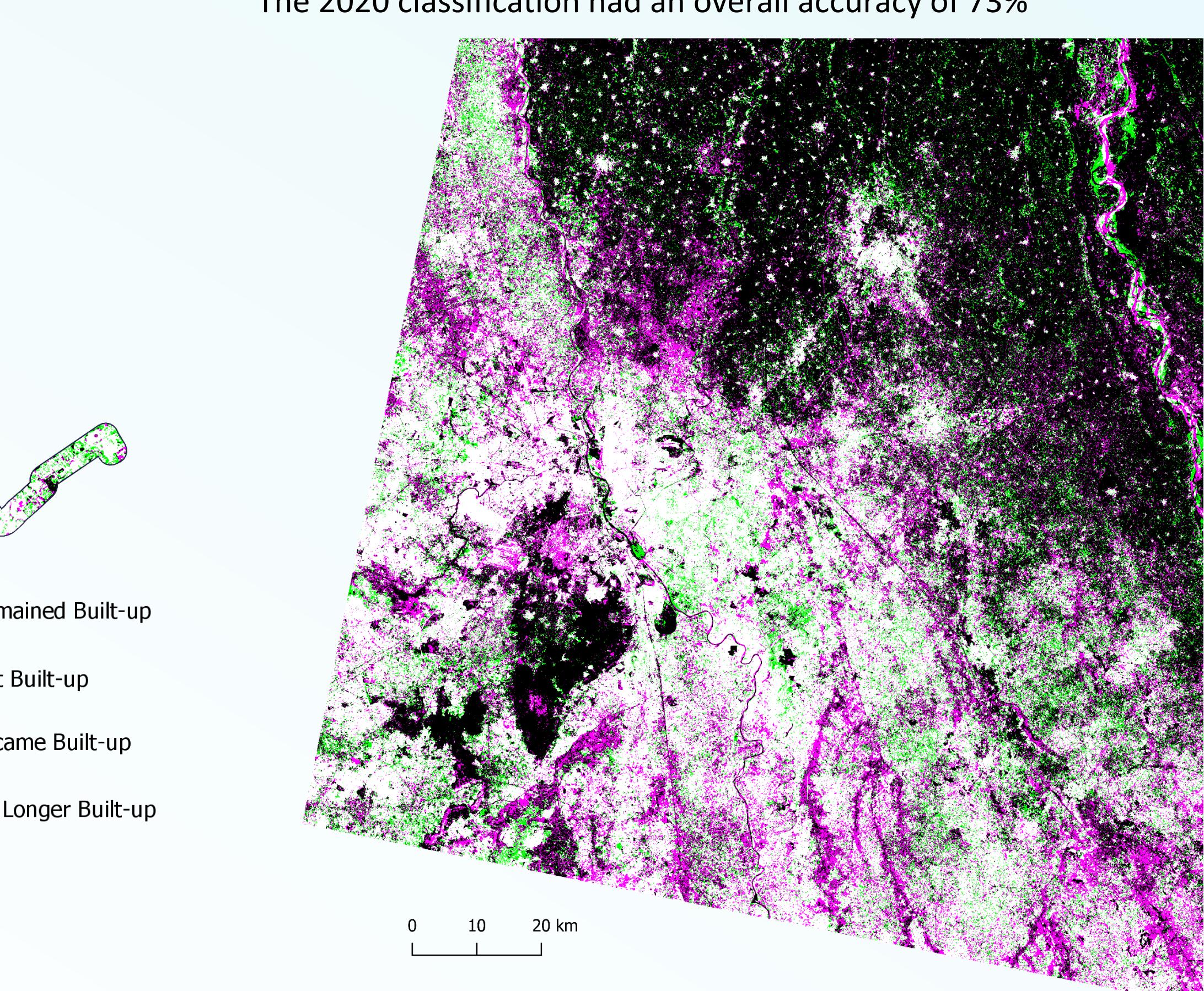
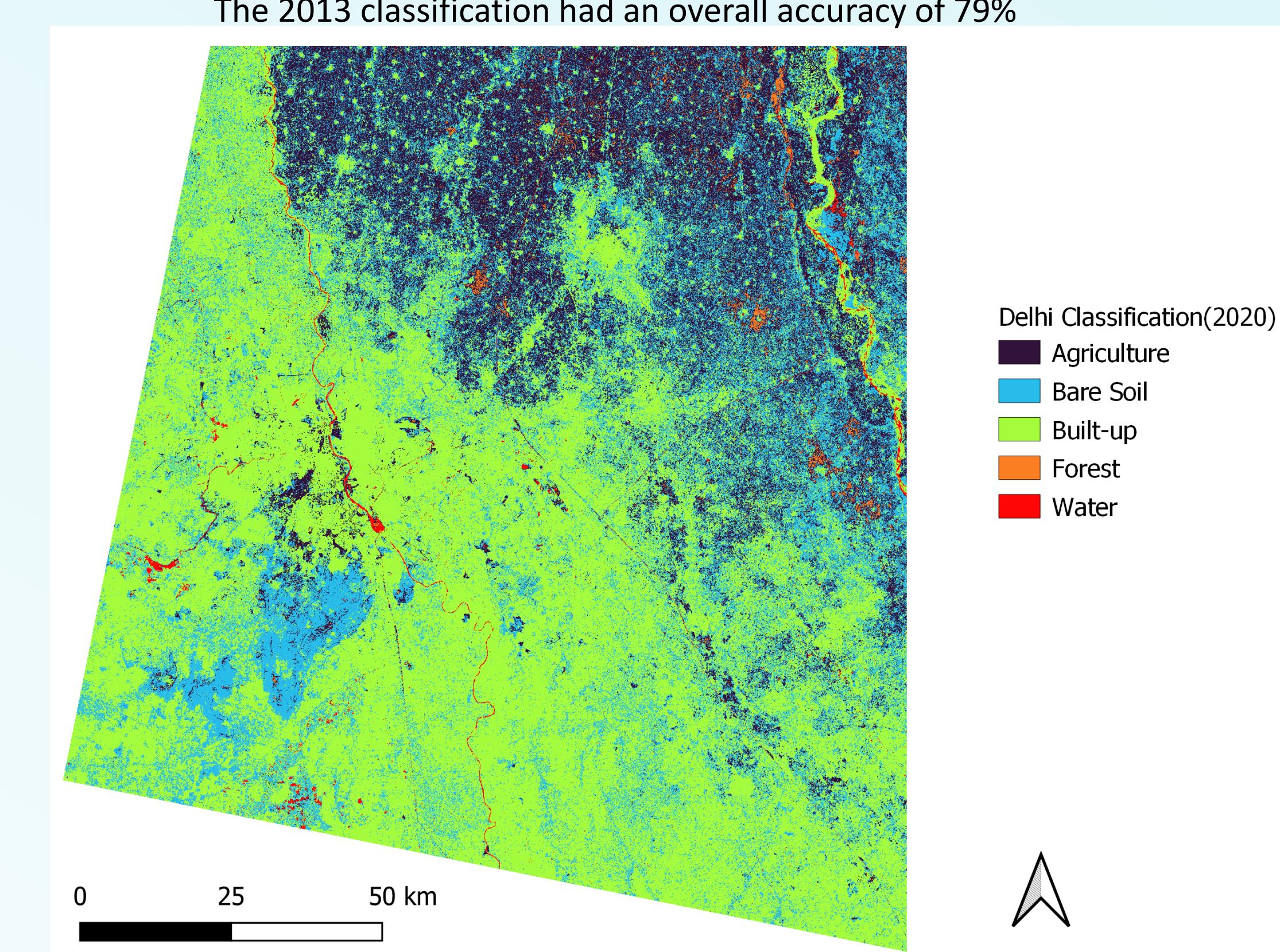
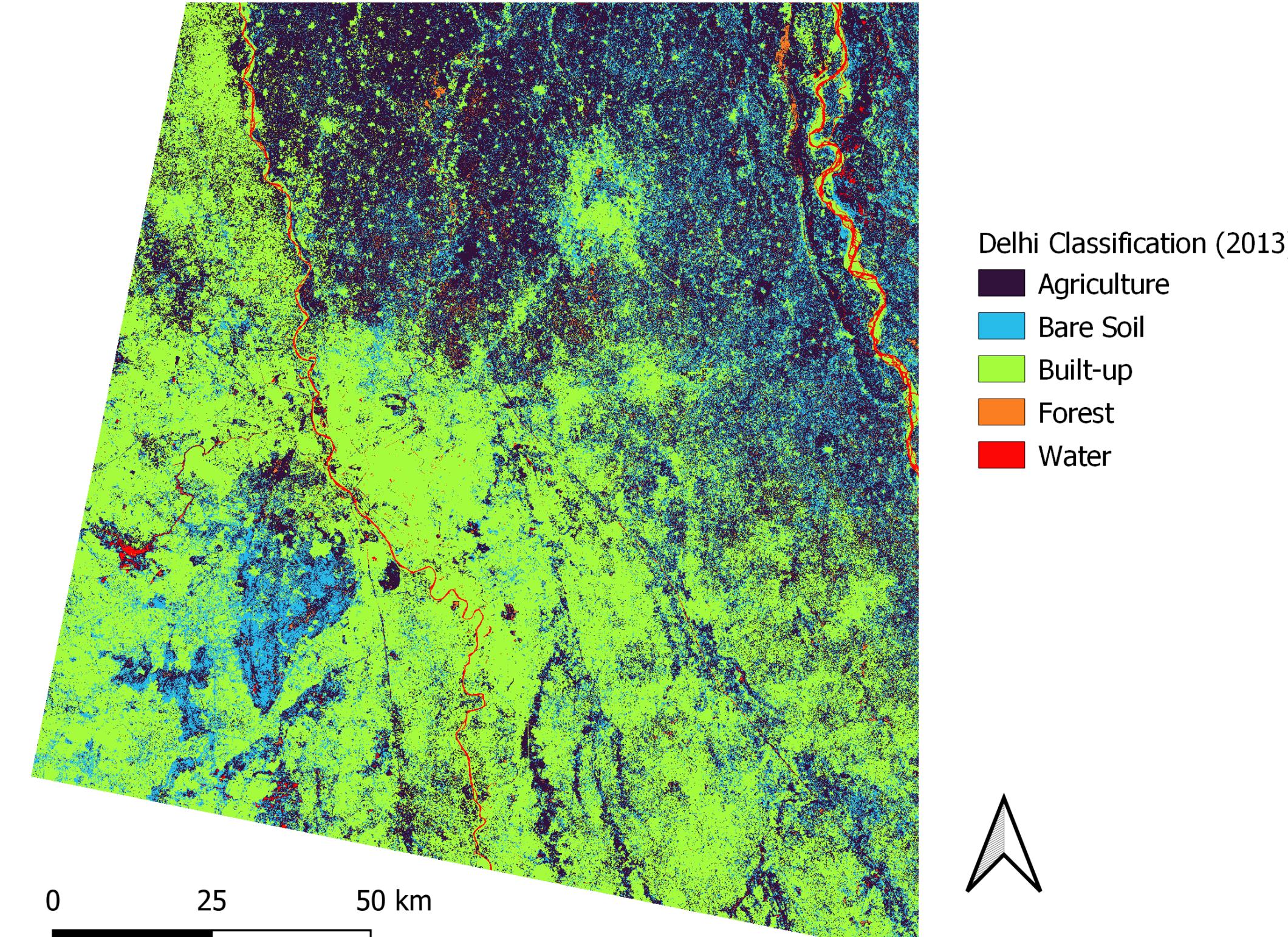
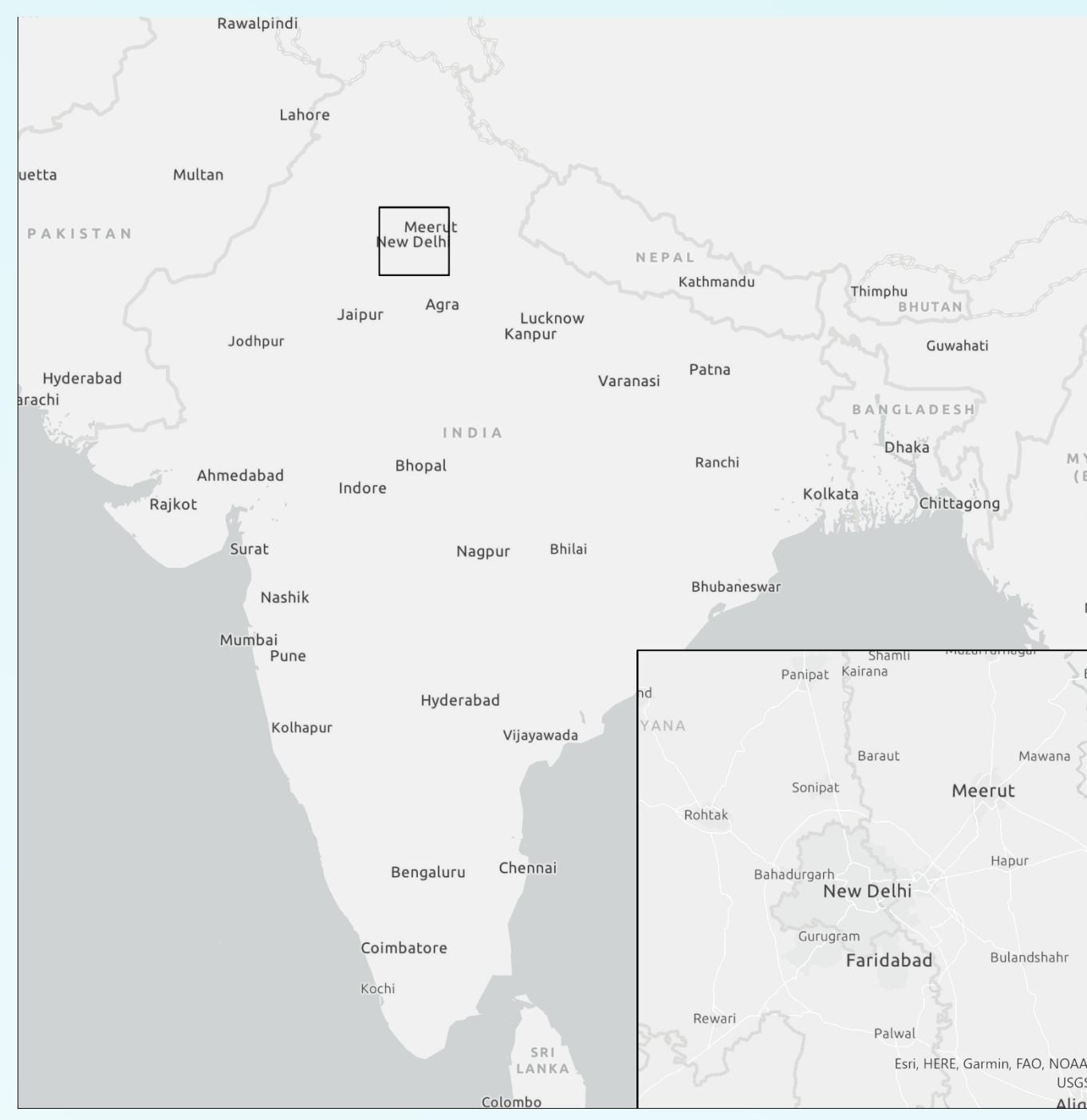


Delhi Land Cover Change

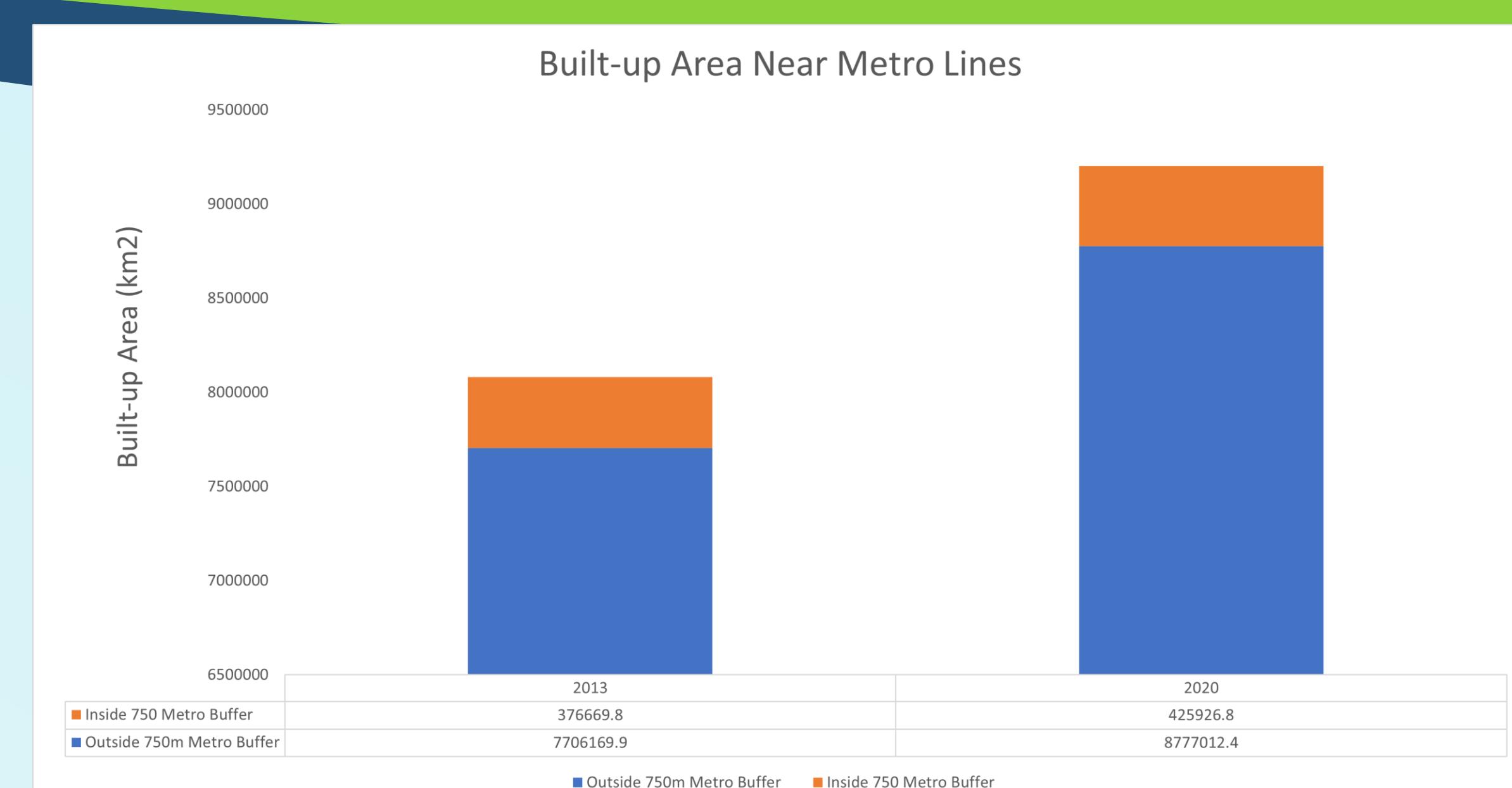
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Introduction

Delhi, India has been experiencing drastic land cover change over the years and is projected to surpass Tokyo to become the world's most populous city by 2028¹. We are interested in the percentage of vegetation being converted to man-made structures and the impacts those changes have on the surrounding environment. With such intense growth, there are also a lot of economic impacts. We want to see how the changes in land cover correlate with the growth of the regional economy. Understanding the impacts the effects of land cover change has on the environment and the economy is fundamental in creating and implementing new policies regarding city growth. Previous research on the growth of built-up areas in the city has shown that growth is mostly centered around the peripherals of the city rather than along the metro lines². This project seeks to evaluate the current growth trends of the city and see if they have changed their development patterns. Remote sensing imagery will be invaluable in detecting land cover change over such a large and dynamic region. It is our hope that the results of this project will aid in making important decisions for sustainable growth in Delhi and other developing cities.



Results



	2013	2020
Per Capita GSDP (₹)	225117	414711
Built-up area (km²)	8082839.7	9202939.2

- 13.9% increase in built-up land cover in the study region
- 13.1% increase in built-up land cover within the 750-meter metro buffer
- 47.6% decrease in agricultural land cover in the study region
- 84.2% increase in Per Capita Gross State Domestic Product for the Delhi National Capital Territory from 2013-2020

Conclusion

- Classification was somewhat inaccurate for water in some parts of the image due to variation in sediment and reflectance for the rivers
- The correlation between economic growth and land cover change was trending in the same direction but the proportions were different
 - This was due to the way the economy was heading. The city seems to be becoming a more service-based economy which does not require as much land cover as agriculture.
 - Rate of growth of built-up area near the metro lines was similar to the overall growth in the study region
 - The city of Delhi seems to be putting more emphasis on growth near the metro line than they did in the past.
 - A future analysis could use higher resolution imagery to distinguish different types of urban land cover
 - Classification could likely be improved by using a different classification method or higher quality training data/polygons

References

1. 2018 revision of World Urbanization Prospects | Multimedia Library - United Nations Department of Economic and Social Affairs (2018) United Nations. Available at: <https://www.un.org/development/desa/publications/2018-revision-of-world-urbanization-prospects.html> [Accessed May 26, 2022].
2. S. Ahmad, R. Avtar, M. Sethi, A. Surjan, Delhi's land cover change in post transit era. Cities 50, 111–118 (2016).

Materials & Methodology

DATA

Landsat 8 OLI imagery for 2013, 2016, 2020 (Landsat 8 OLI) (path: 146 row: 40 on USGS)

METHODS

- Created a study site polygon in QGIS to focus our study region on Delhi and the surrounding area
- Used R to validate the coordinate reference system of our imagery, crop and mask the image to the study site, reclassify erroneous pixel values, rescale the reflectance values
- Exported Delhi Metro shapefile using OpenStreetMap Overpass API
- Created 750-meter buffer around the metro lines
- Created shapefiles to help discriminate the different land covers (i.e., Forest, crops, water, bare soil, and built up)
- Trained a decision tree classifier to create classifications for each year
- Created a confusion matrix to test the accuracy of the classification using validation points in the study area.
- Evaluated changes in built-up land cover close to the Delhi metro system
- Compared change of built-up land cover to changes in per capita GDP during that time