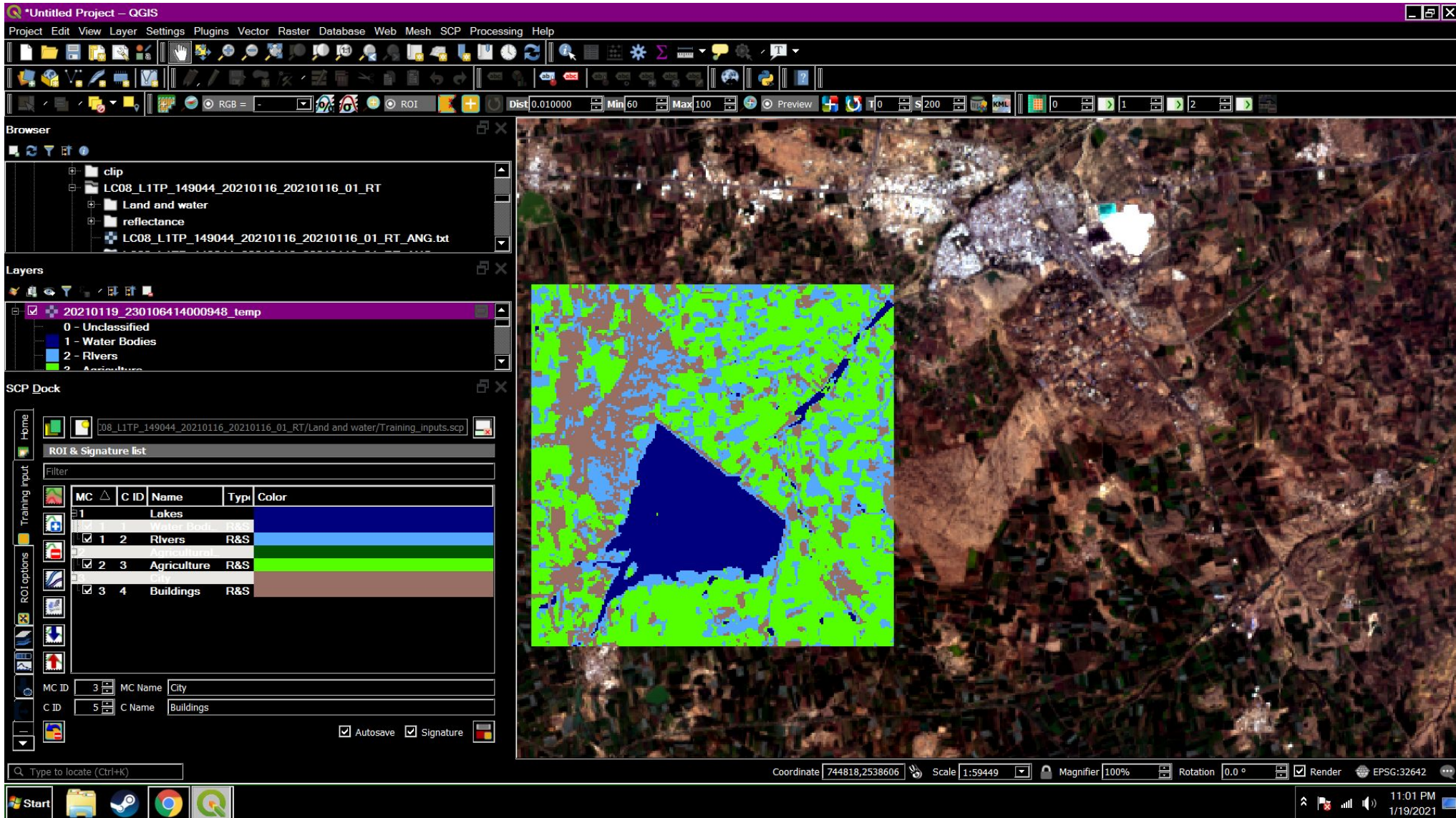## Afforestation-Deforestation

Location	Date
Near Bhopal	January 2016 and January 2021

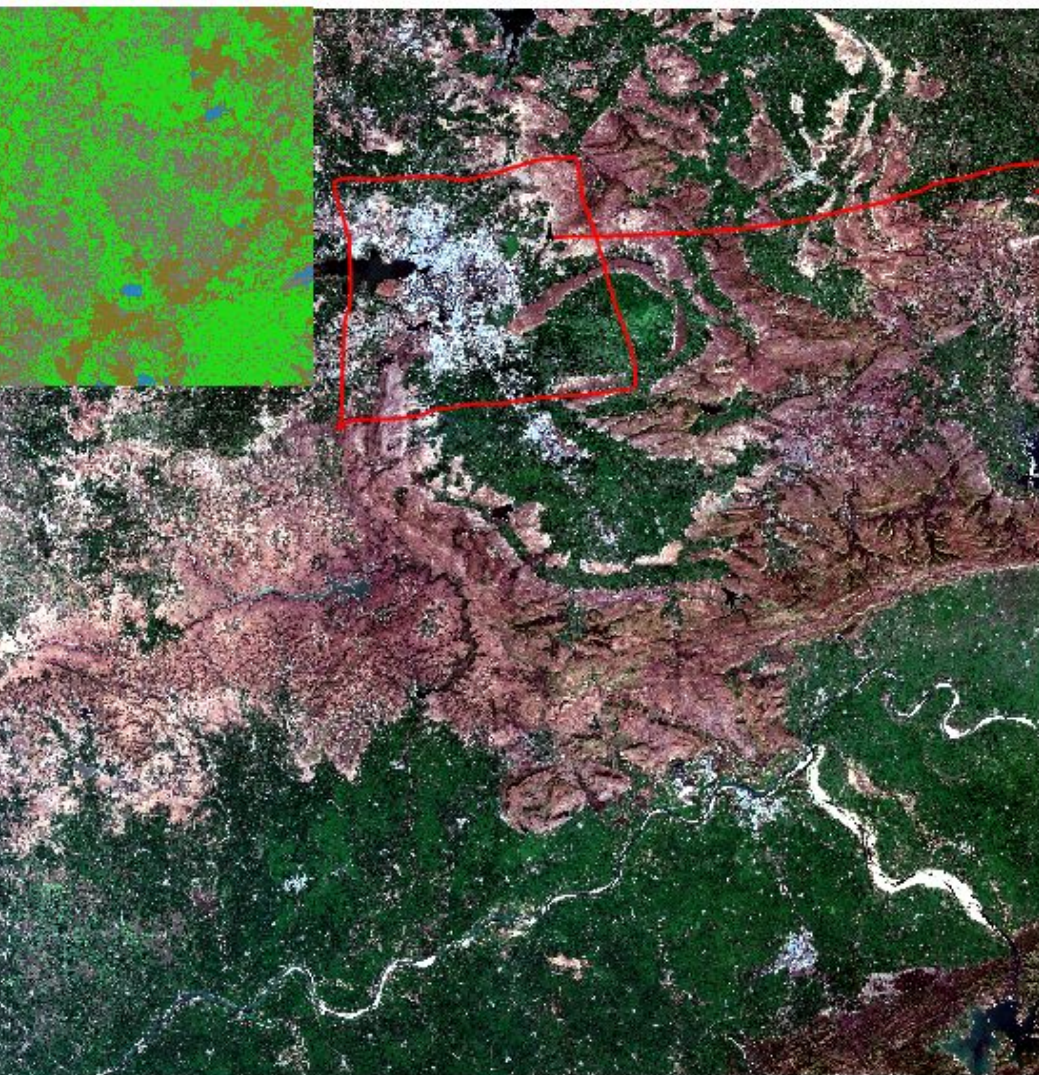# IMPLEMENTATION DETAILS

Object Classification

1. Download the data of desired location and time within the Landsat tile footprint from earthexplorer.

2. Extract and browse to the directory in qgis, import the bands in layers.

3. In Semi-automatic classification plugin or SDP, import all the layers in band set-1 and go to pre-processing. Then clip the section of tile which is to be analyzed and classified.

4. Remove the previous layers but keep only the clipped ones.

5. In SDP, Re-import the layers in band set-1 (remove previous layers), select the satellite to Landsat-8 in dropdown list [It will adjust the wavelengths accordingly].

6. Now, go to the preprocessing tab and browse to Landsat, tick correction in volumetric clouds and specify clipped layers folder and .Mtl file for the data [included in extracted landsat data].

7. Click run and remove previous layers. Keep only with [RT_] named layers.

8. In the RGB panel, specify the bands combination in order to transform the layers according to wavelengths and requirements.

9. Now, SDP panel and under training input select add, click on polygon and select the features on map like river, vegetation, buildings. [Hold ctrl for selecting more than 1 polygon]. Specify the class for each feature and click on add selected polygon to training input.

10. Now click on view classified tile and tap on map to view classified features.
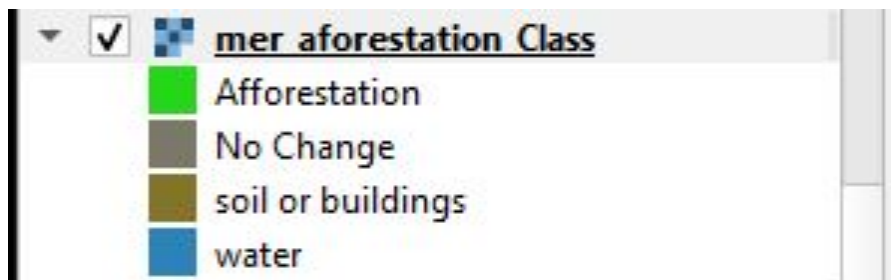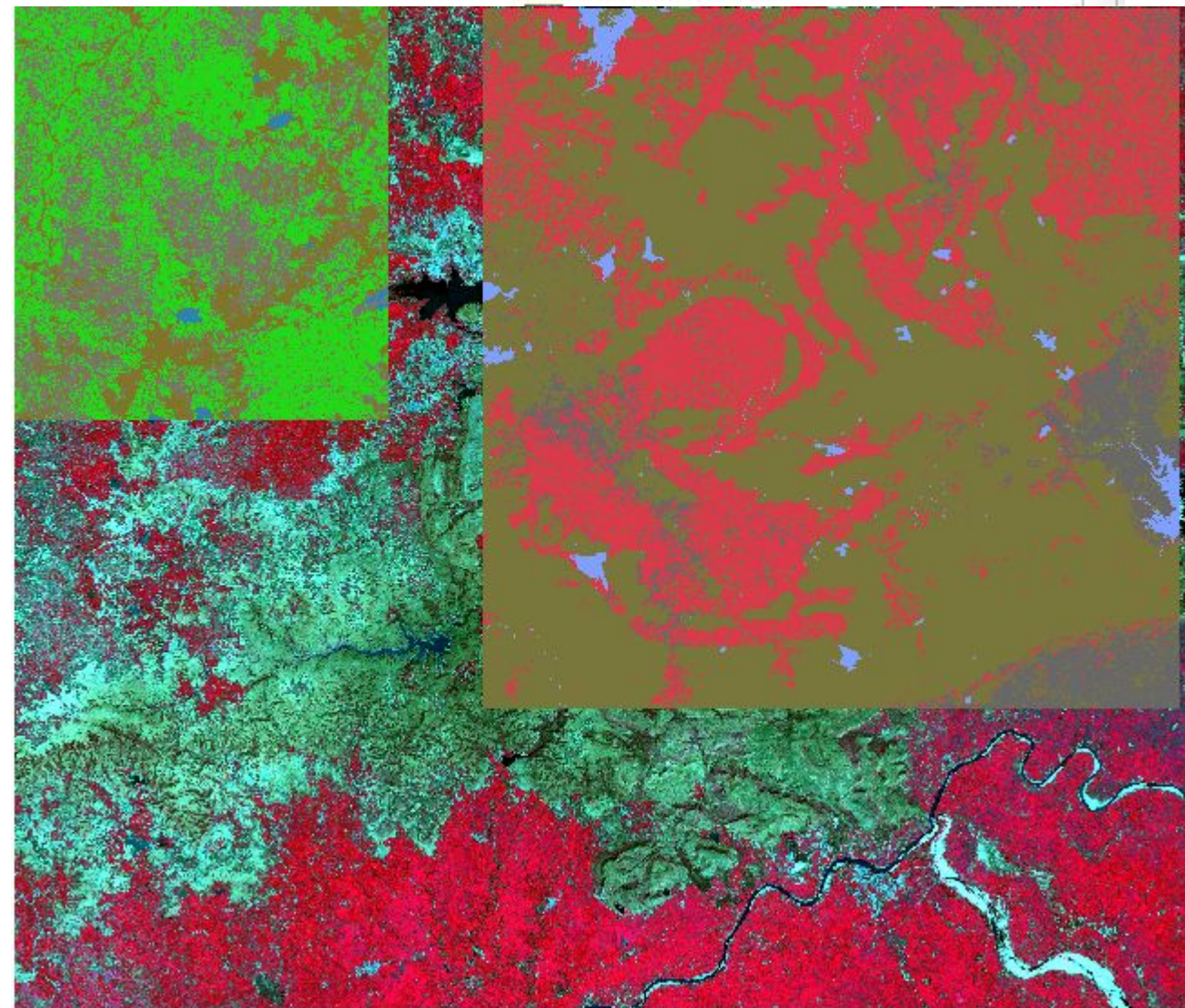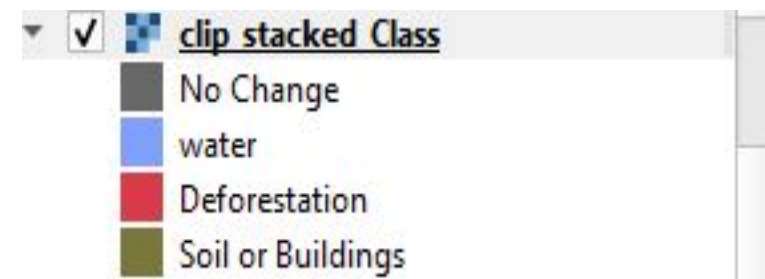
Output (scp Plugin)

Detecting Afforestation and Deforestation

1.Acquire Data

2. Import Band images in Qgis

3.Make composite layer for band combinations (8-4-3 for vegetation)

4. Clip the desired area from both the images (2016 and 2021) and merge them. To verify the result, I took NDVI difference of both year images.

5. Create a shapefile for training input

6. Load training shapefile and merged image into R for Random forest classification

7. Style the output image.

Bhopal

clip_stacked Class
- No Change
- water
- Deforestation
- Soil or Buildings

mer_aforestation Class
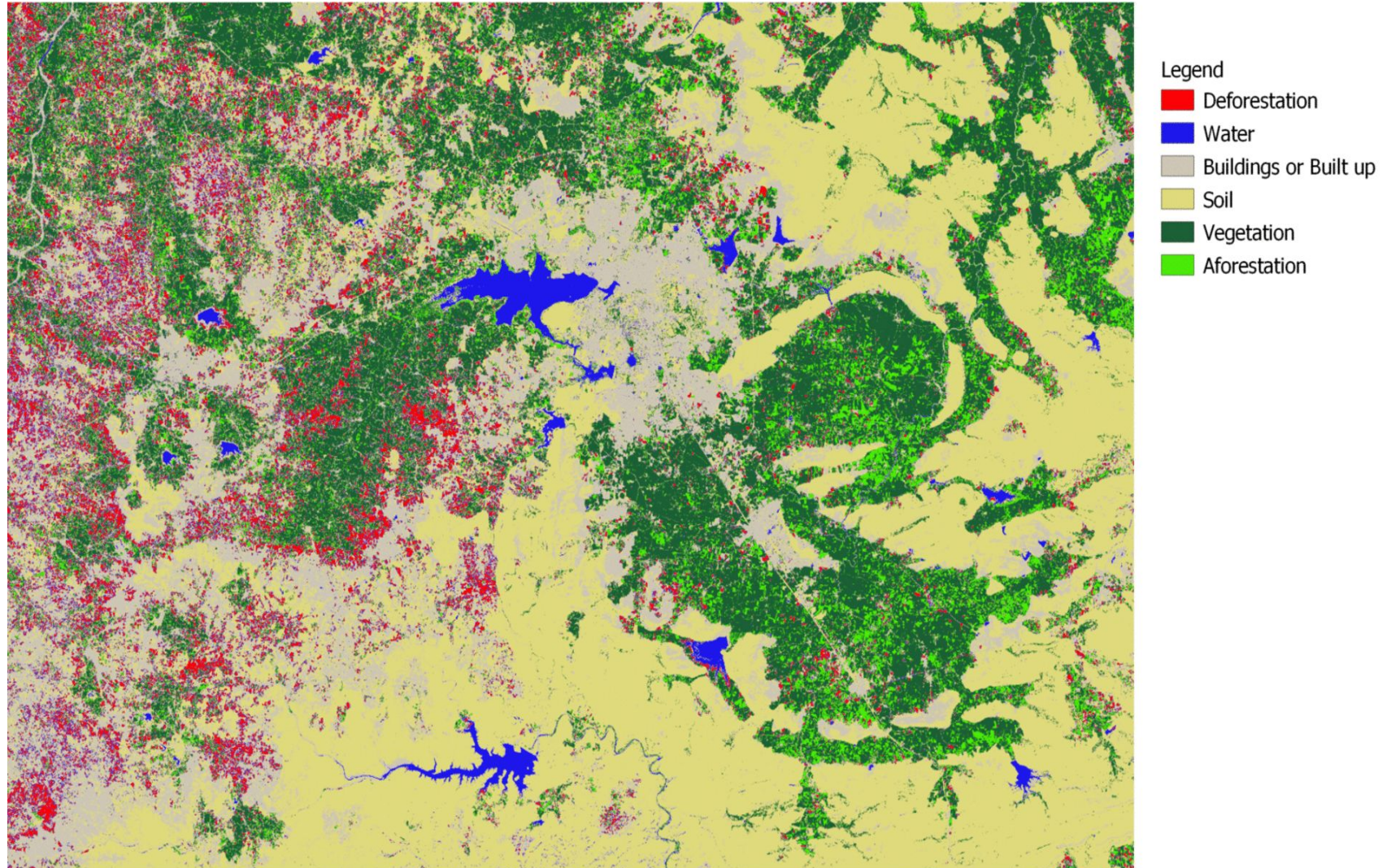- Afforestation
- No Change
- soil or buildings
- water

Change Detection

1.Acquire Data

2. Import Band images in Qgis

3.Make composite layer for band combinations (8-4-3 for vegetation)

4. Clip the desired area from all the images
(Jan-2016,Feb-2017,Feb-18,Feb-19,Feb-20 and Jan-2021) and merge them. To verify the result, I took NDVI difference of images.

5. Create a shapefile for training input

6. Load training shapefile and merged image into R for Random forest classification

7. Style the output image.

Results

Bhopal Jan,2016 - Feb,2017

Legend
- ■ Deforestation
- ■ Water
- ■ Buildings or Built up
- ■ Soil
- ■ Vegetation
- ■ Aforestation
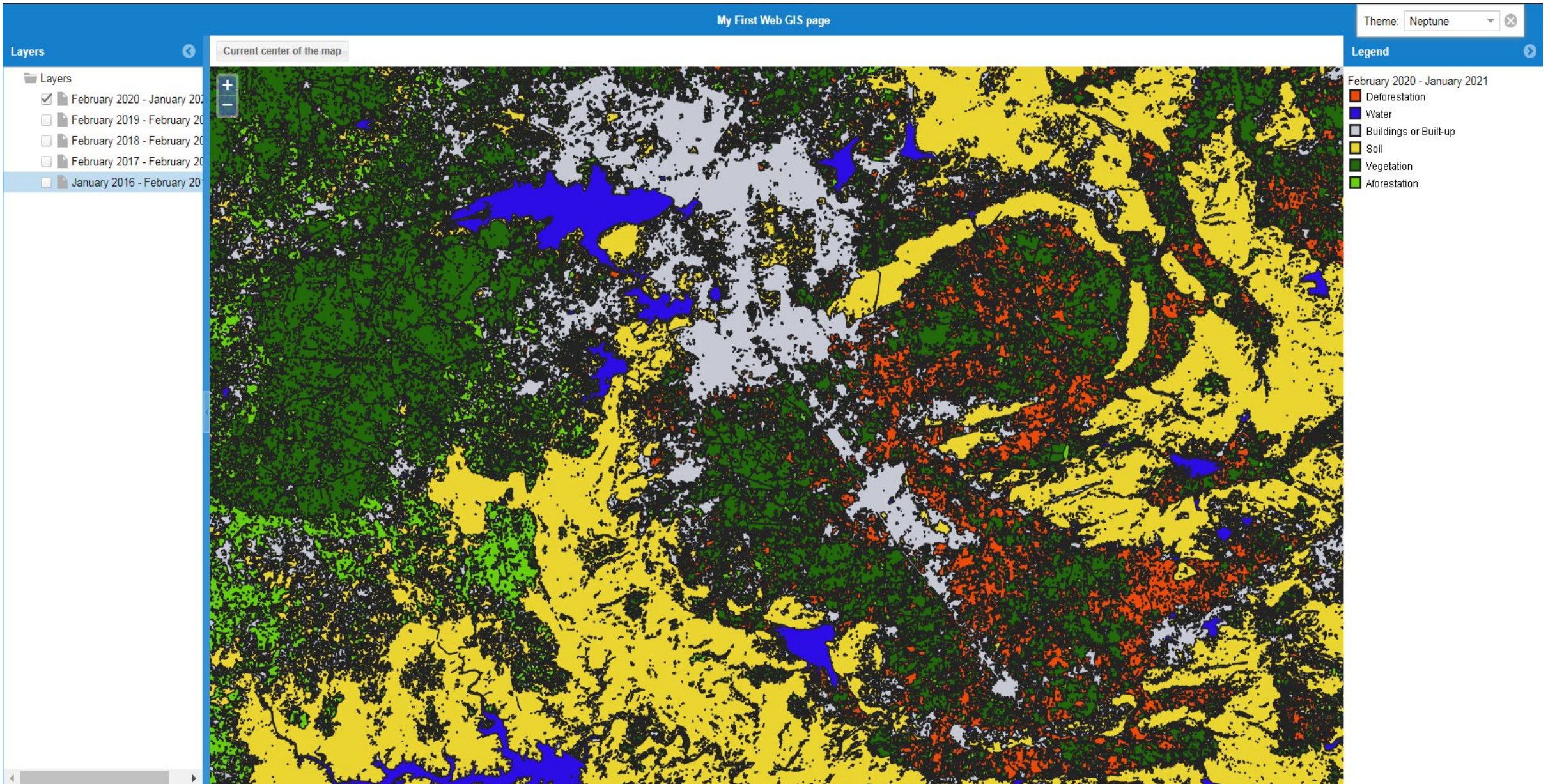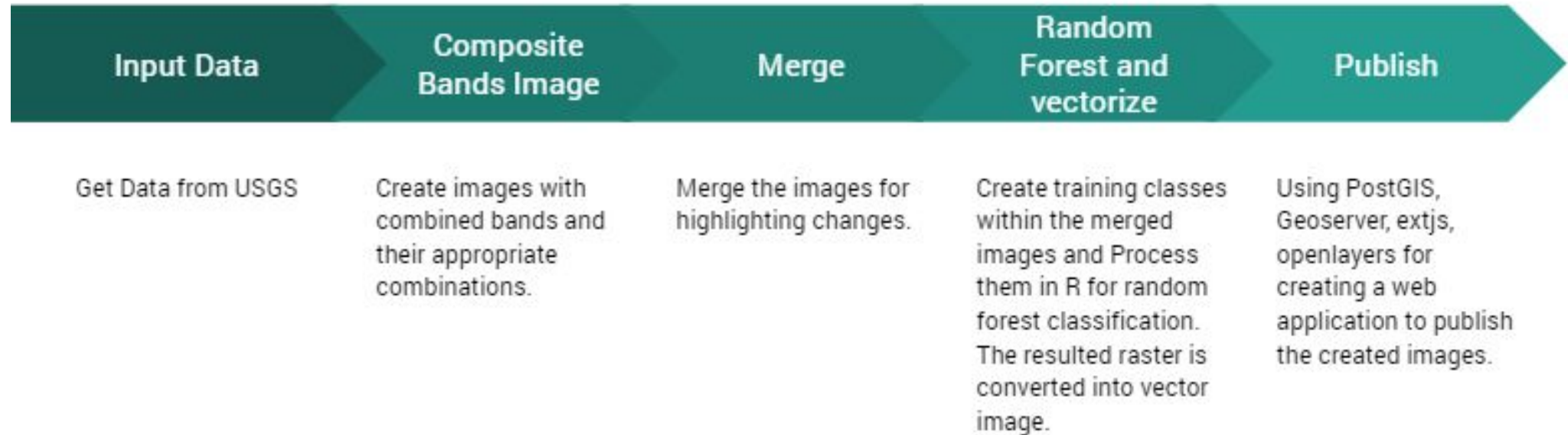
Publishing

1.) Vectorize raster images in QGIS.
2.) Publish them in geoserver.
3.) Create a web application page using extjs,openlayer,html.

Output of Web Application

Summary Process Model

Input Data	Composite Bands Image	Merge	Random Forest and vectorize	Publish
Get Data from USGS	Create images with combined bands and their appropriate combinations.	Merge the images for highlighting changes.	Create training classes within the merged images and Process them in R for random forest classification. The resulted raster is converted into vector image.	Using PostGIS, Geoserver, extjs, openlayers for creating a web application to publish the created images.

CONCLUSION

Afforestation is essential and a must for all humans to take that in serious consideration. The Visualization reflects that urbanization is leading to loss of forests. Policies for development can be drafted on comparing the forested and deforested extent.

FUTURE WORK

Exploring remote sensing domain further and expanding our knowledge on the same, we will be looking into exploring machine learning with remote sensing whilst performing geo spatial tasks on various areas using geo pandas and visualize the same using folium library and python code. Further we will work on qgis to implement a tasks such as mangroves mapping, and vegetation quantification, etc.