

Appendix

Inhoud

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1 Datasets

1.1 Photographs

The aerial photographs are World War II images taken by the Americans. They are combined into panoramas and artificial bands are created.

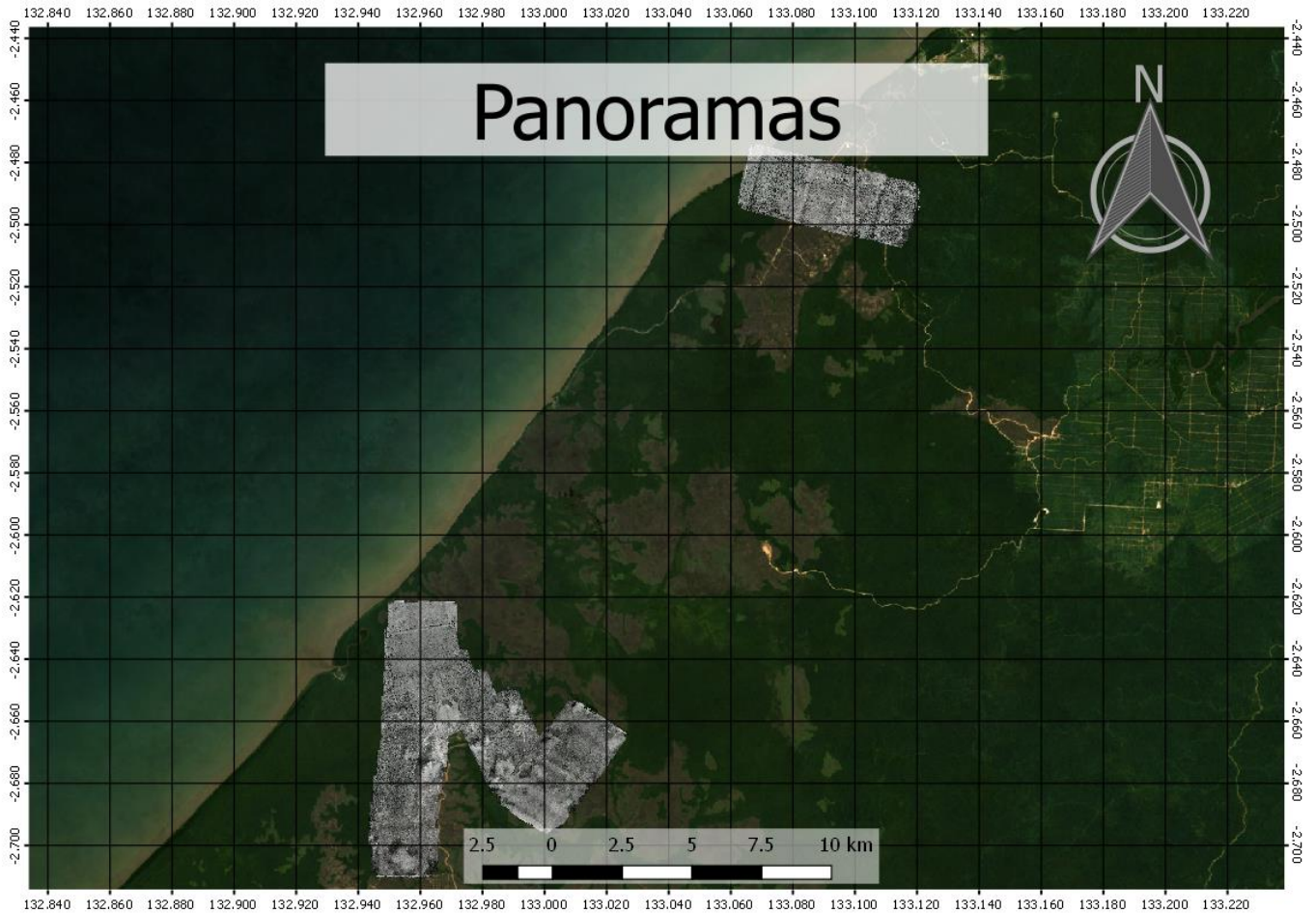


Figure 1 Panorama locations in the field

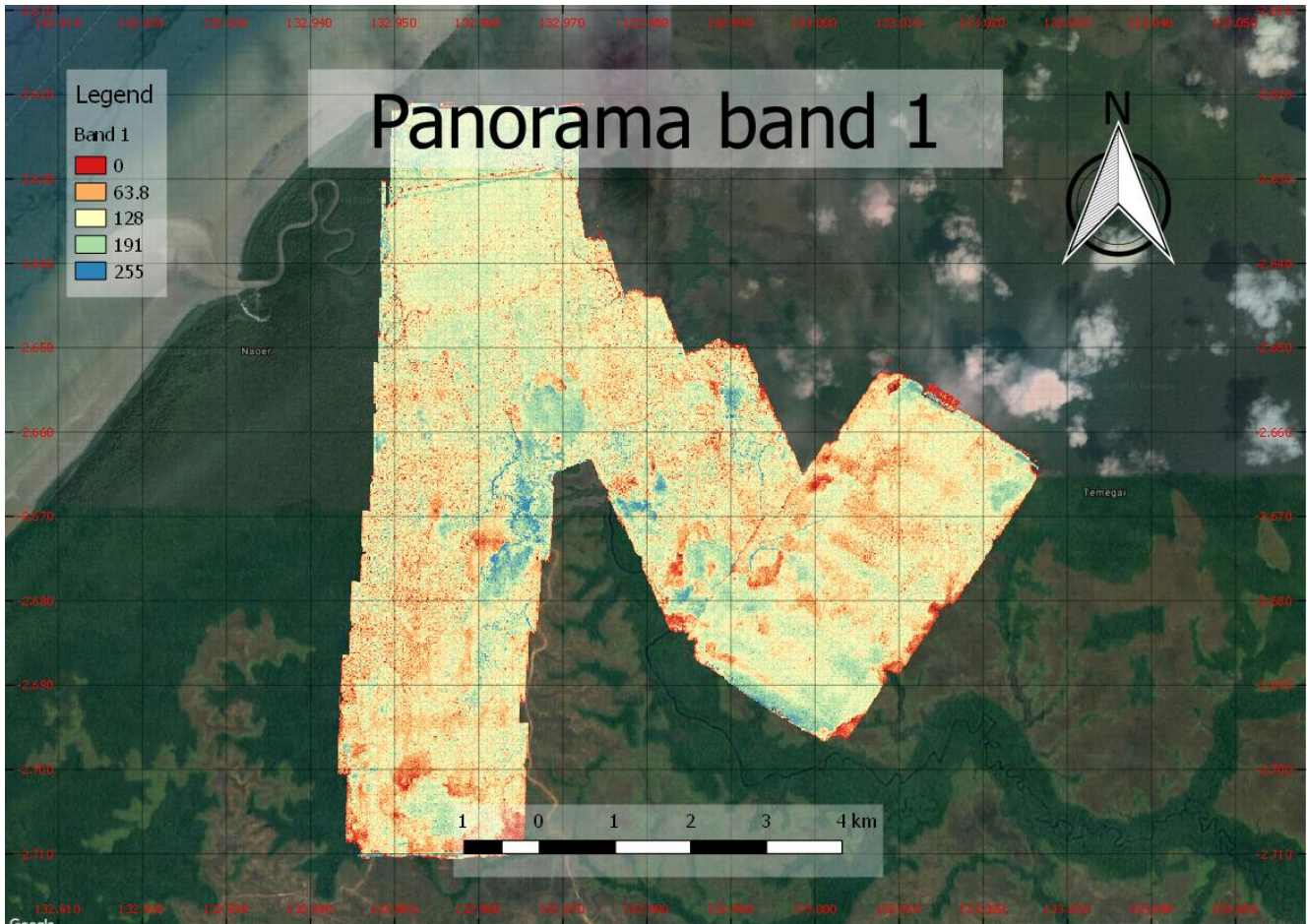


Figure 2 Original intensity data from photographs

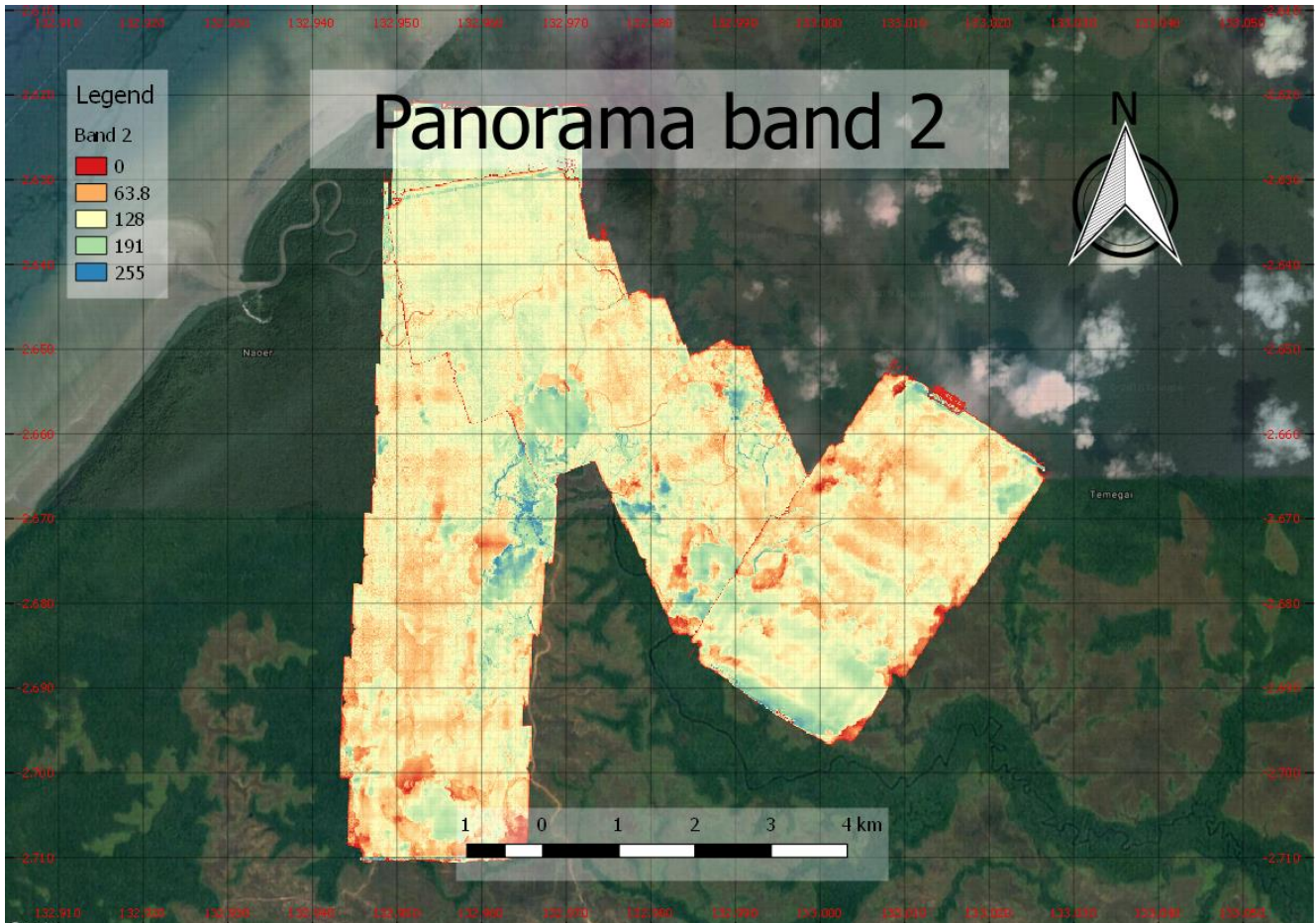


Figure 3 Mean of intensity values

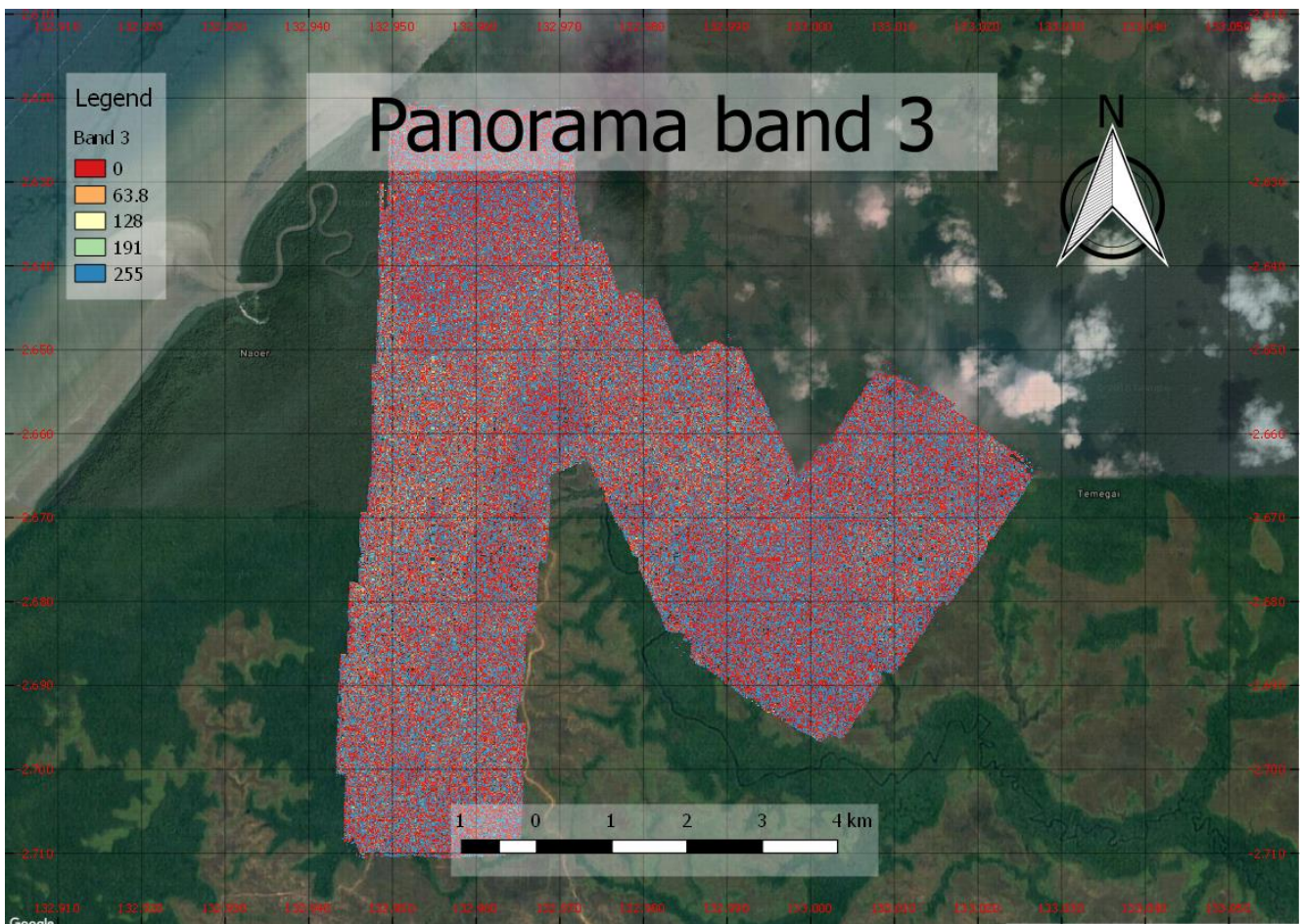


Figure 4 X gradient

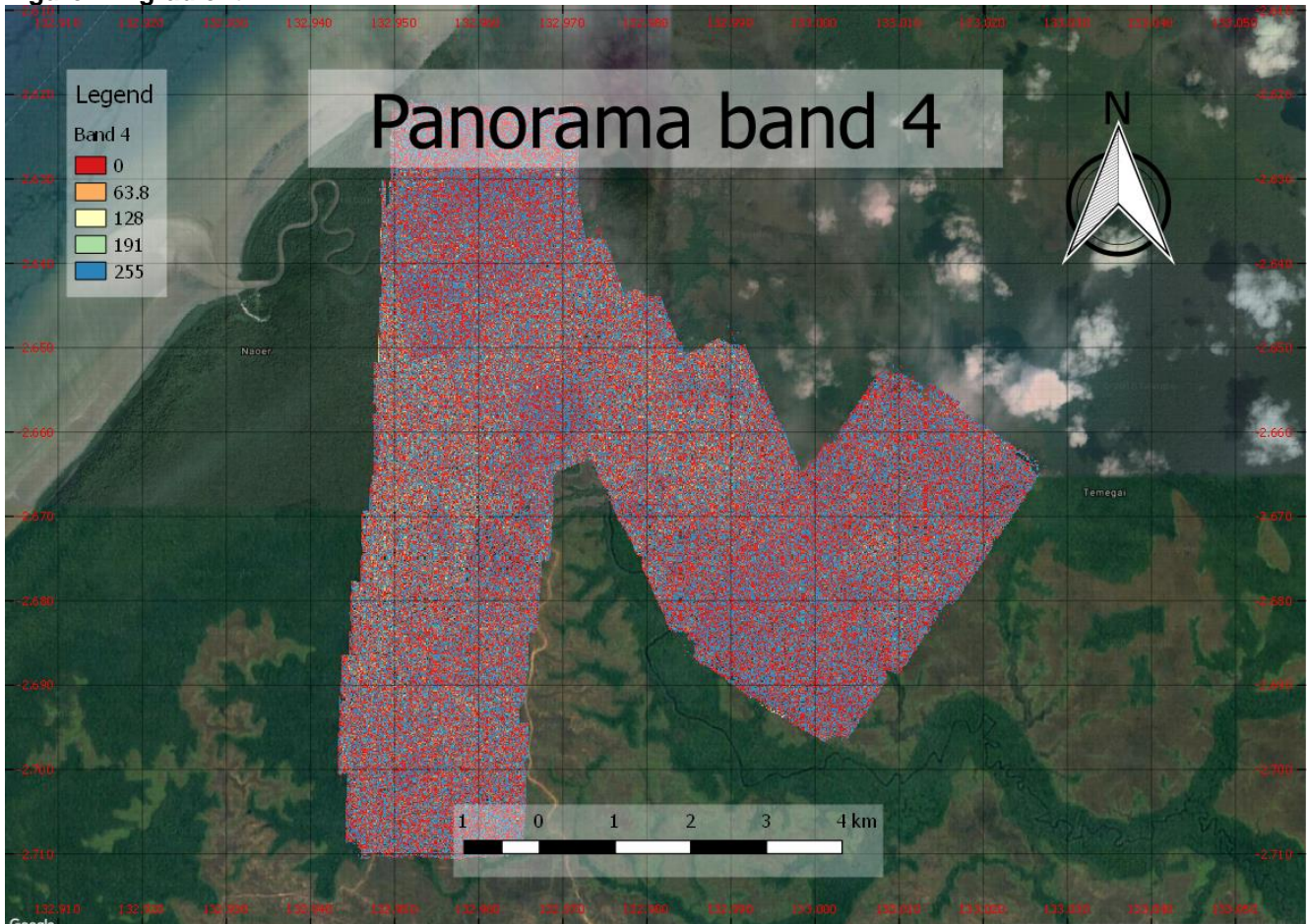


Figure 5 Y gradient

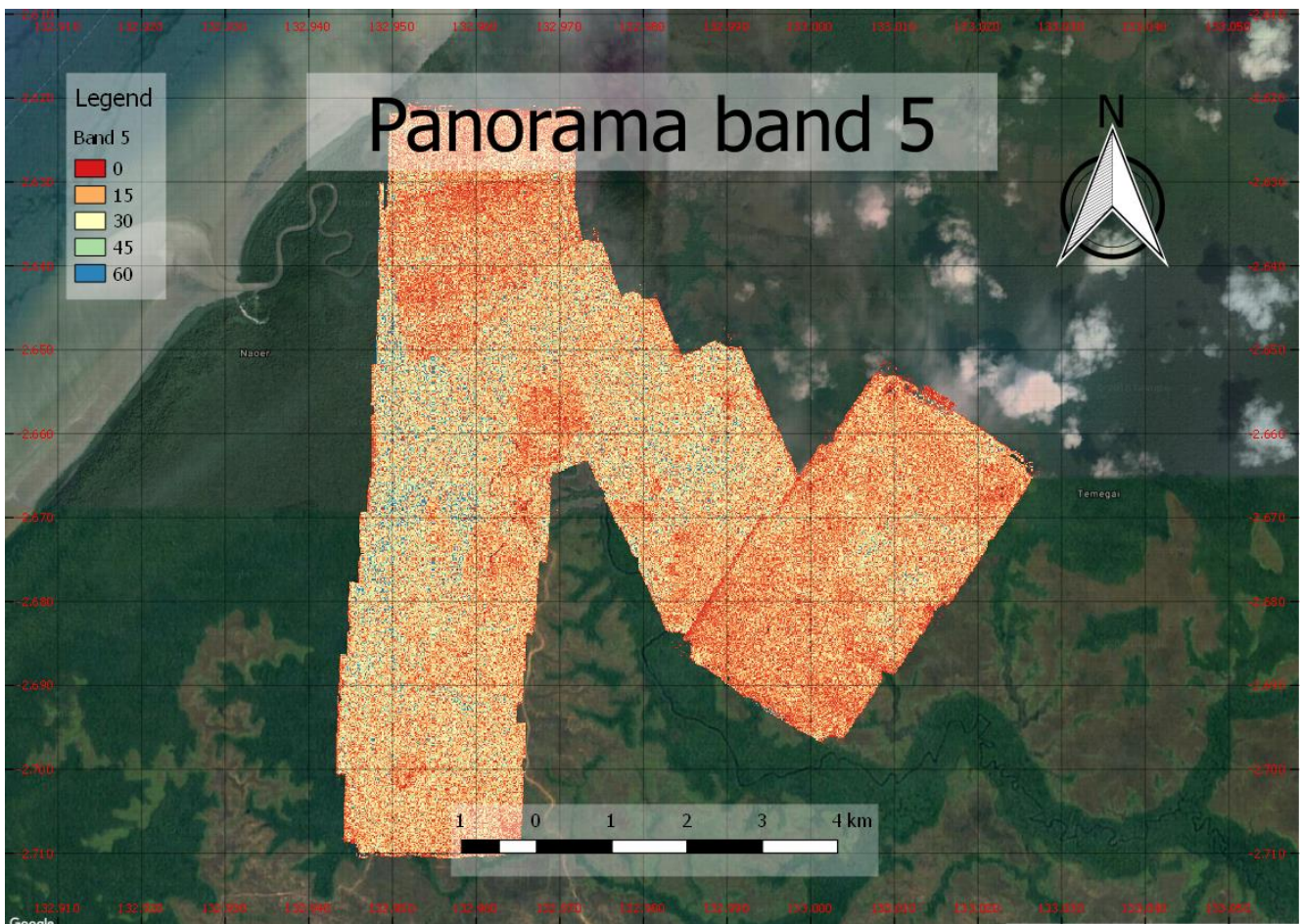


Figure 6 Total gradient

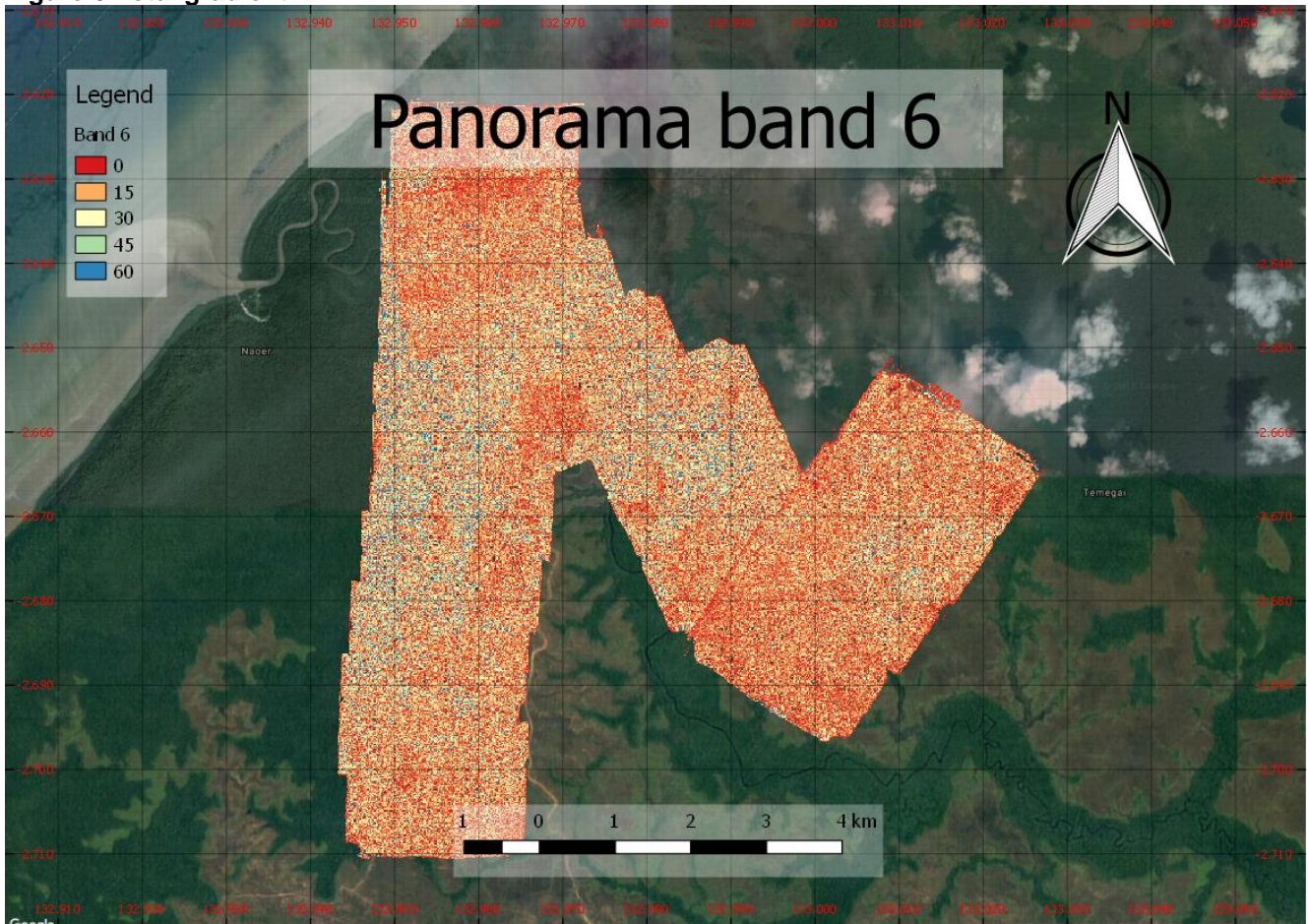


Figure 7 Difference compared to surrounding

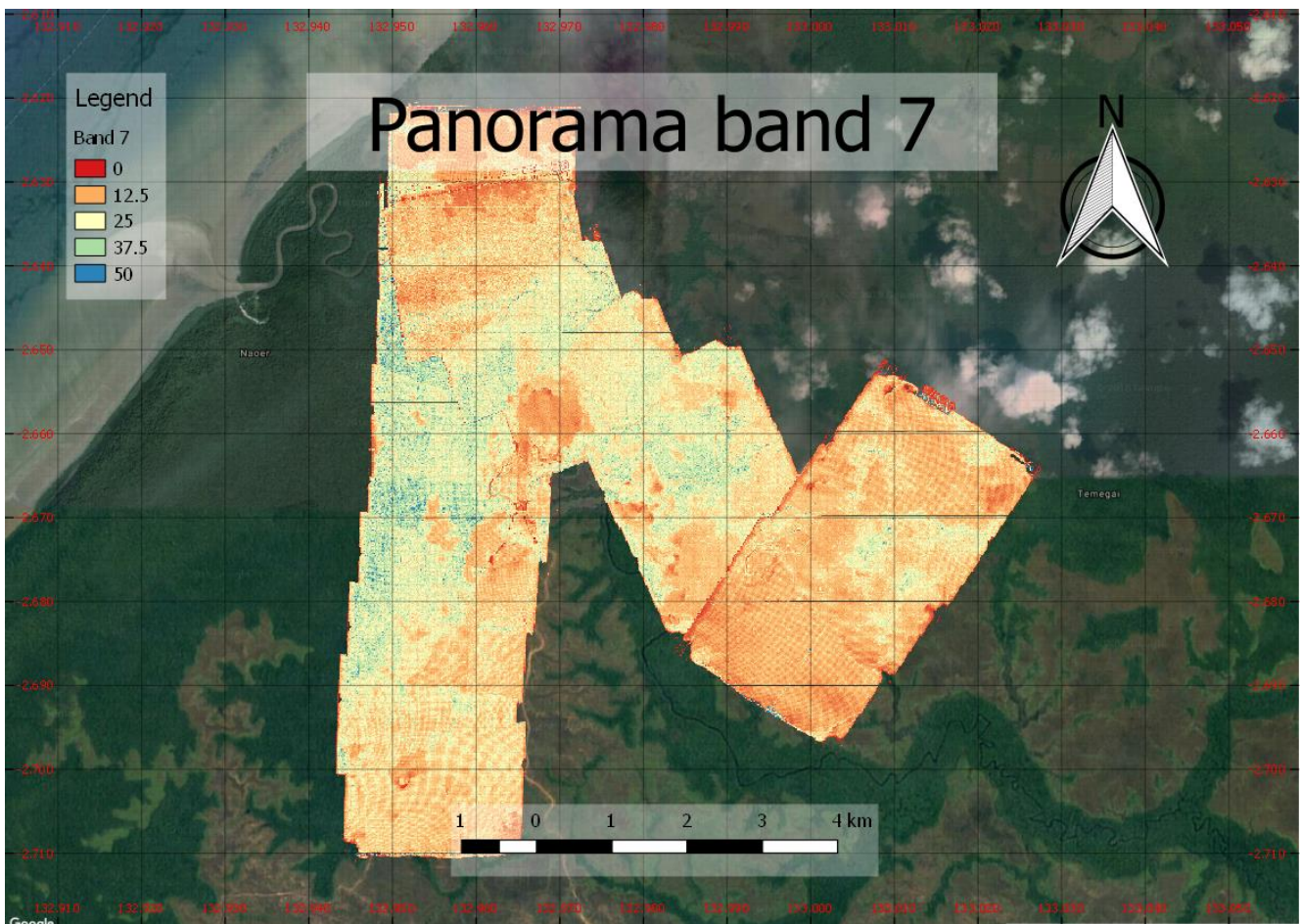


Figure 8 Standard deviation in X direction

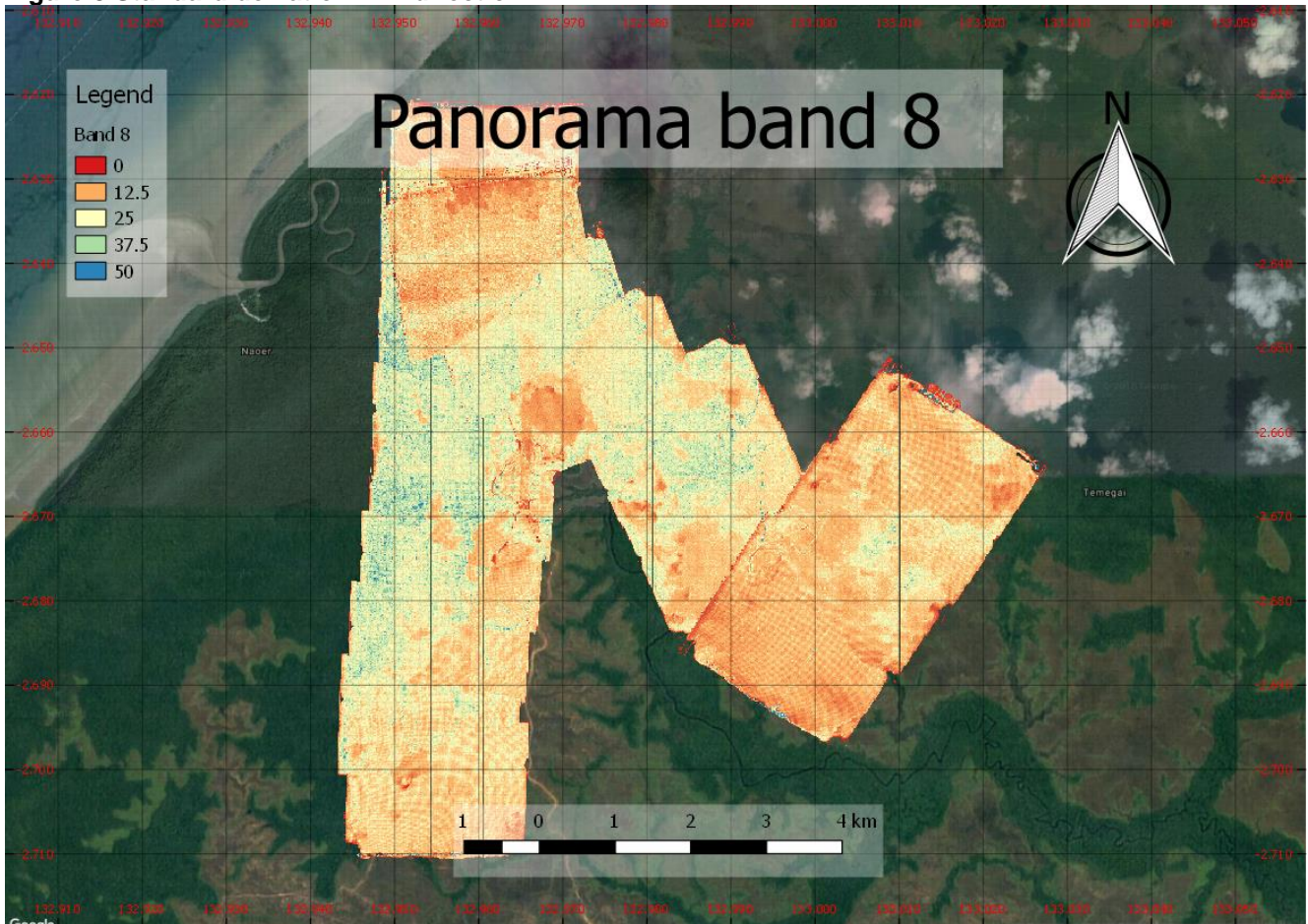


Figure 9 Standard deviation in Y direction

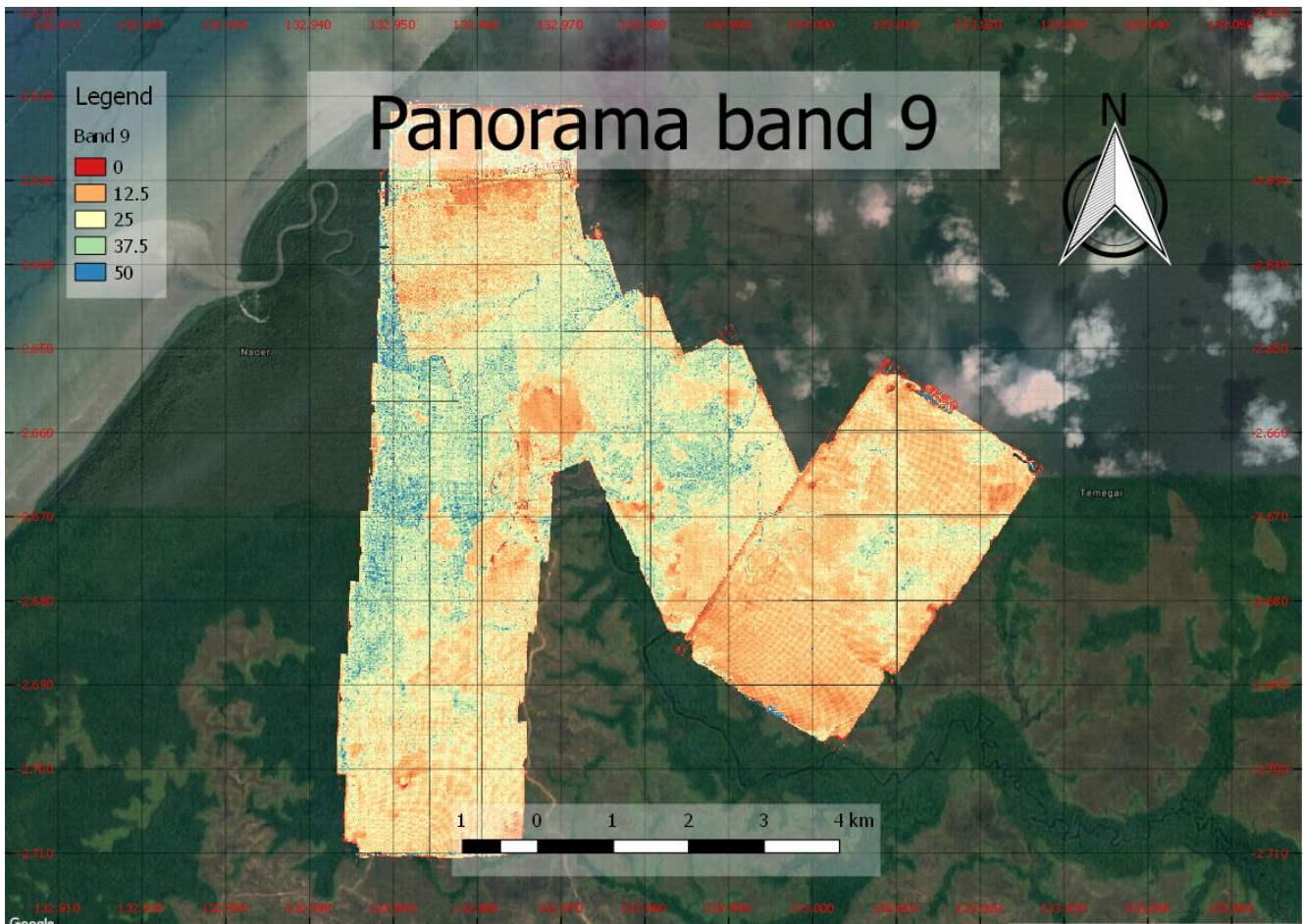


Figure 10 Total standard deviation

1.2 Landsat 8 bands

Landsat 8 is a multispectral satellite image. The 9 available bands are shown below.

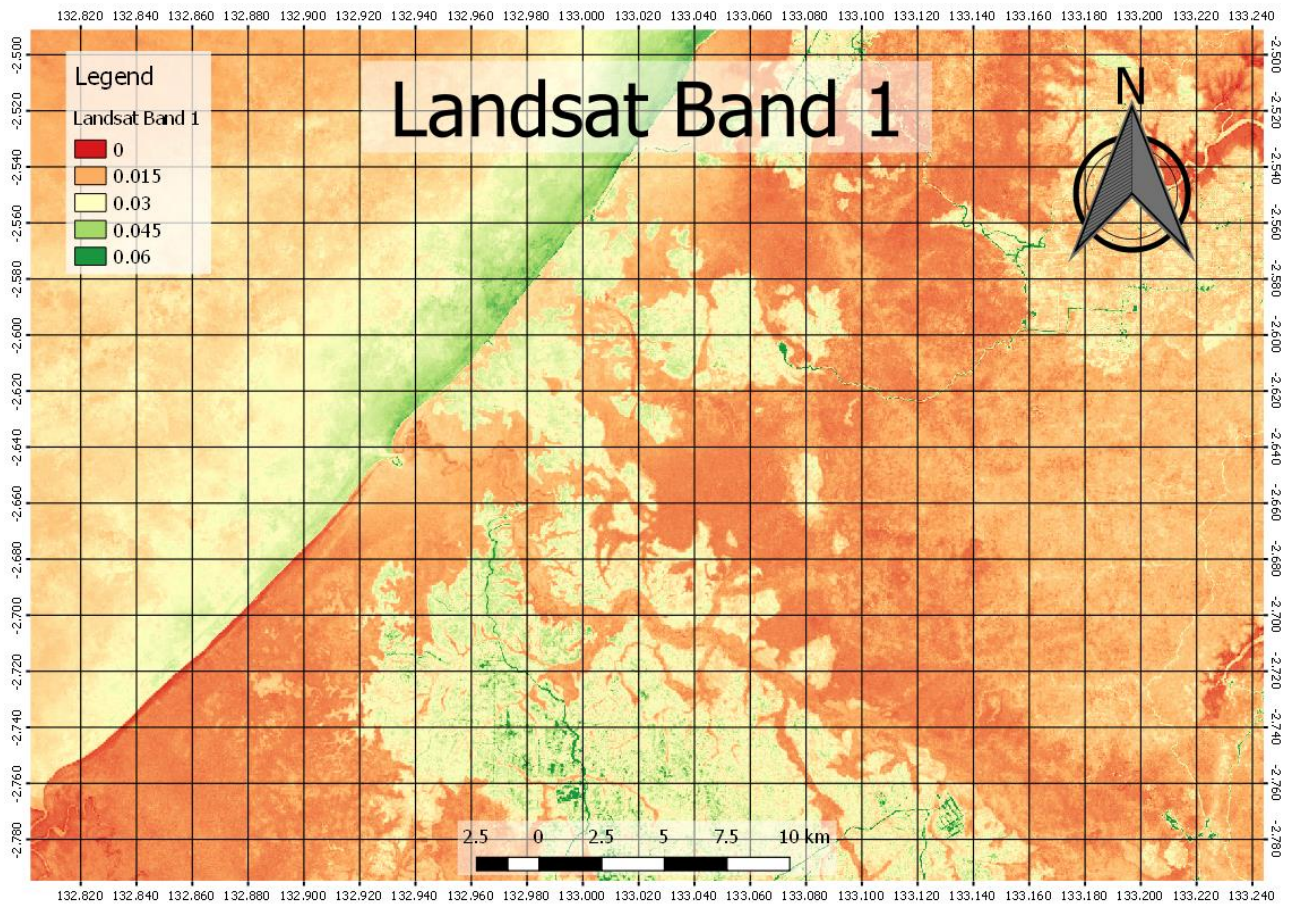


Figure 11 Landsat 8 Band 1: Ultra-Blue

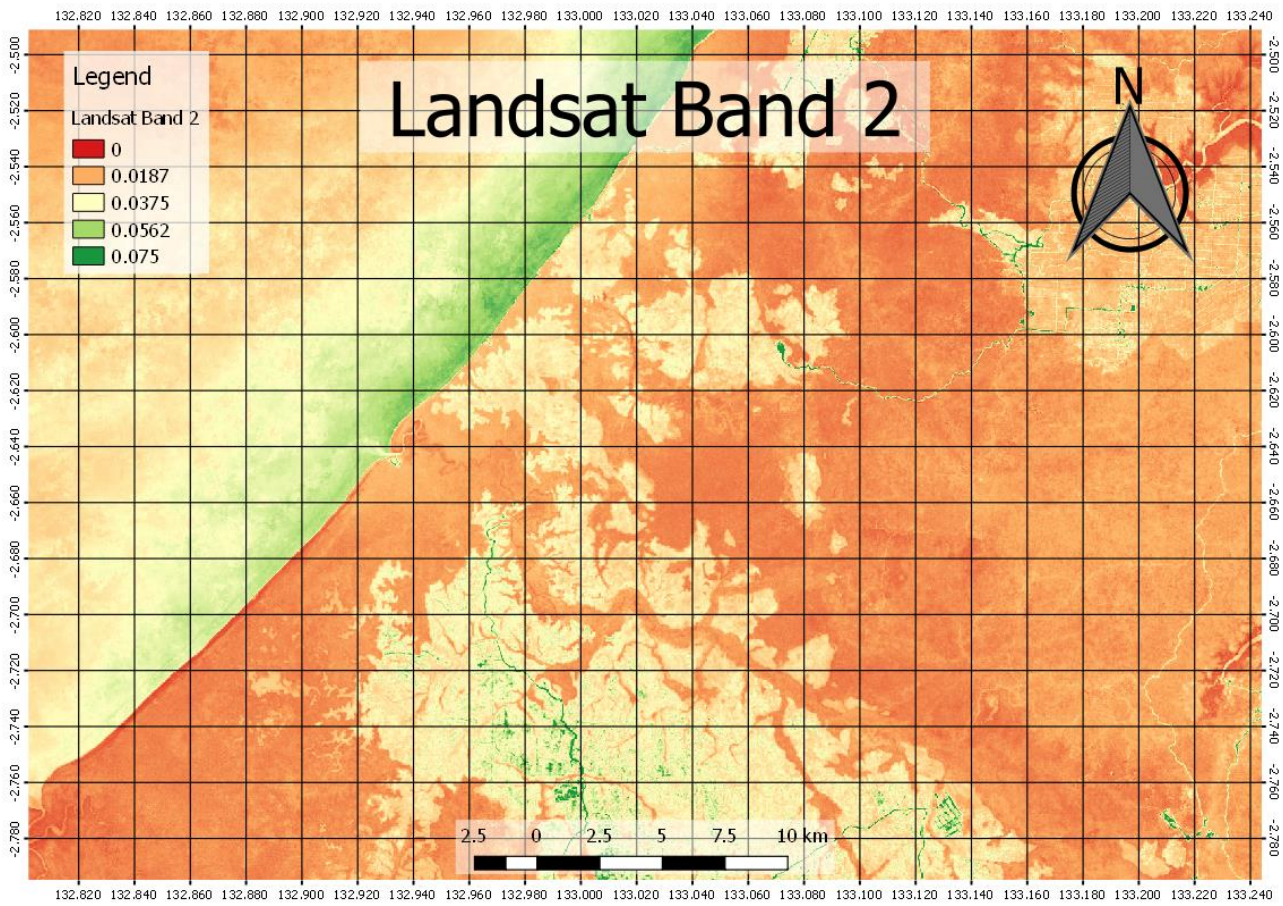


Figure 12 Landsat 8 Band 2: Blue

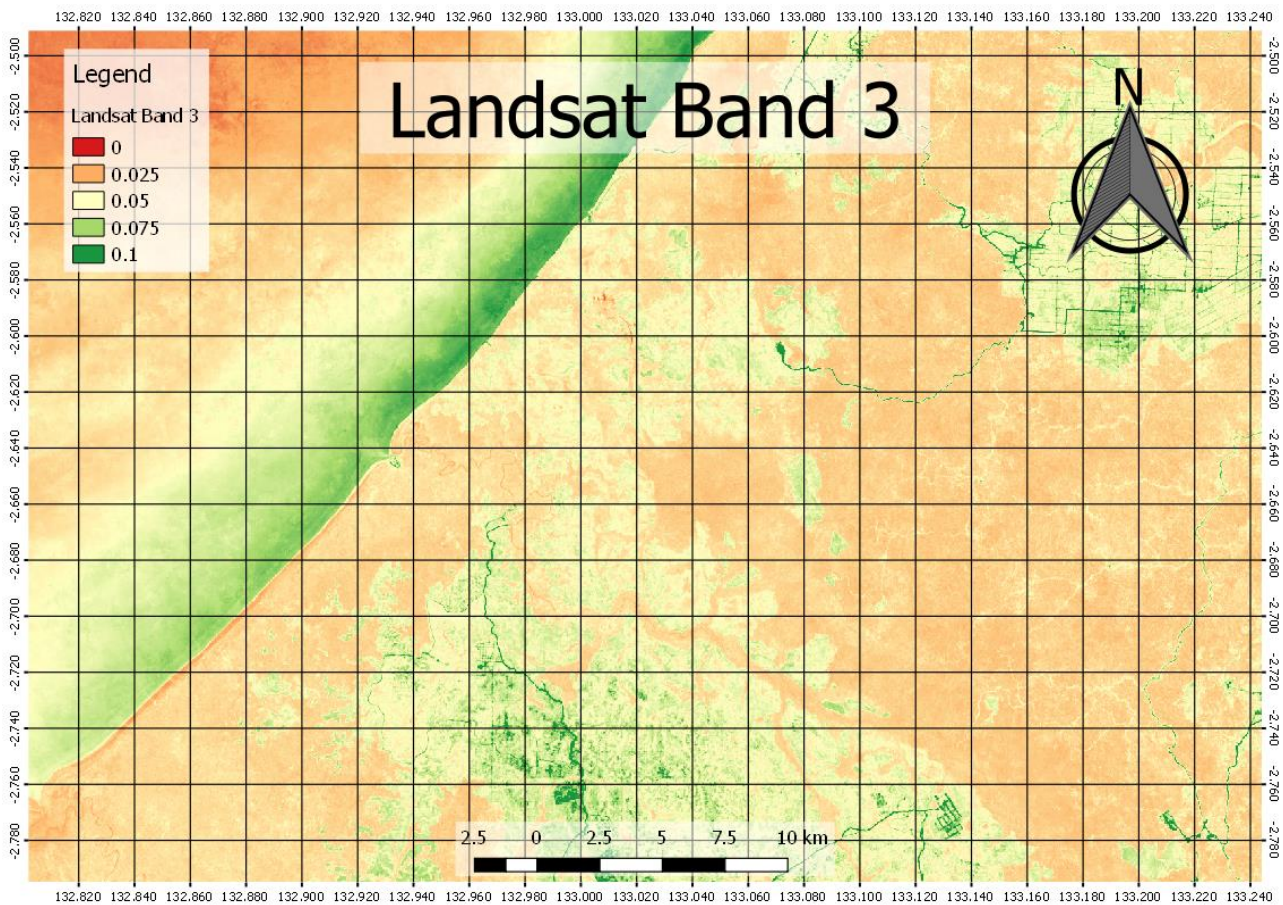


Figure 13 Landsat 8 Band 3: Green

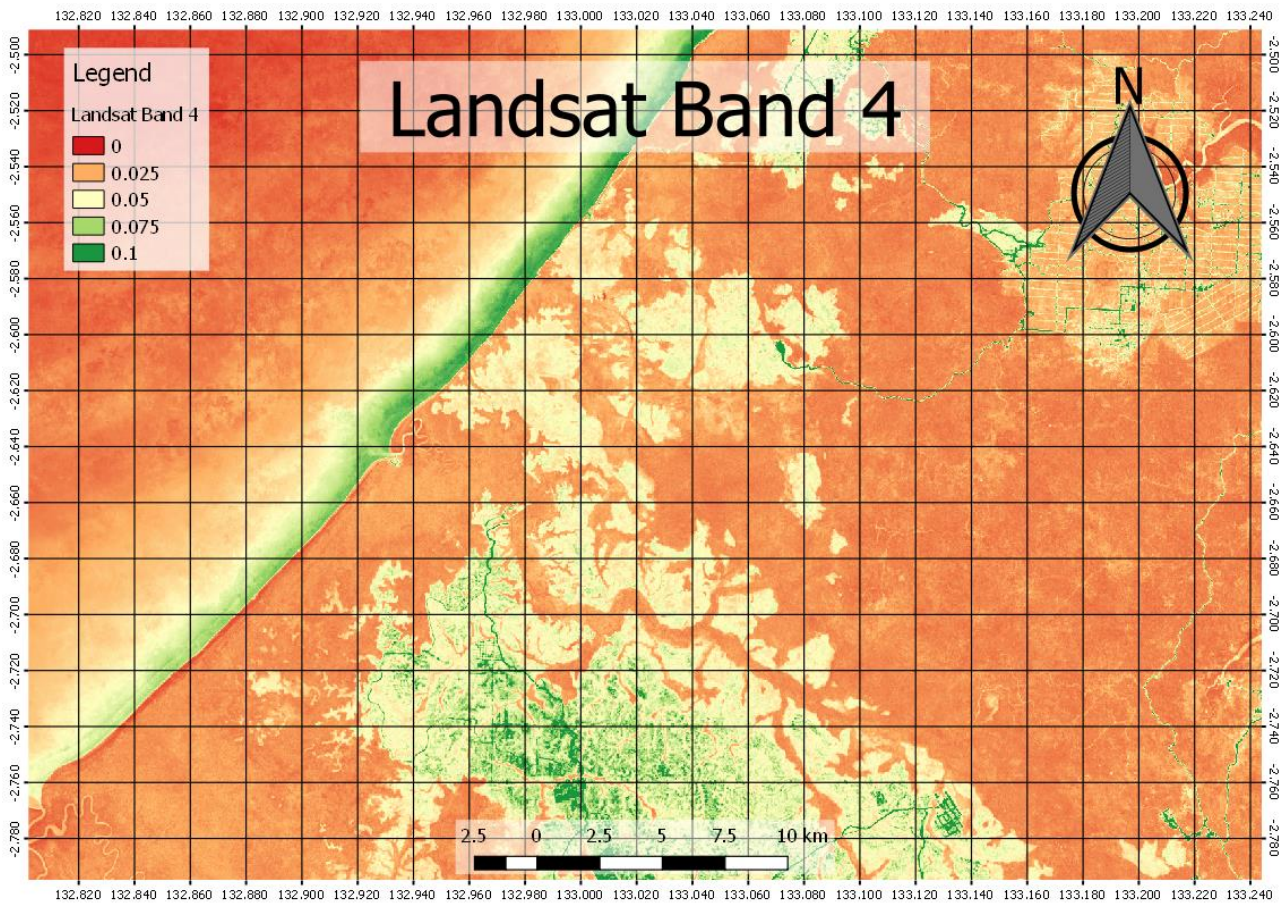


Figure 14 Landsat 8 Band 4: Red

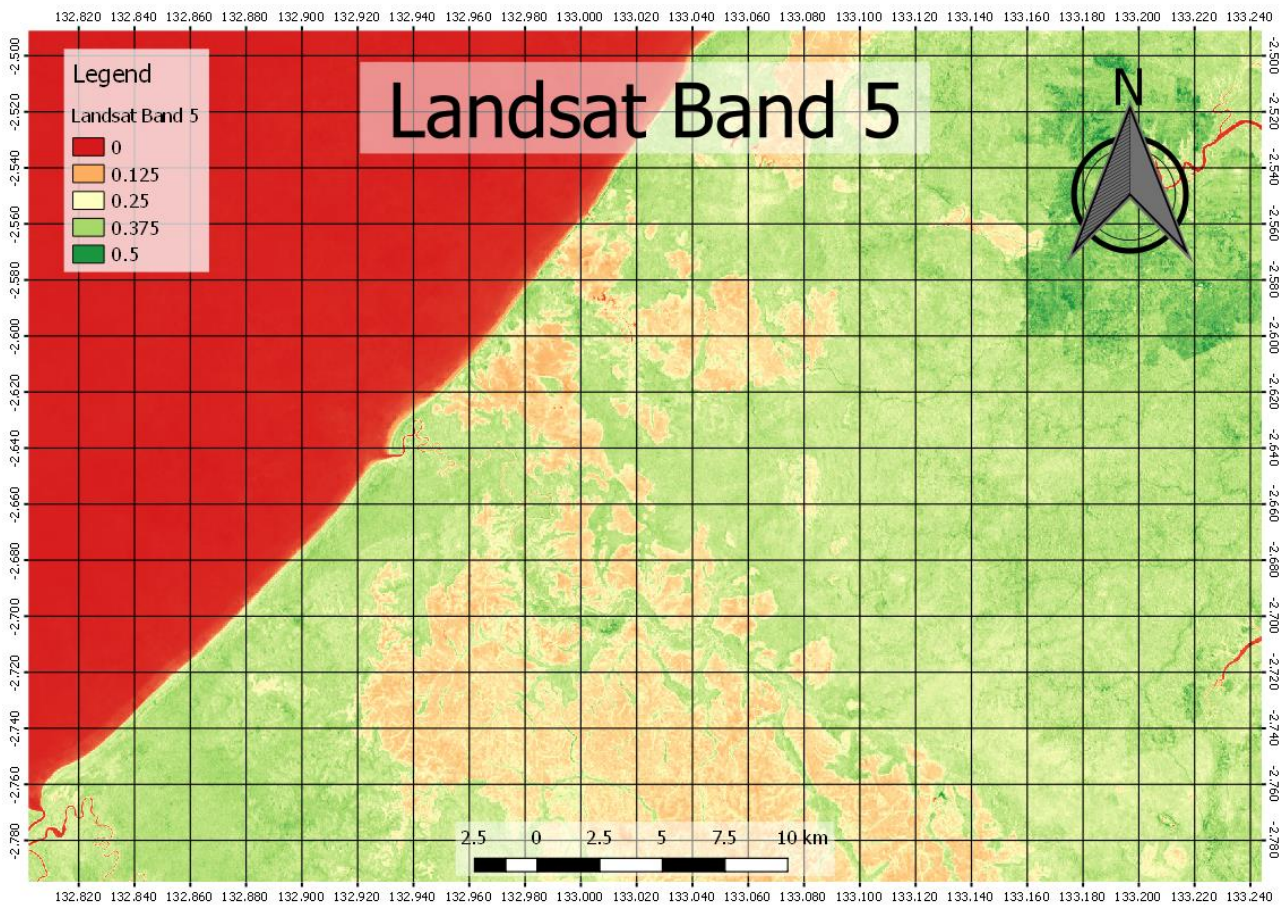


Figure 15 Landsat 8 Band 5: Near Infrared

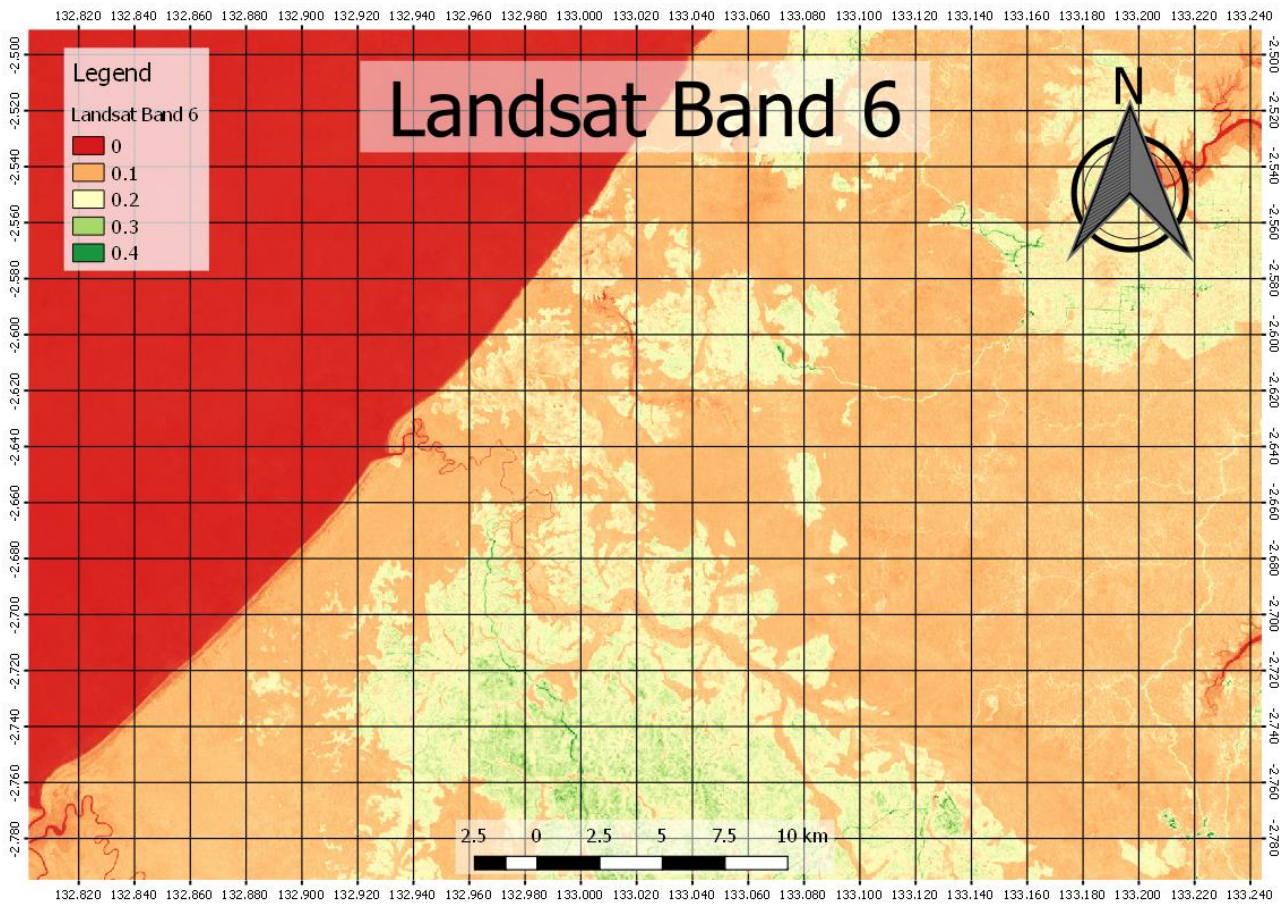


Figure 16 Landsat 8 Band 6: Shortwave Infrared 1

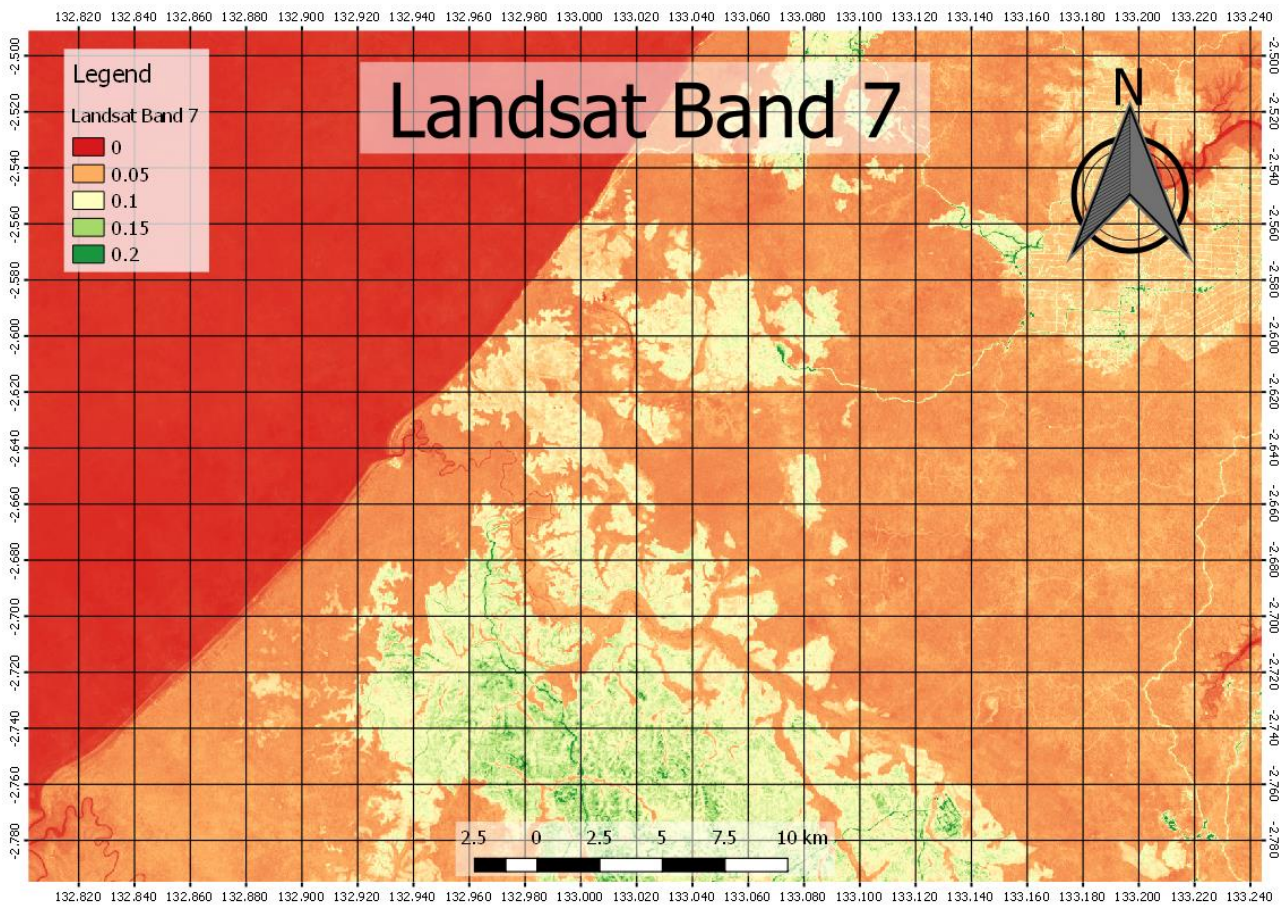


Figure 17 Landsat 8 Band 7: Shortwave Infrared 2

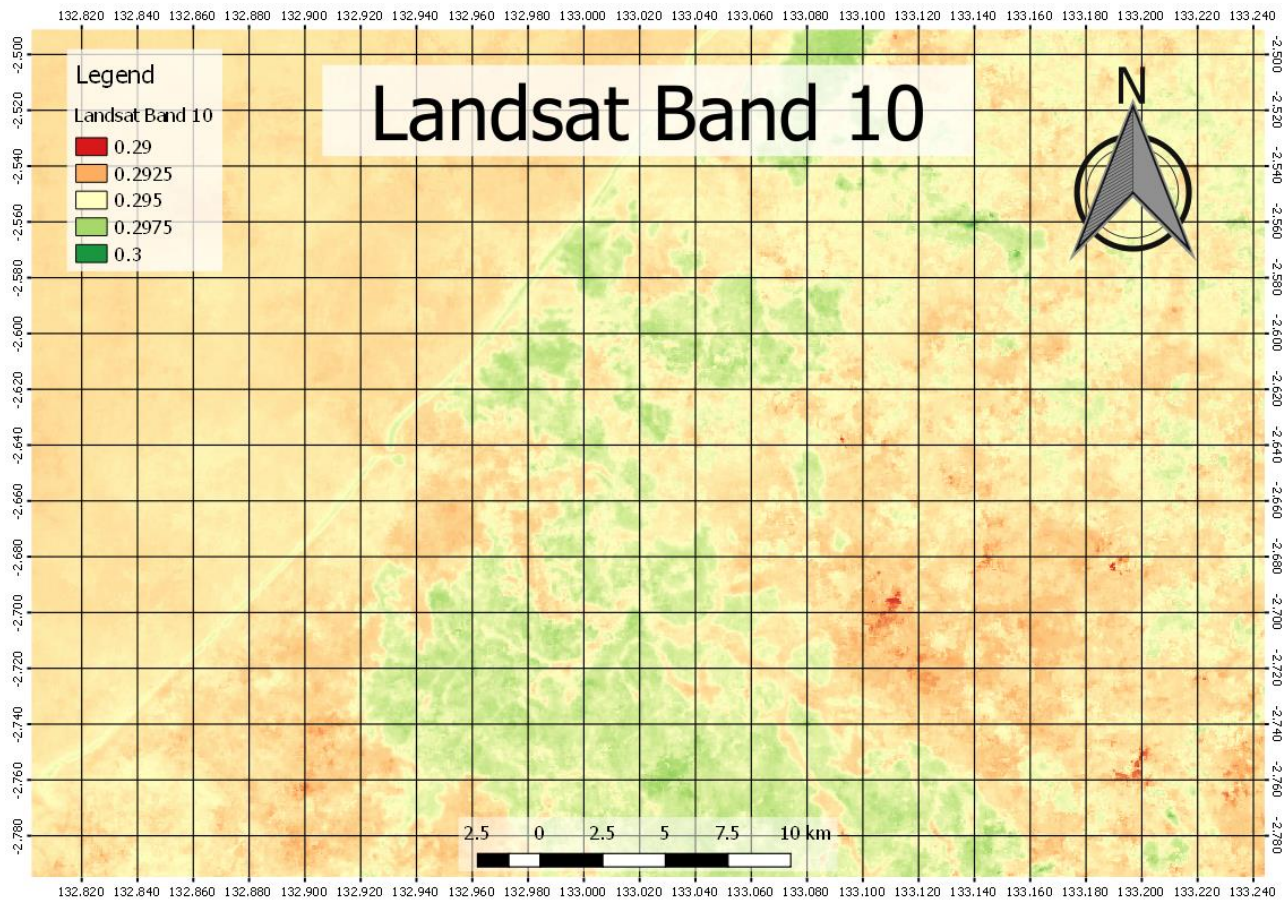


Figure 18 Landsat Band 10: Brightness temperature in °K

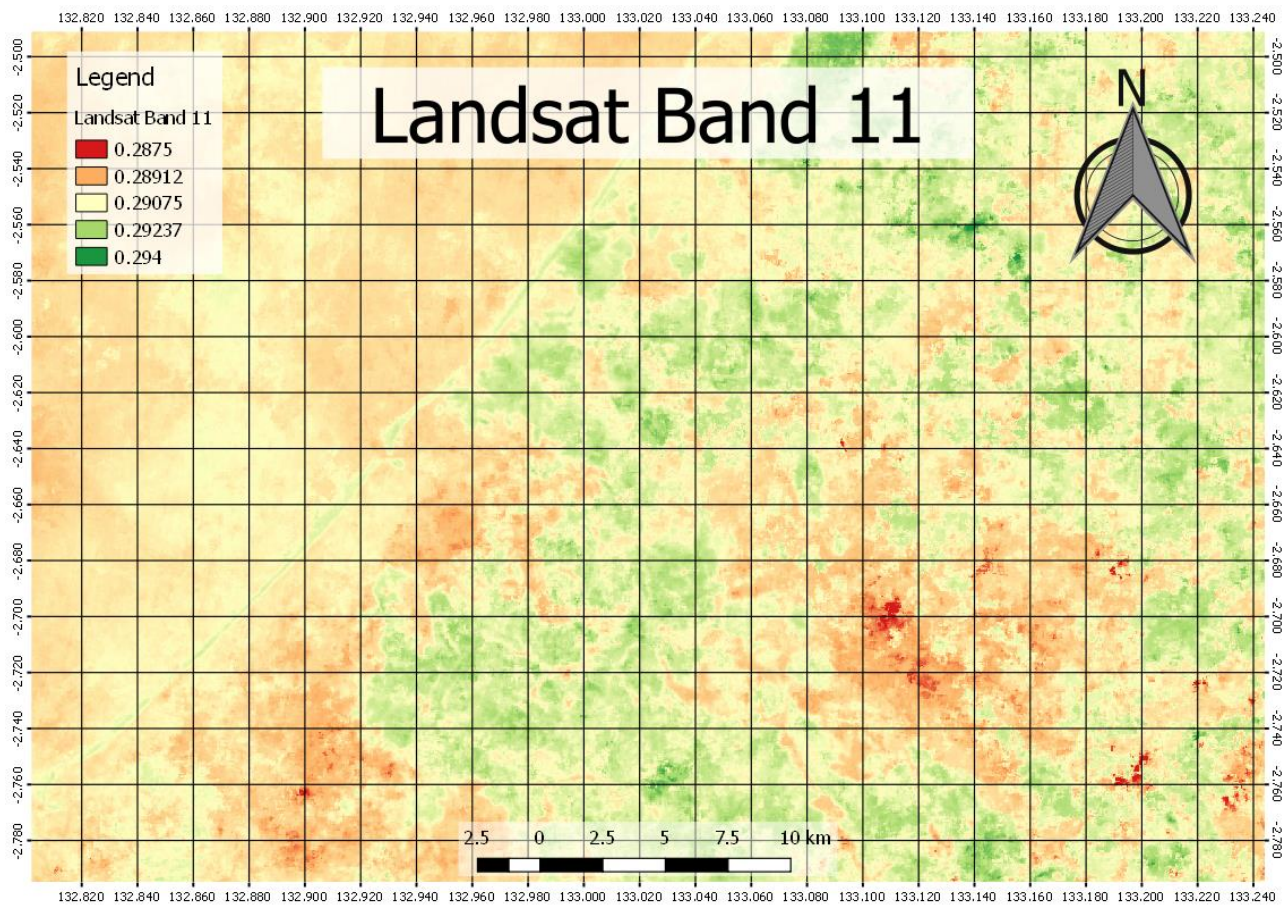


Figure 19 Landsat 8 Band 11: Brightness temperature in °K

1.3 Sentinel-2 bands

Sentinel-2 is a multispectral satellite image. The 13 available bands are shown below.

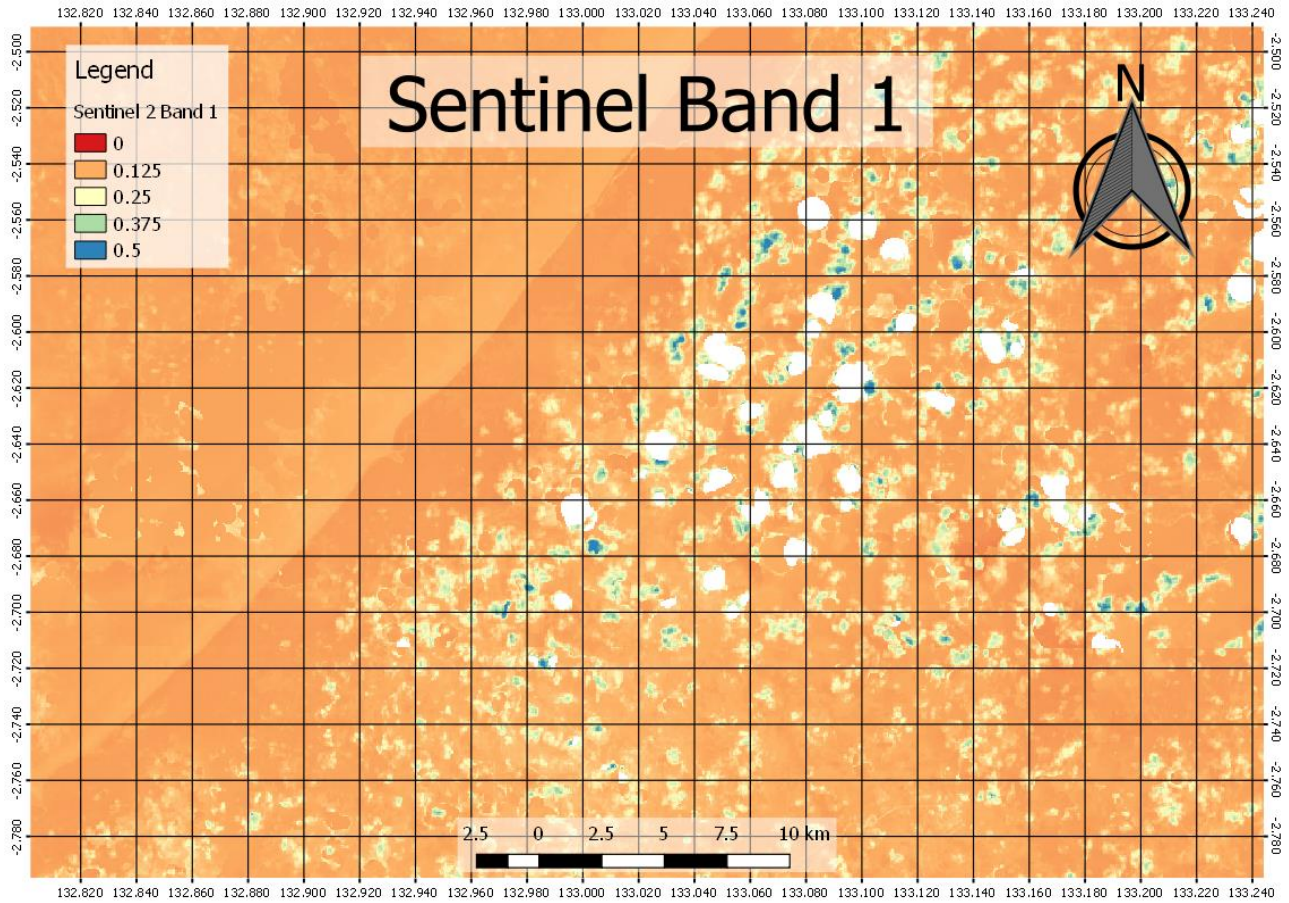


Figure 20 Sentinel-2 Band 1: Aerosols

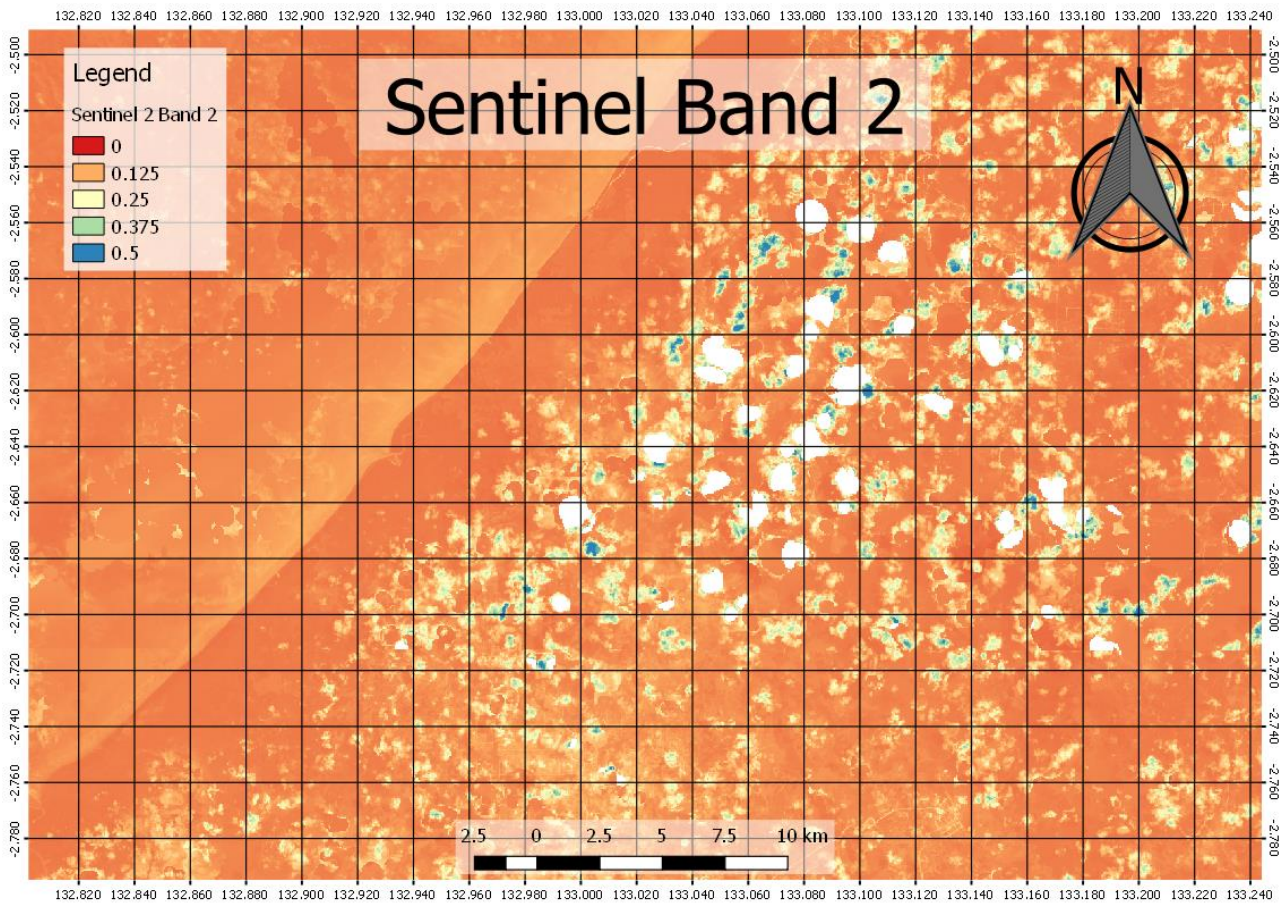


Figure 21 Sentinel-2 Band 2: Blue

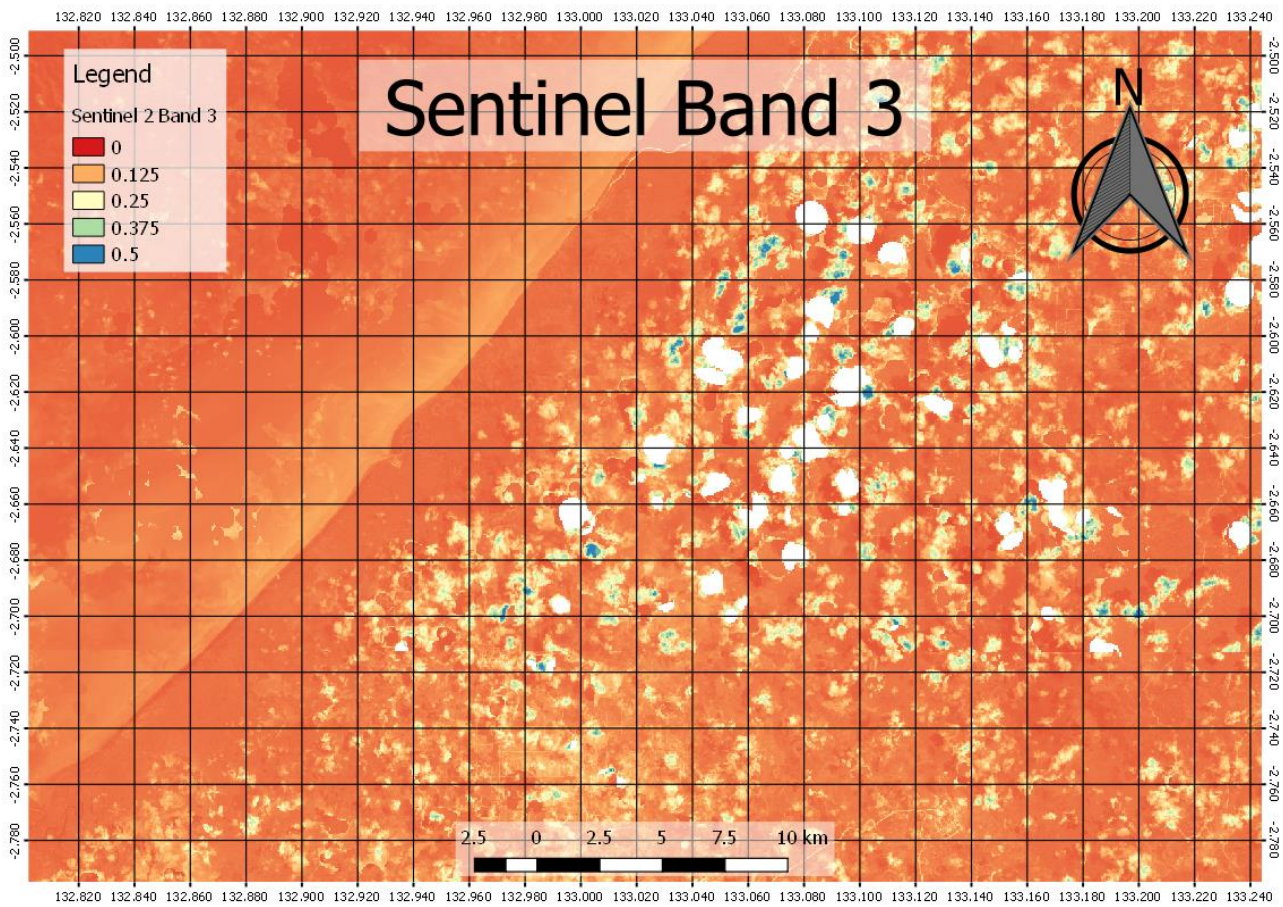


Figure 22 Sentinel-2 Band 3: Green

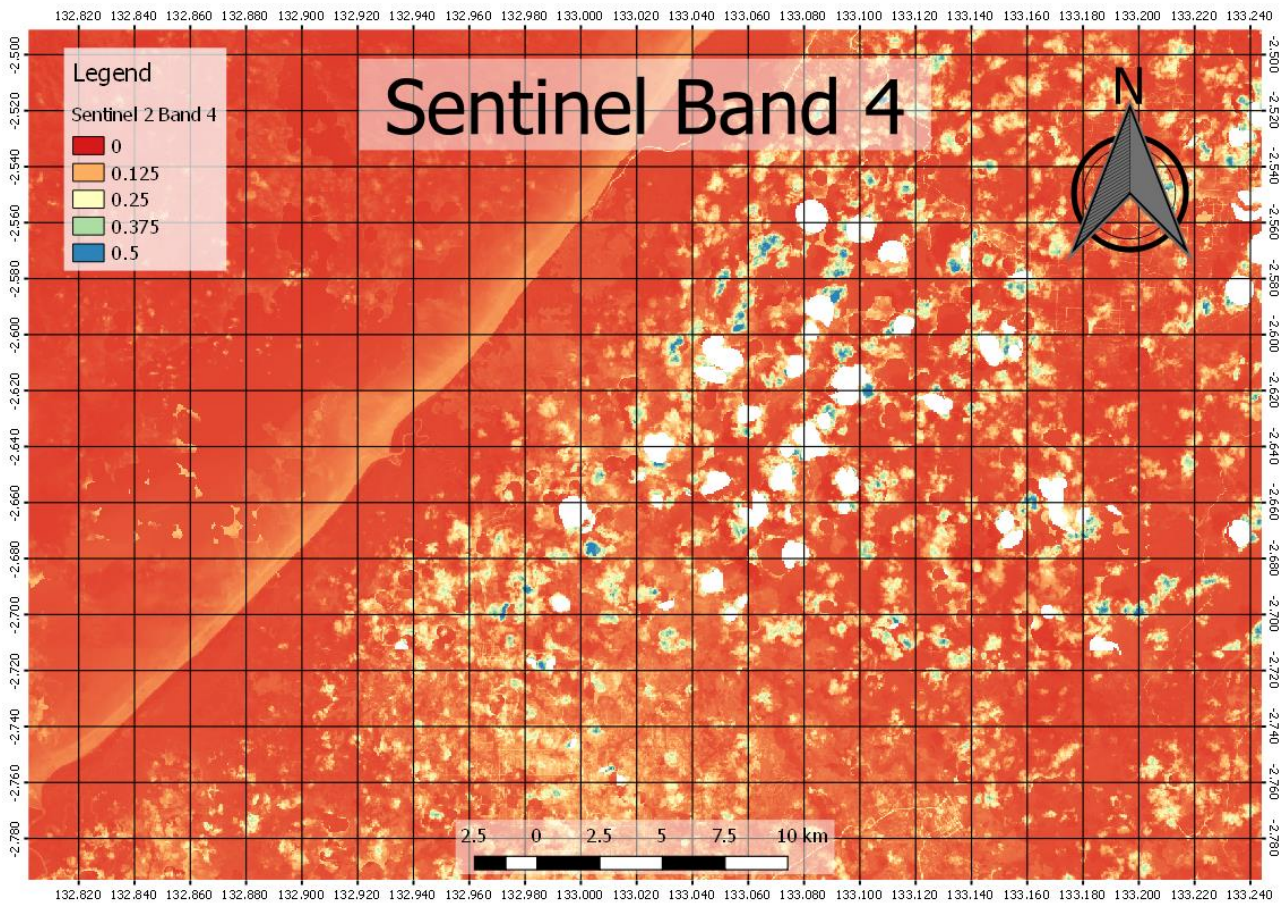


Figure 23 Sentinel-2 Band 4: Red

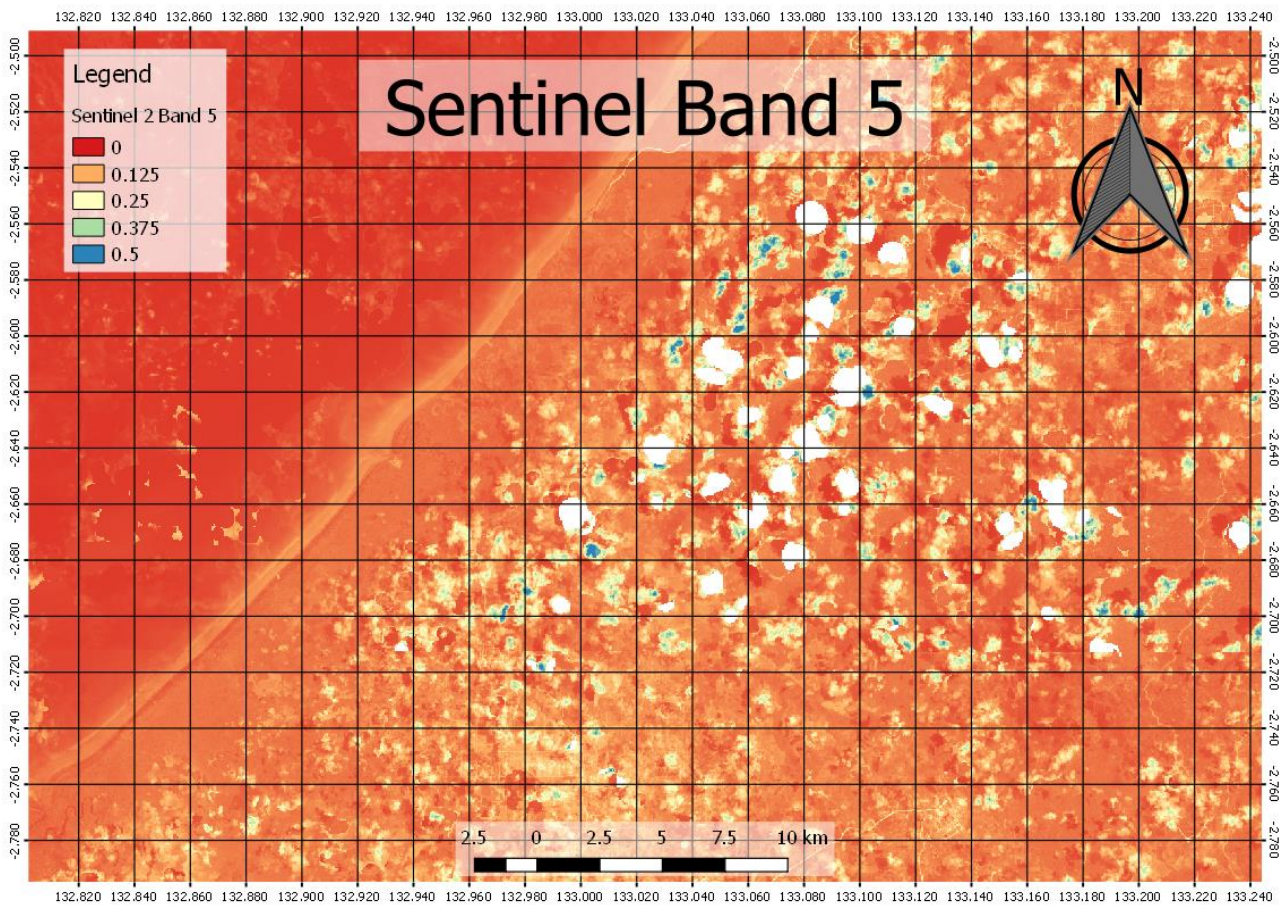


Figure 24 Sentinel-2 Band 5: Red Edge 1

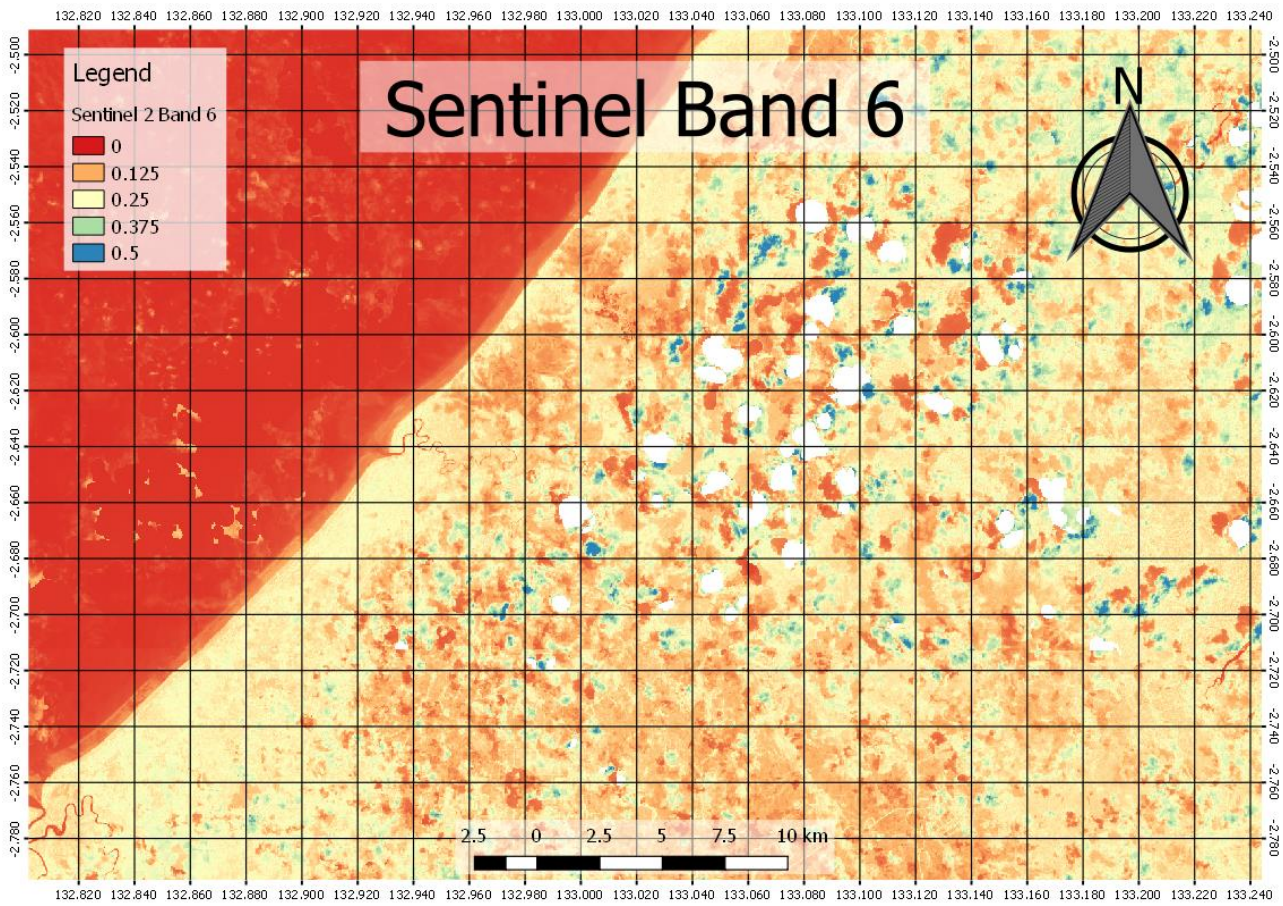


Figure 25 Sentinel-2 Band 6: Red Edge 2

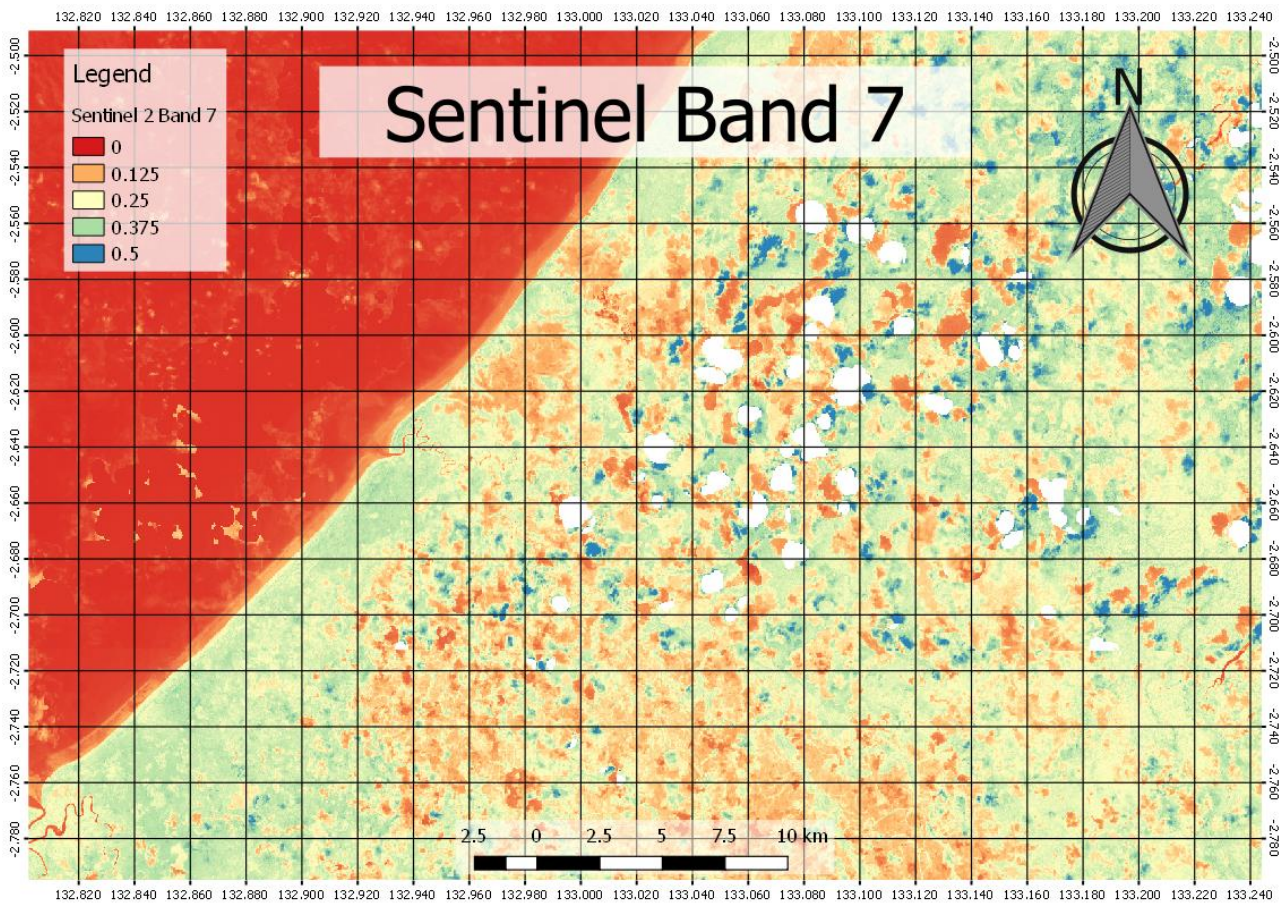


Figure 26 Sentinel-2 Band 7: Red Edge 3

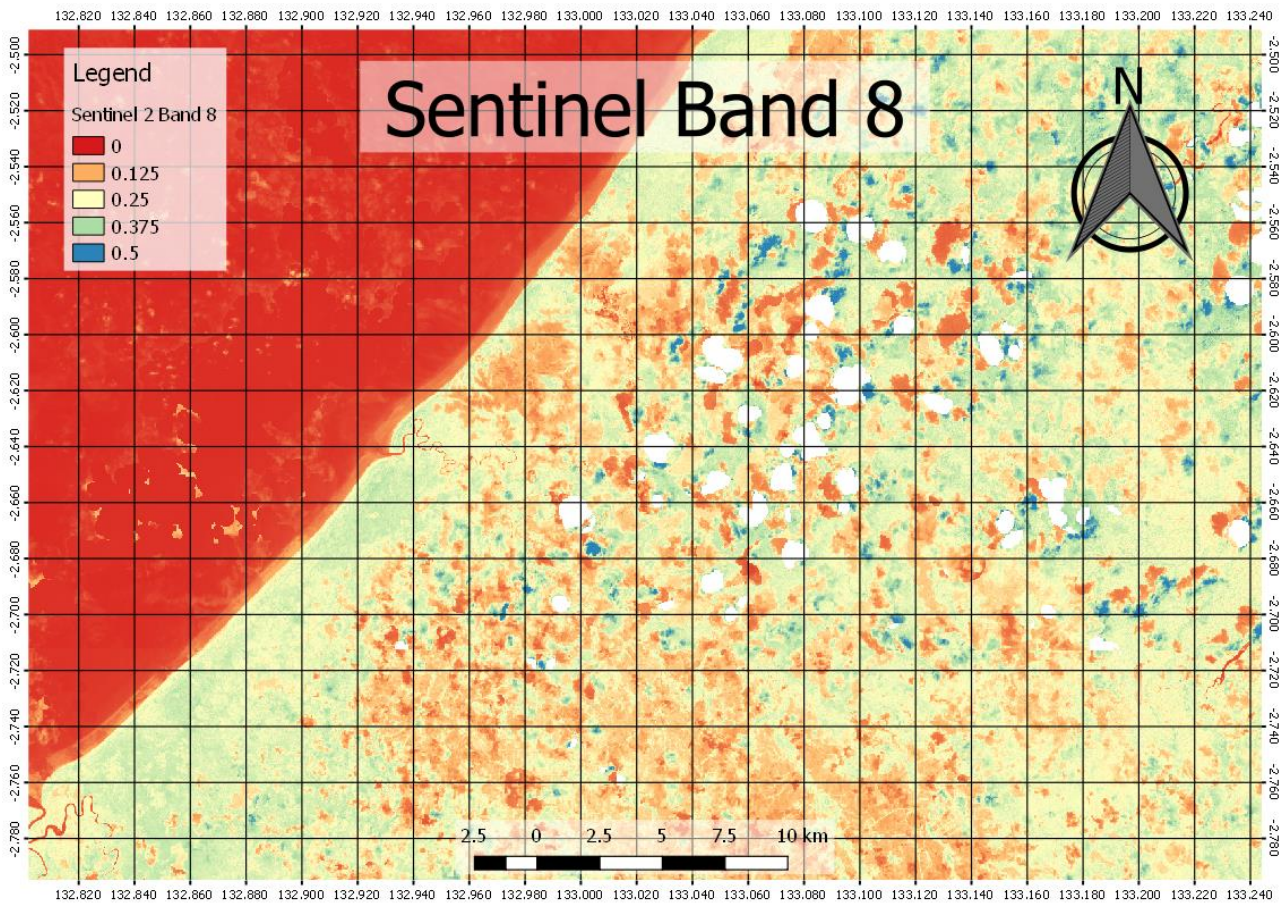


Figure 27 Sentinel-2 Band 8: NIR

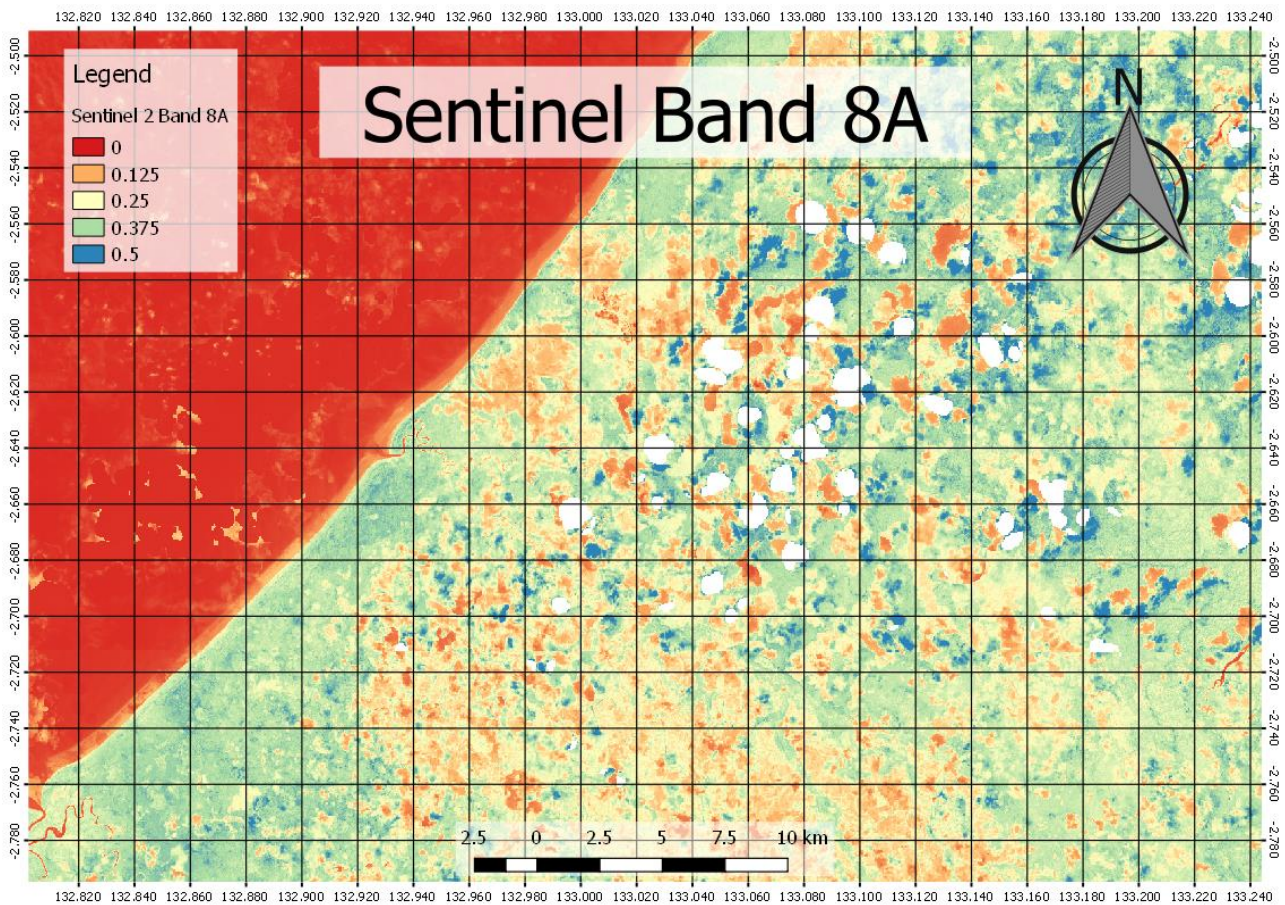


Figure 28 Sentinel-2 Band 8A: Red Edge 4

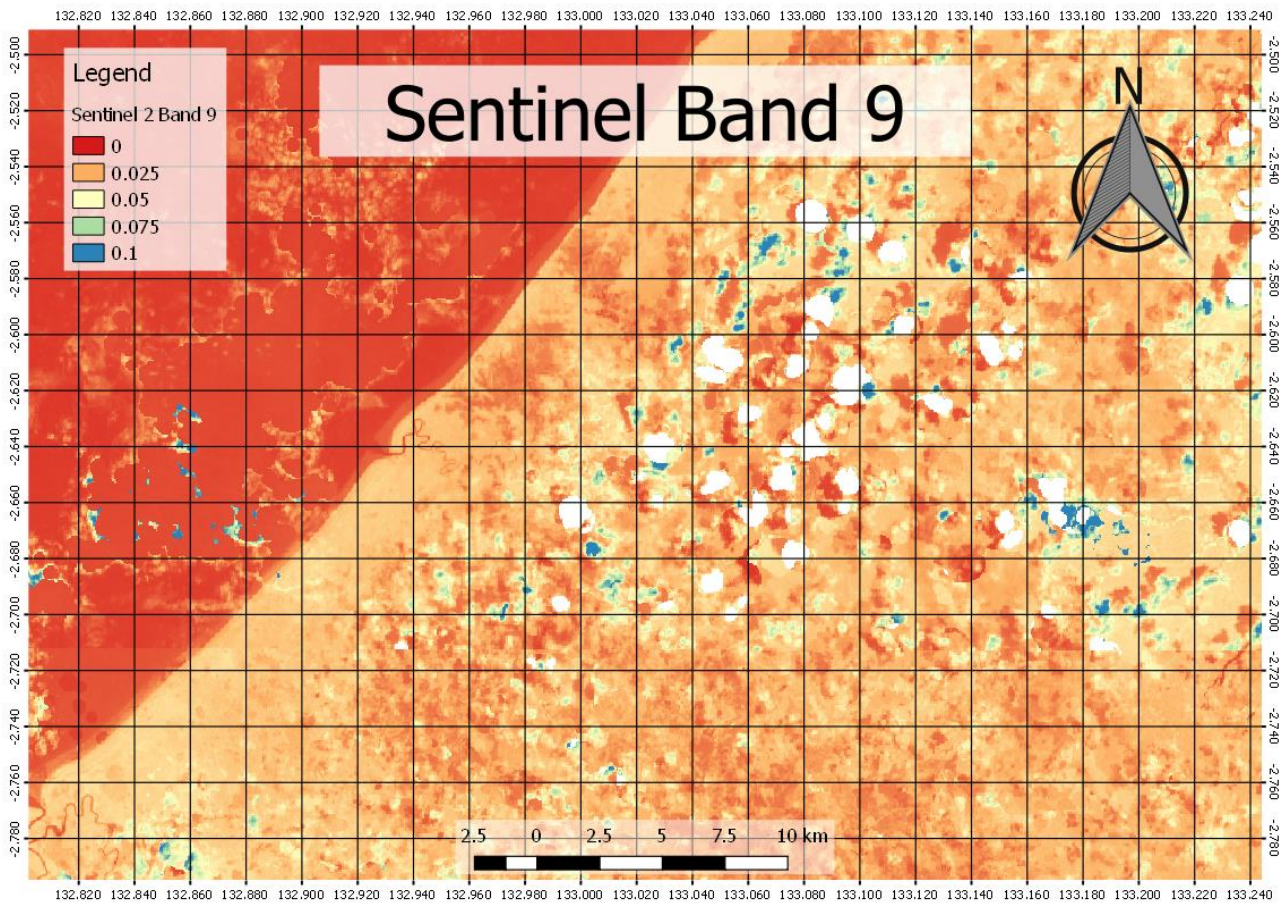


Figure 29 Sentinel-2 Band 9: Water Vapor

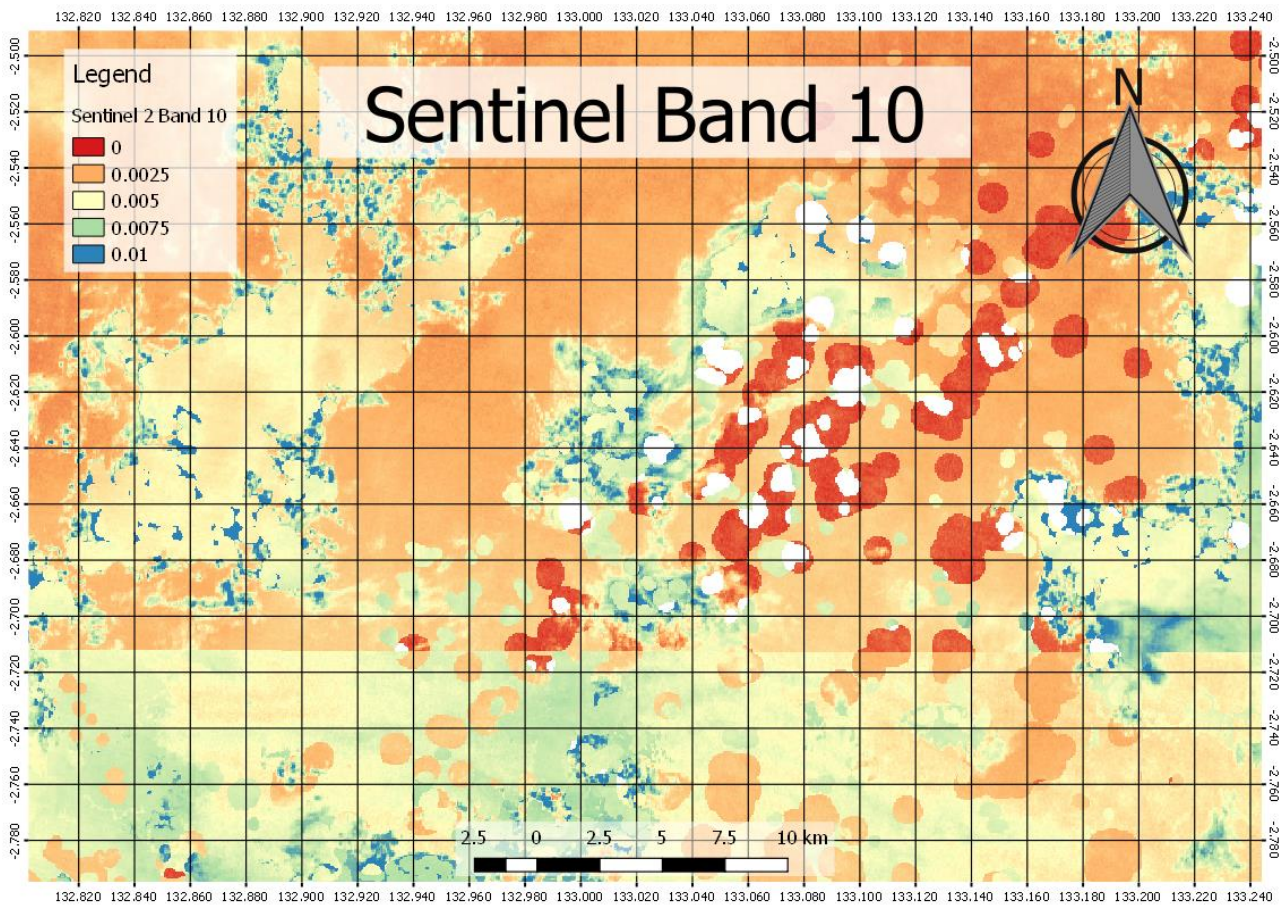


Figure 30 Sentinel-2 Band 10: Cirrus

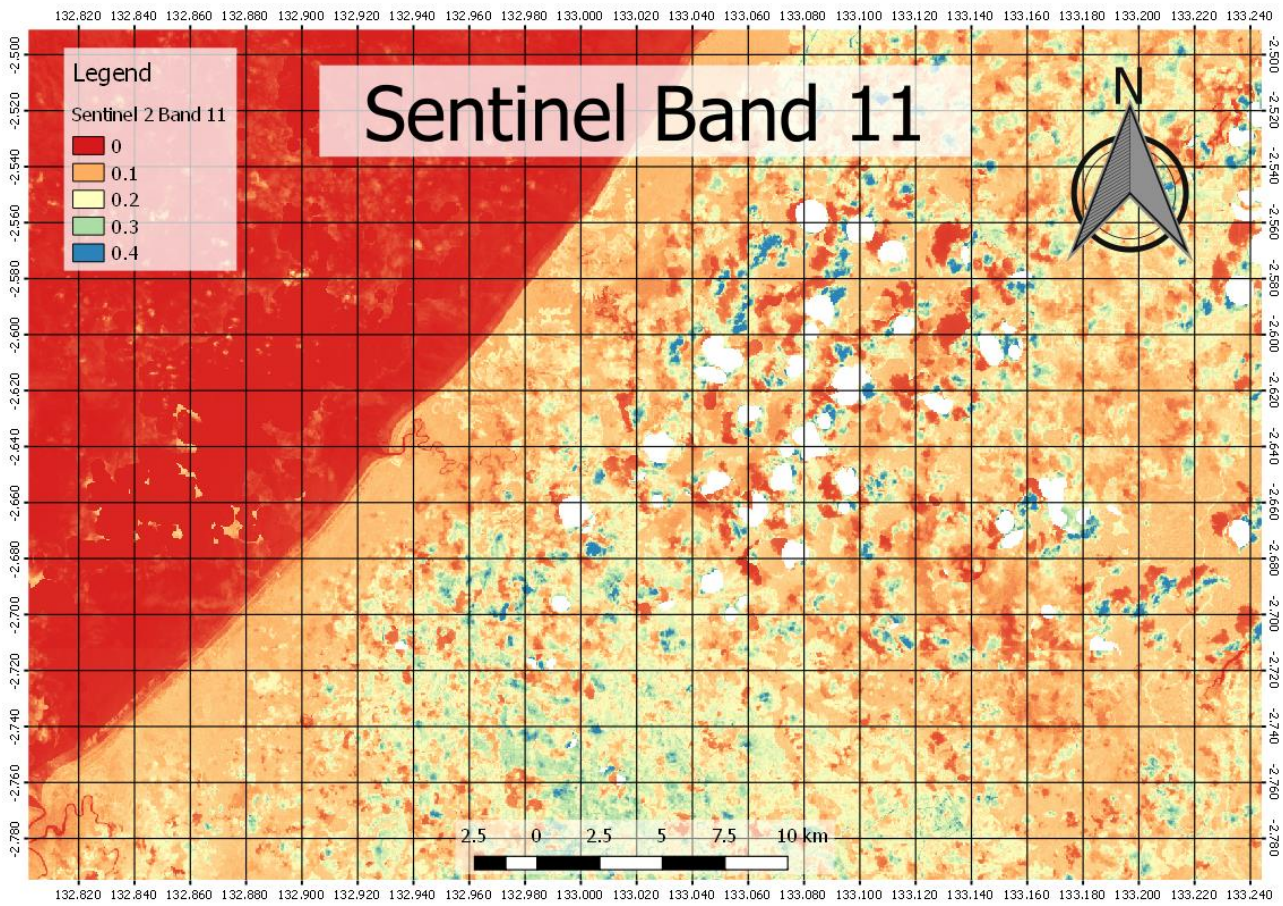


Figure 31 Sentinel-2 Band 11: Short Wave Infrared 1

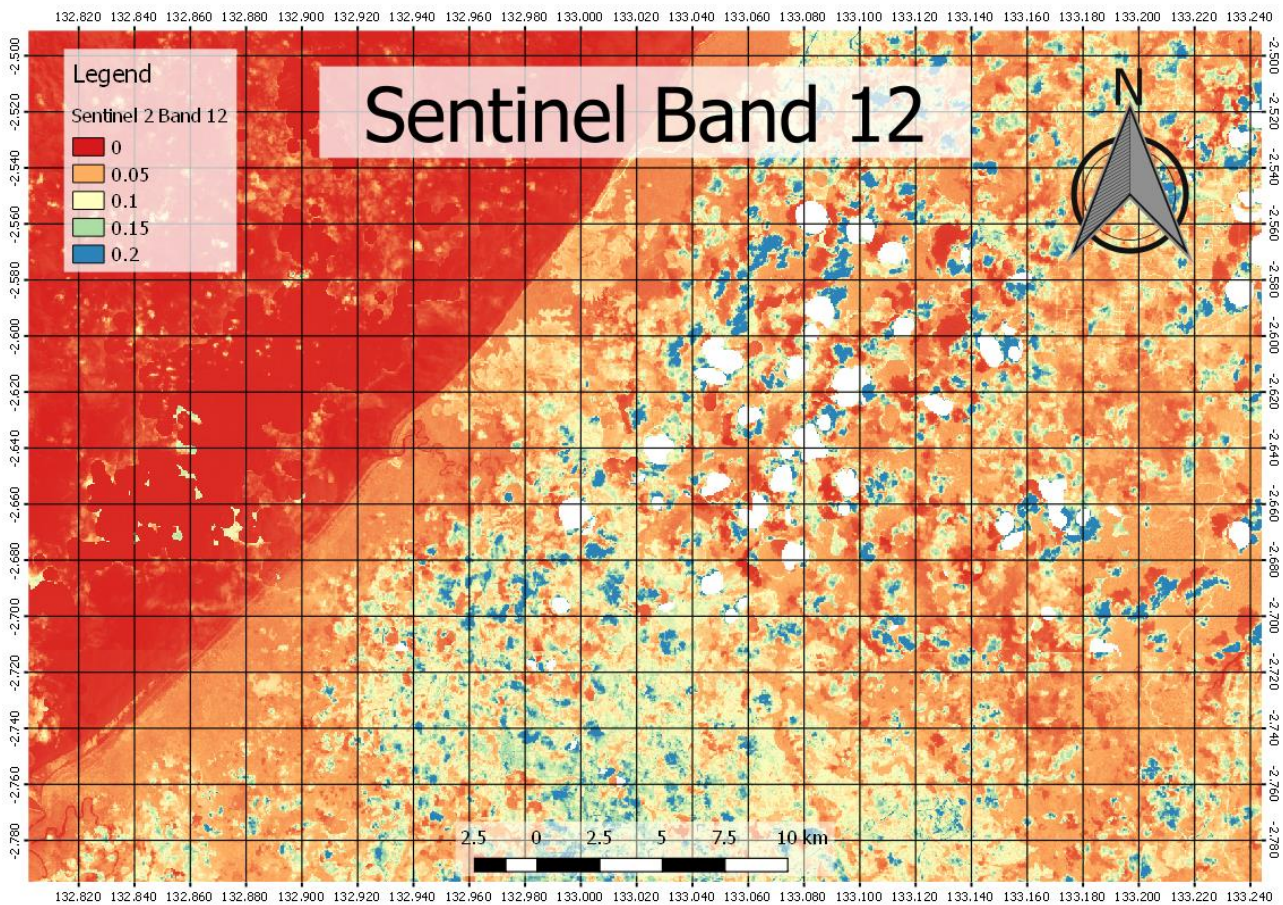


Figure 32 Sentinel-2 Band 12: Short Wave Infrared 2

2 Classification

2.1 Photos

The aerial photos are classified using K-means, minimum distance, maximum likelihood and spectral angle.

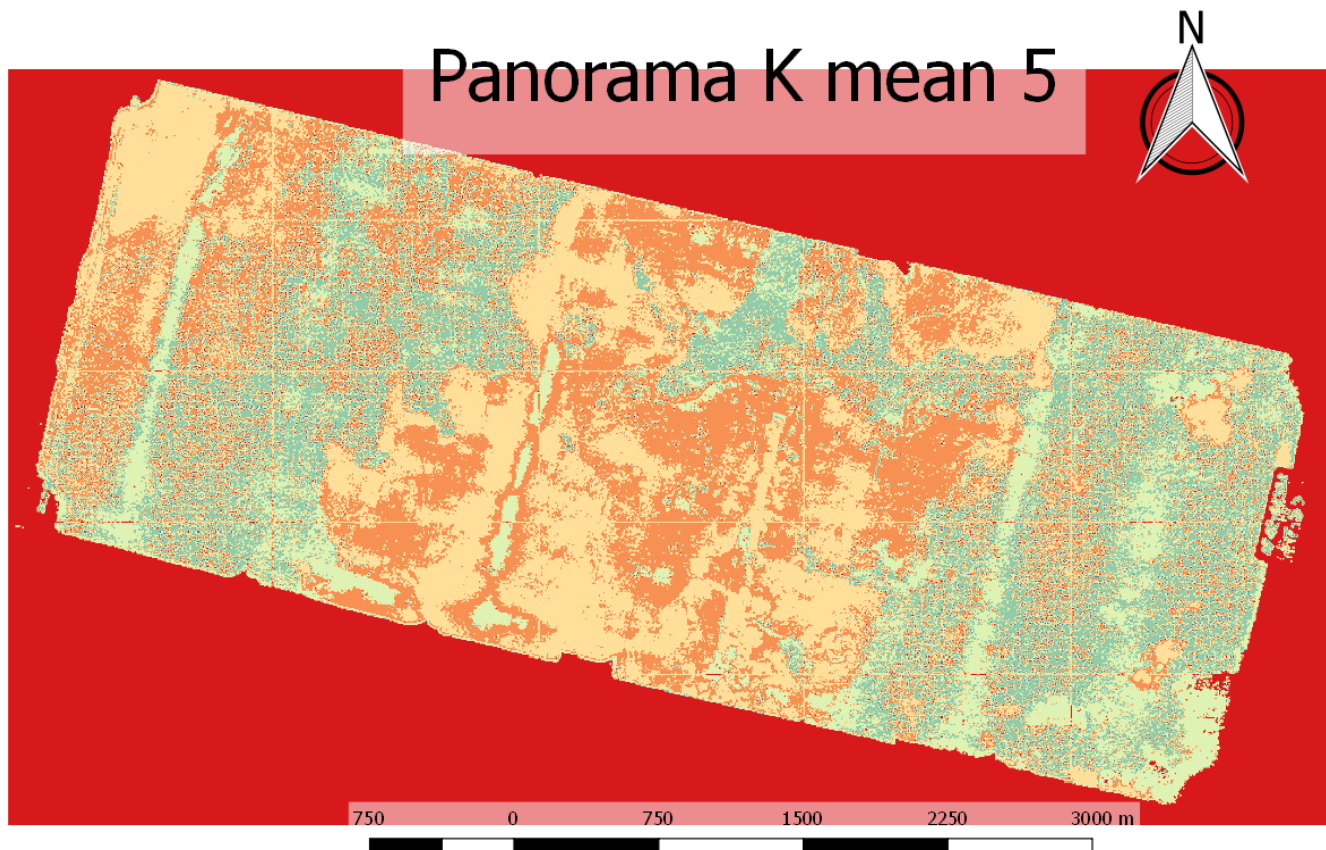


Figure 33 K-means clustering using 5 clusters

Panorama K mean 10

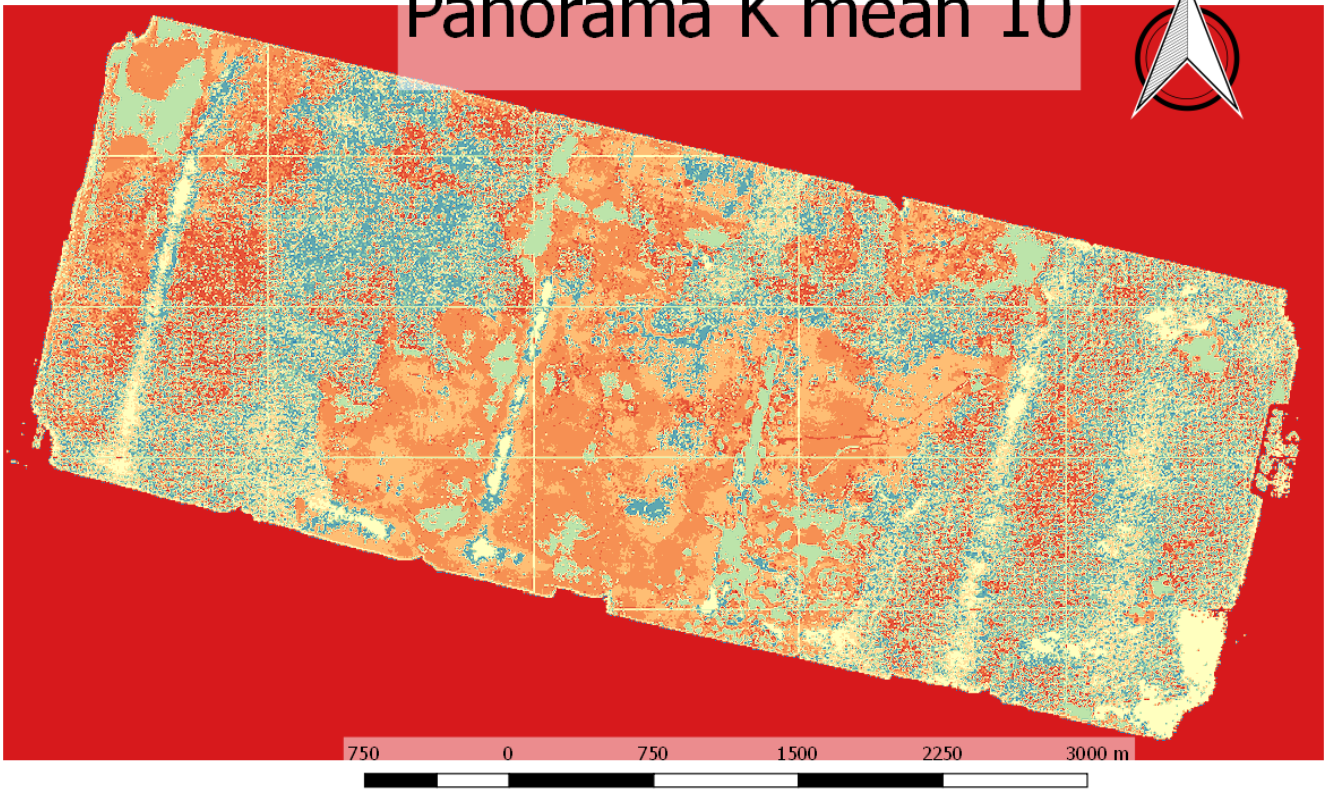


Figure 34 K-means clustering using 10 clusters

Panorama K mean 15

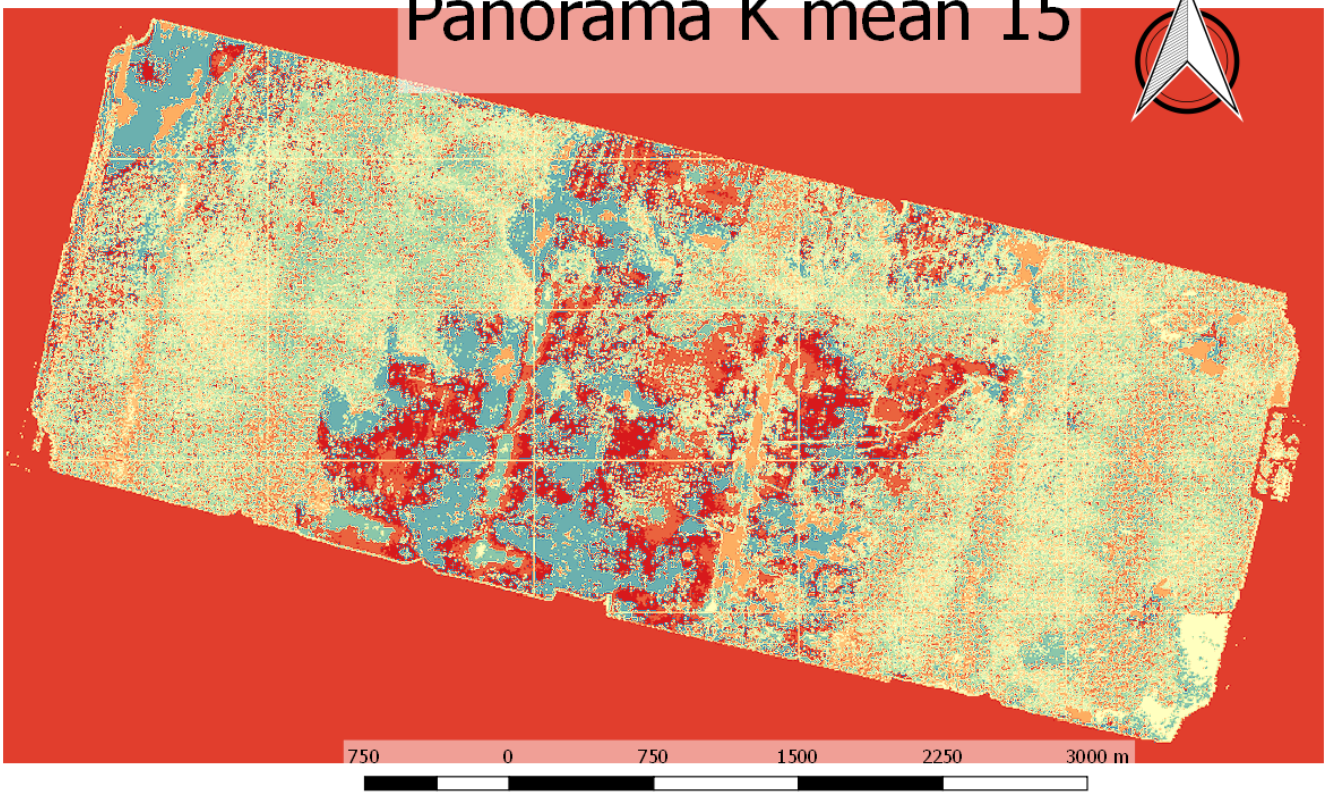


Figure 35 K-means clustering using 15 clusters

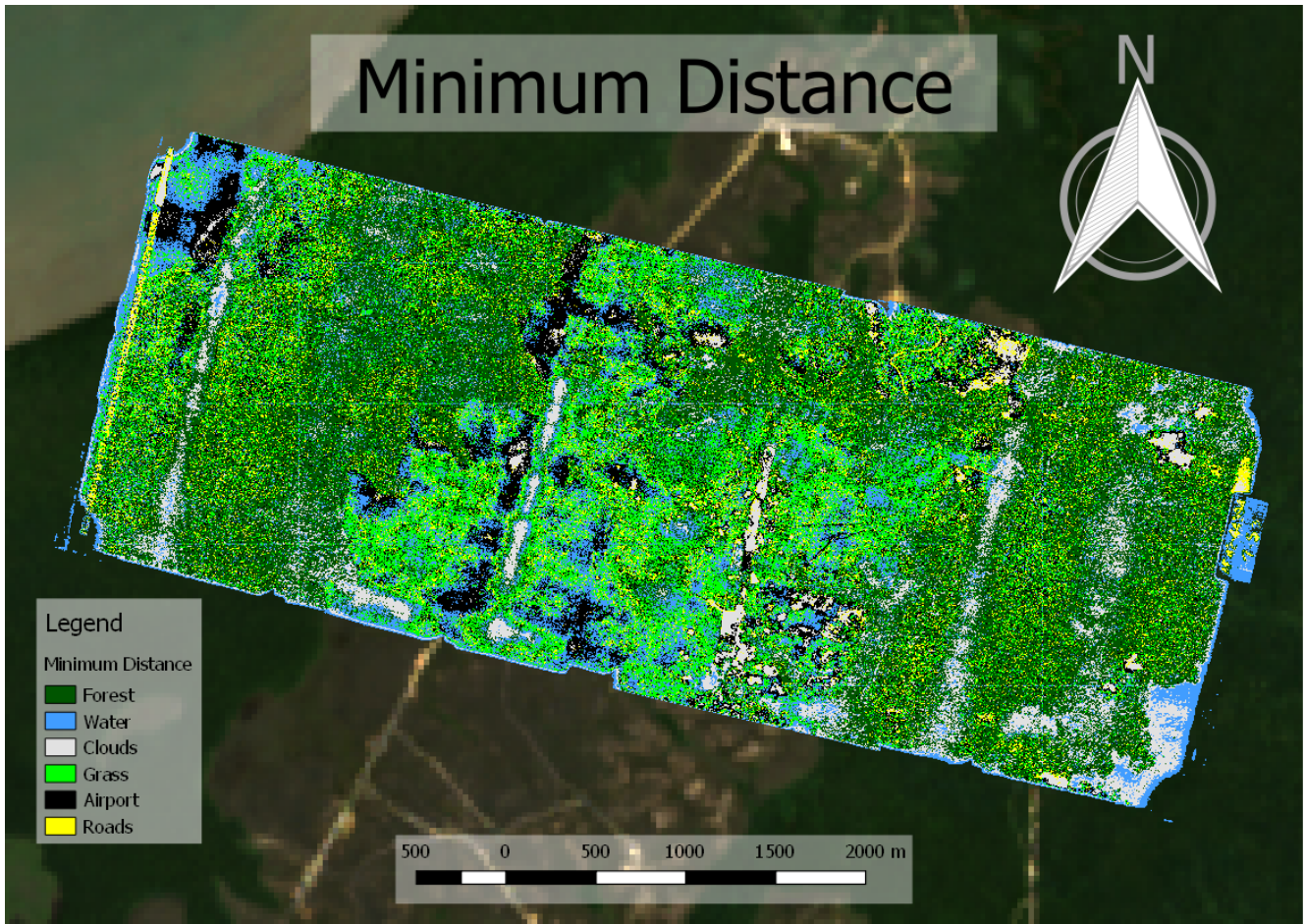


Figure 36 Panorama classification using minimum distance algorithm

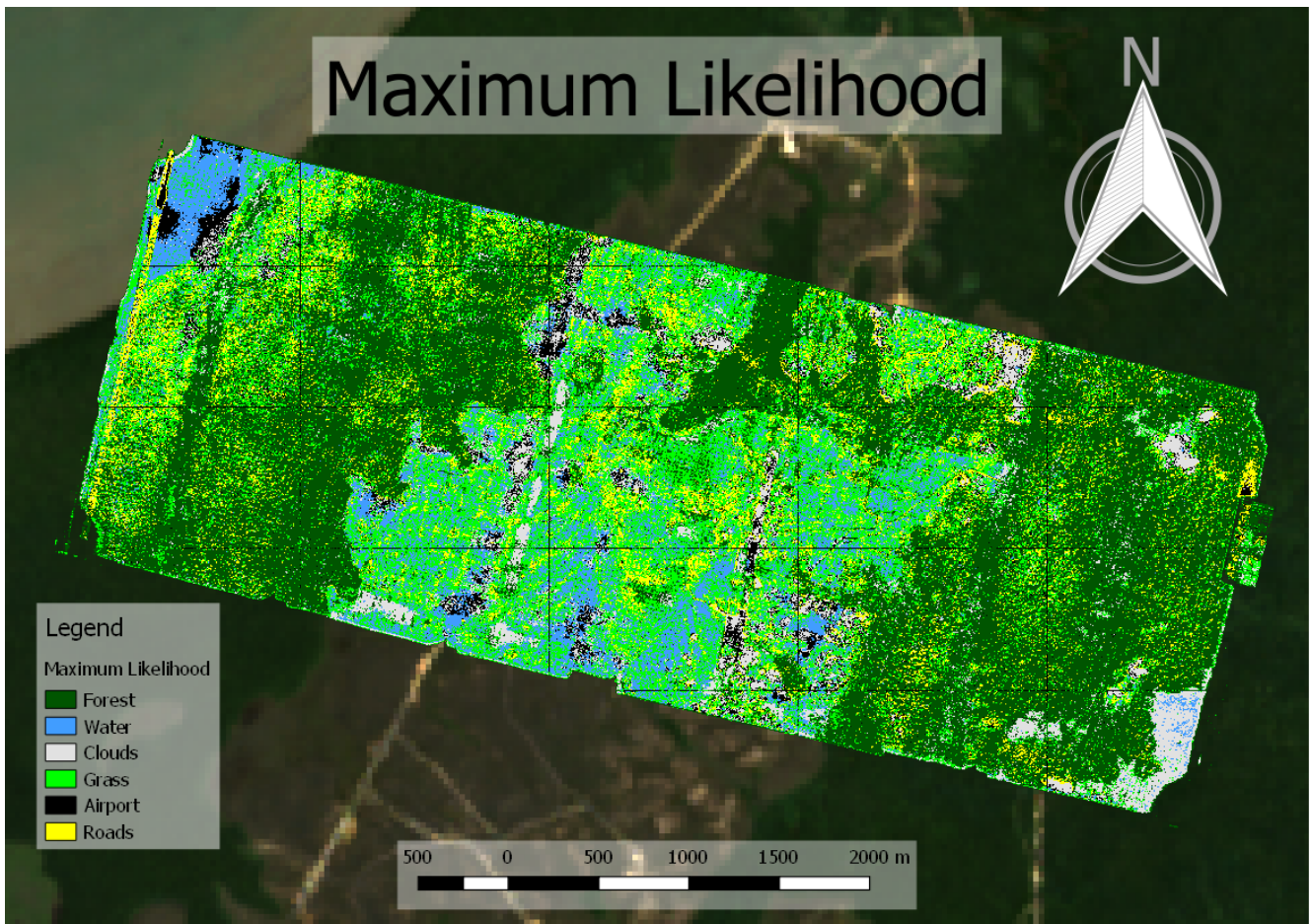


Figure 37 Panorama classification using maximum likelihood algorithm

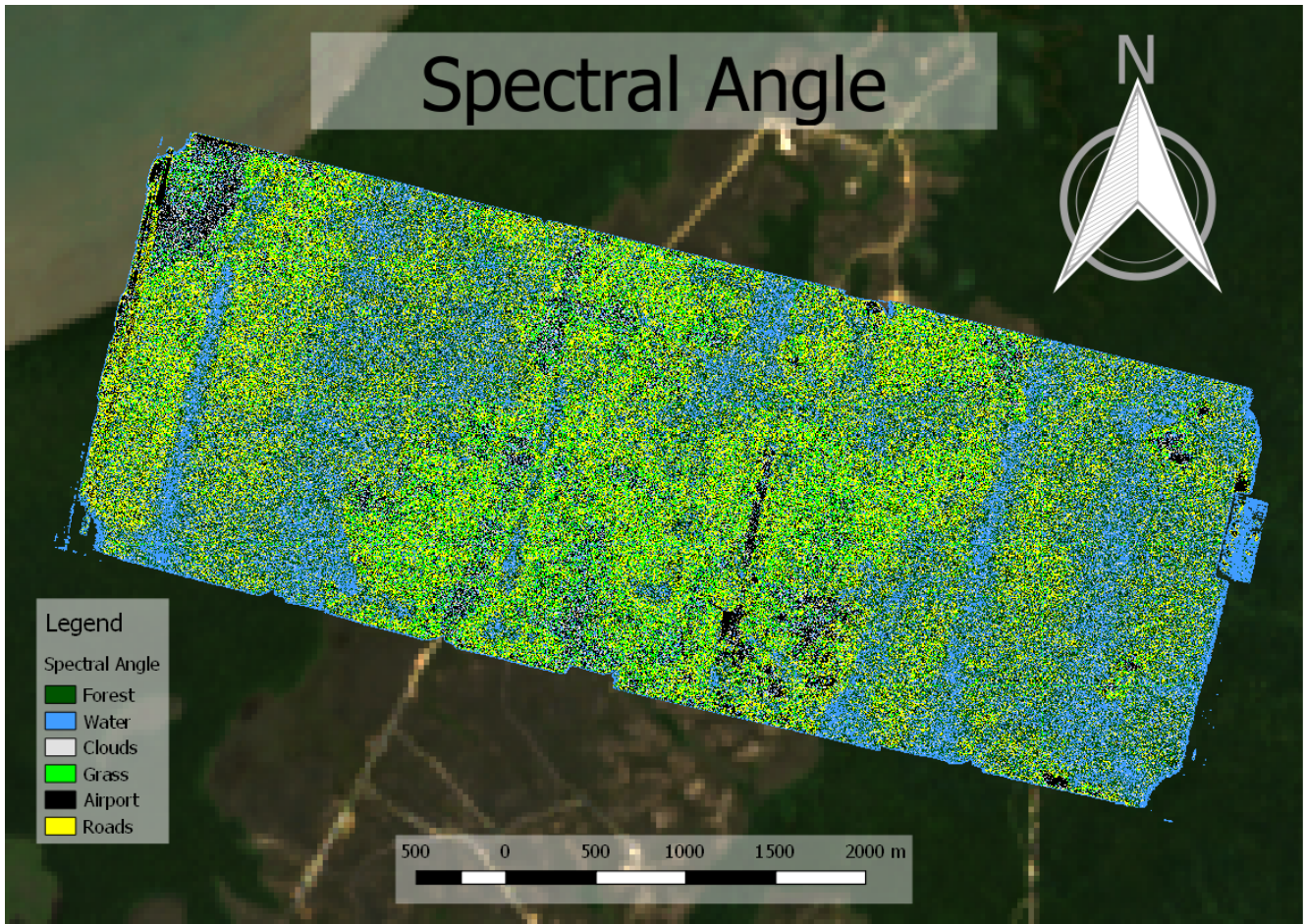


Figure 38 Panorama classification using spectral angle algorithm

2.2 Landsat 8

Landsat 8 classified using K-means and CART.

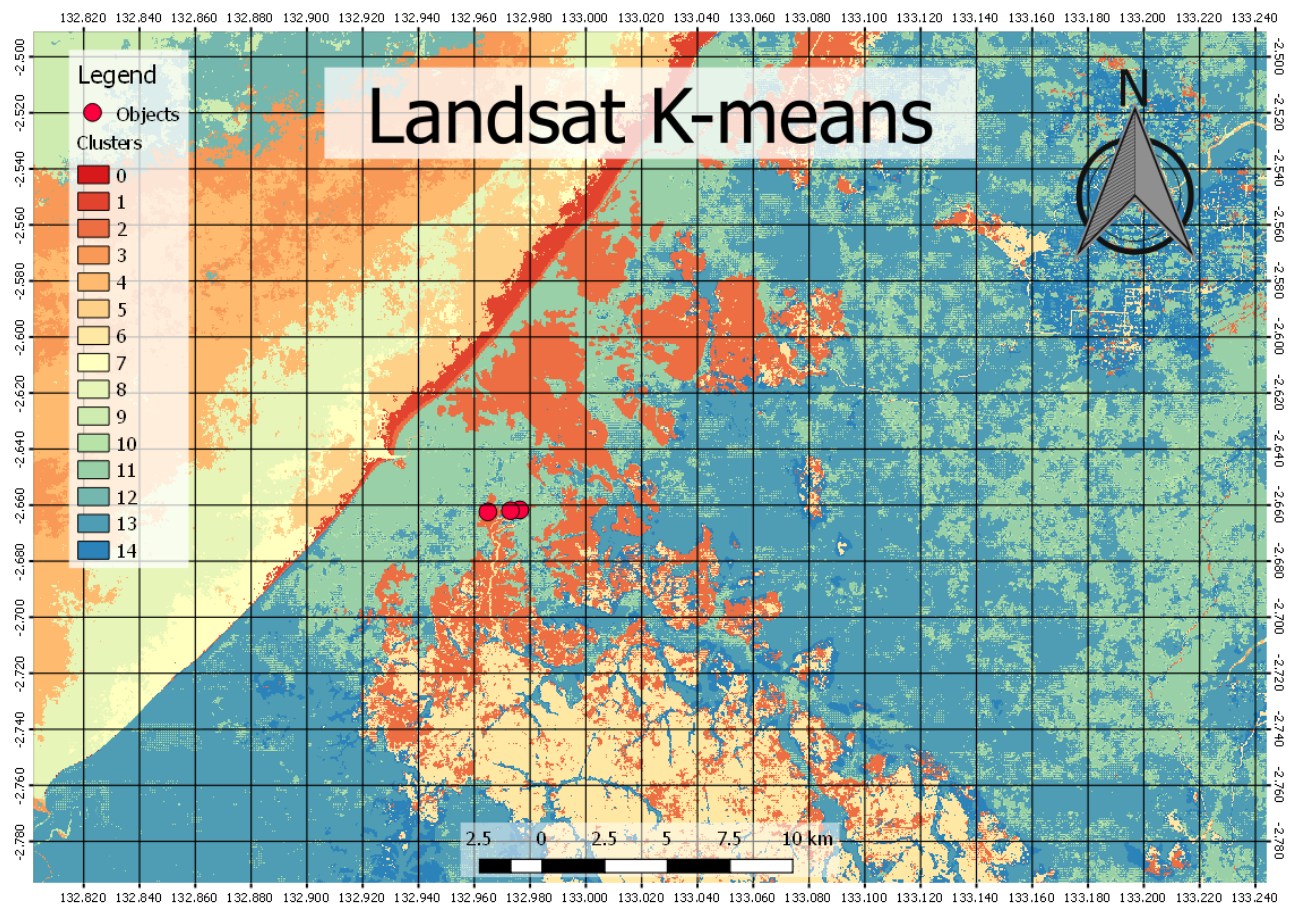


Figure 39 Landsat 8 clustering using K-means

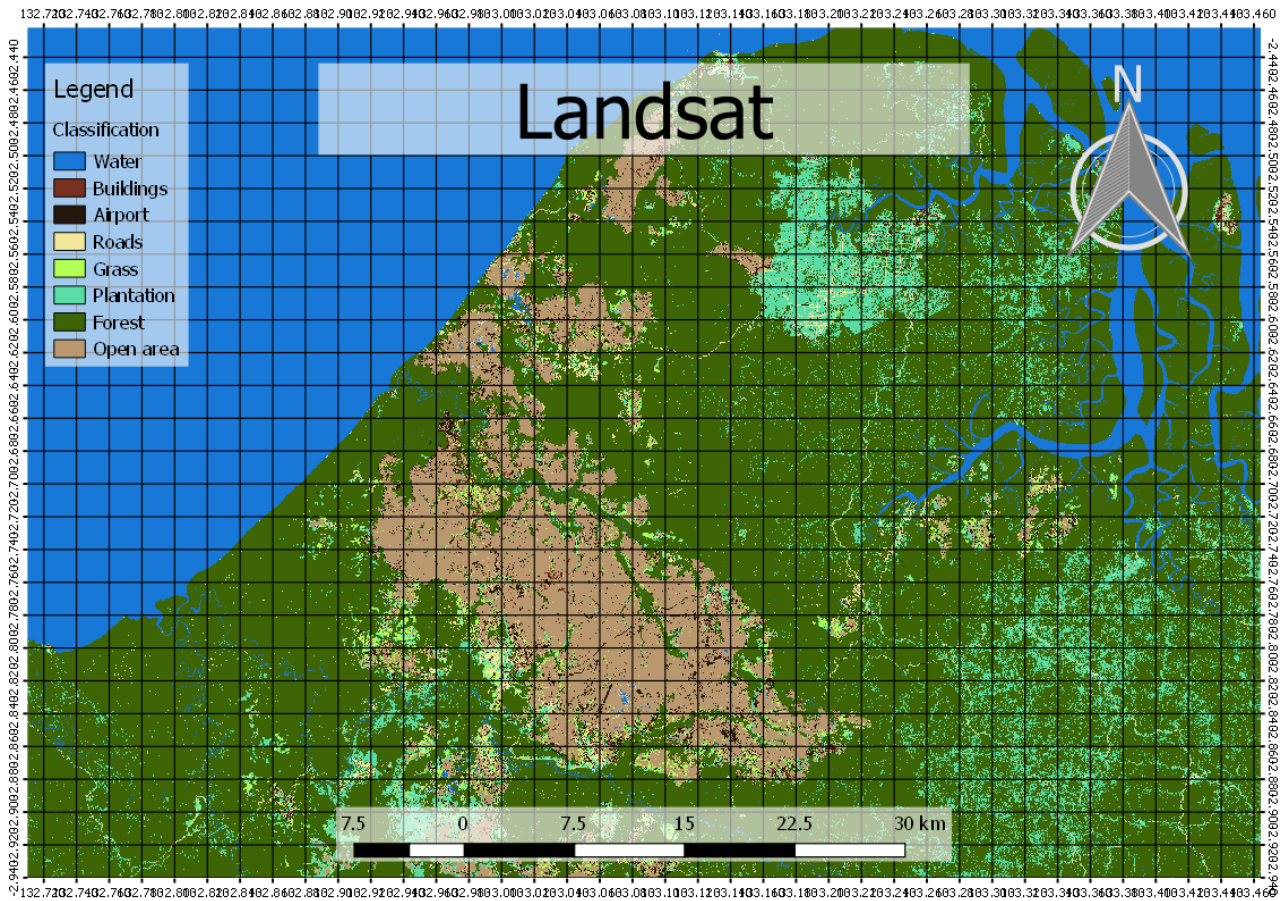


Figure 40 Landsat 8 classification using CART excluding the equipment class

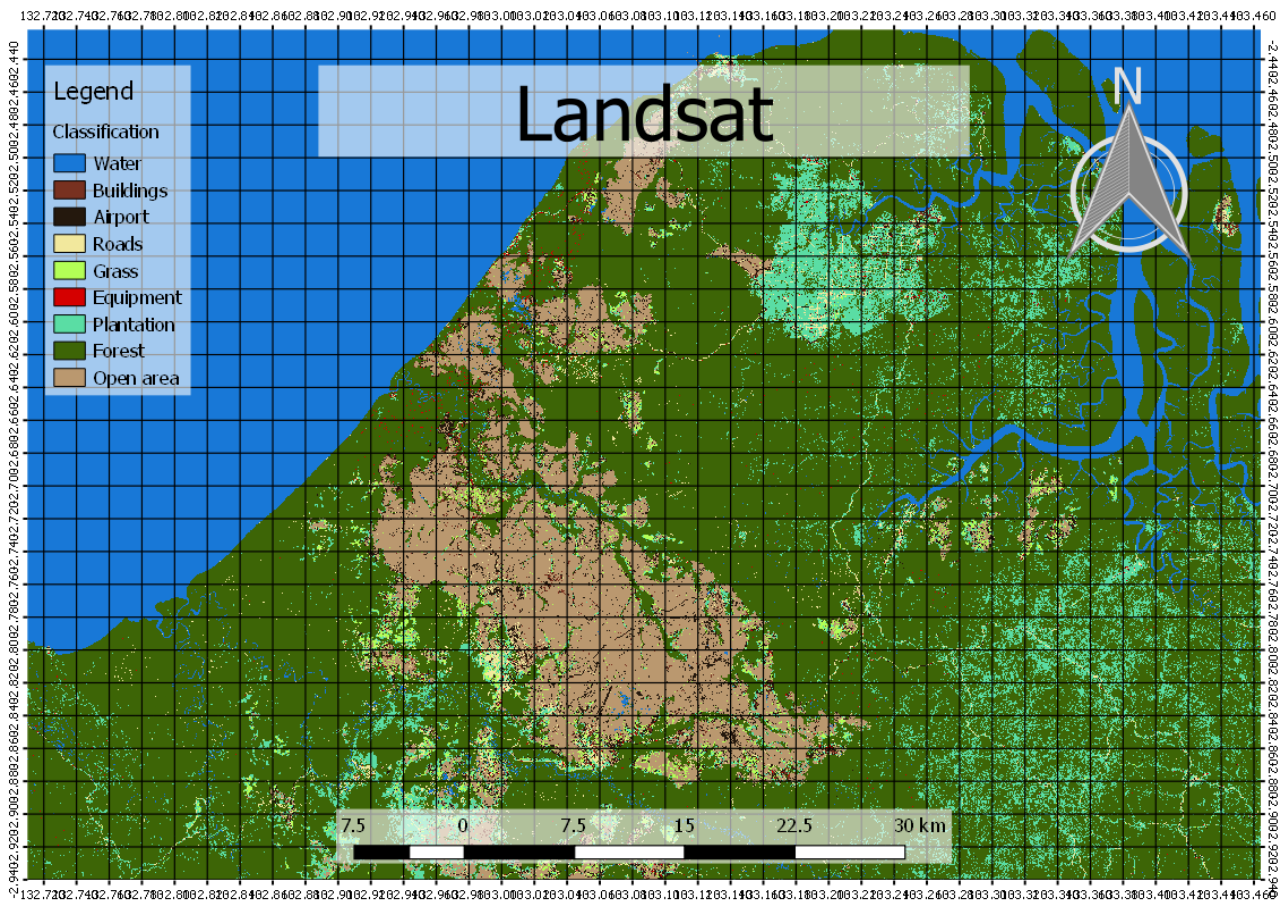


Figure 41 Landsat 8 classification using CART including the equipment class

2.3 Sentinel-2

Sentinel-2 classified using K-means and CART, for both the averaged clouds and the applied cloud filter.

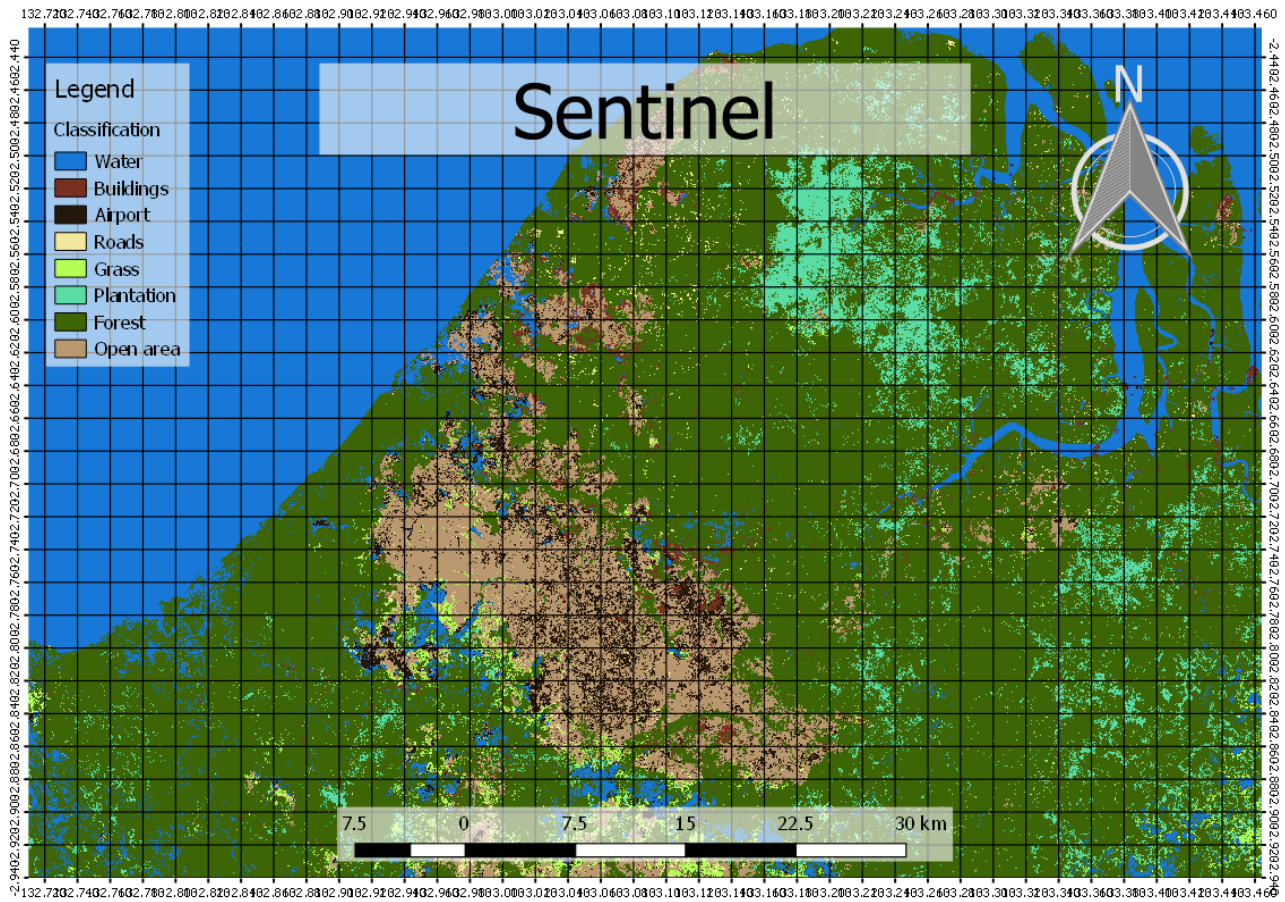


Figure 42 Sentinel-2 averaged clouds classification using CART excluding the equipment class

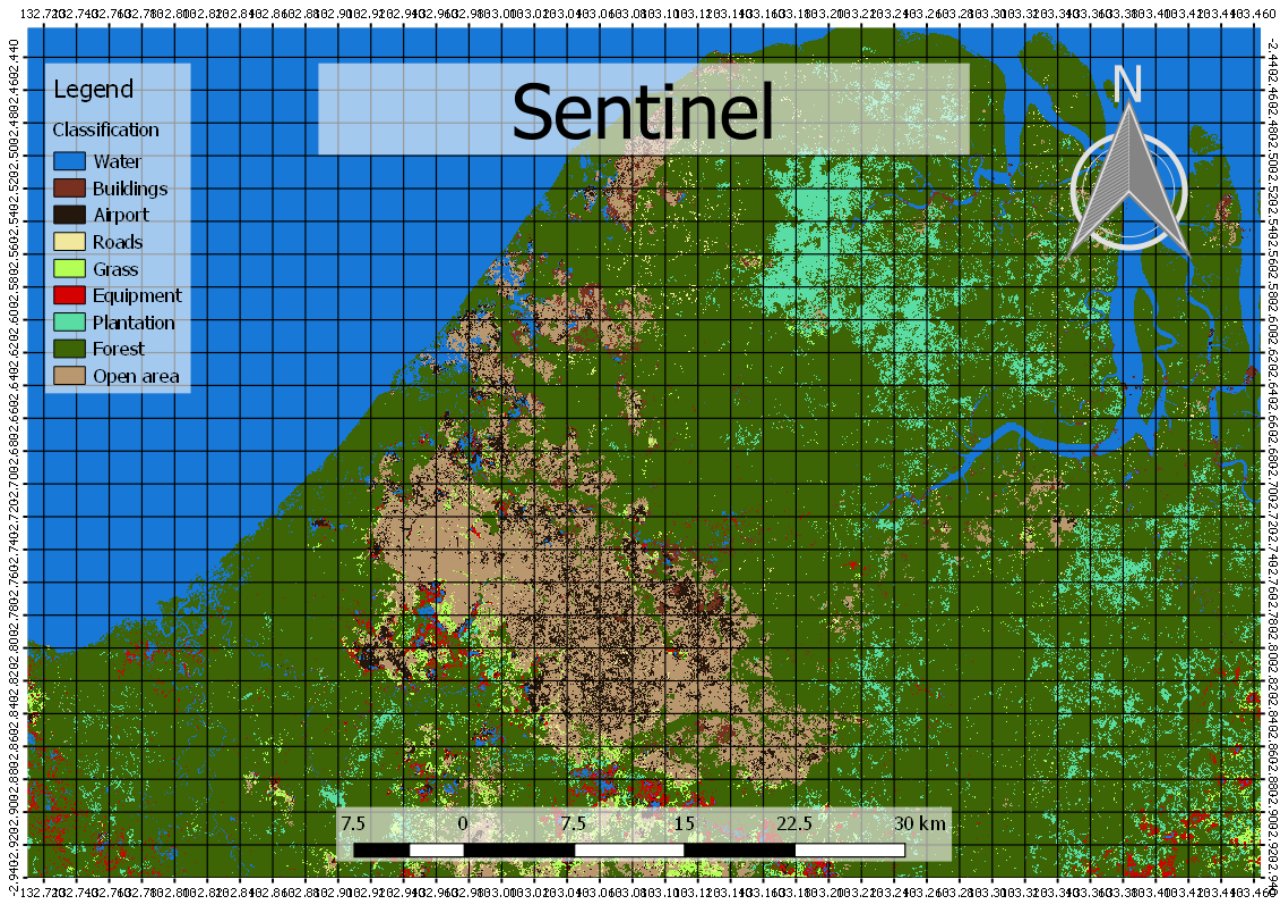


Figure 43 Sentinel-2 averaged clouds classification using CART including the equipment class

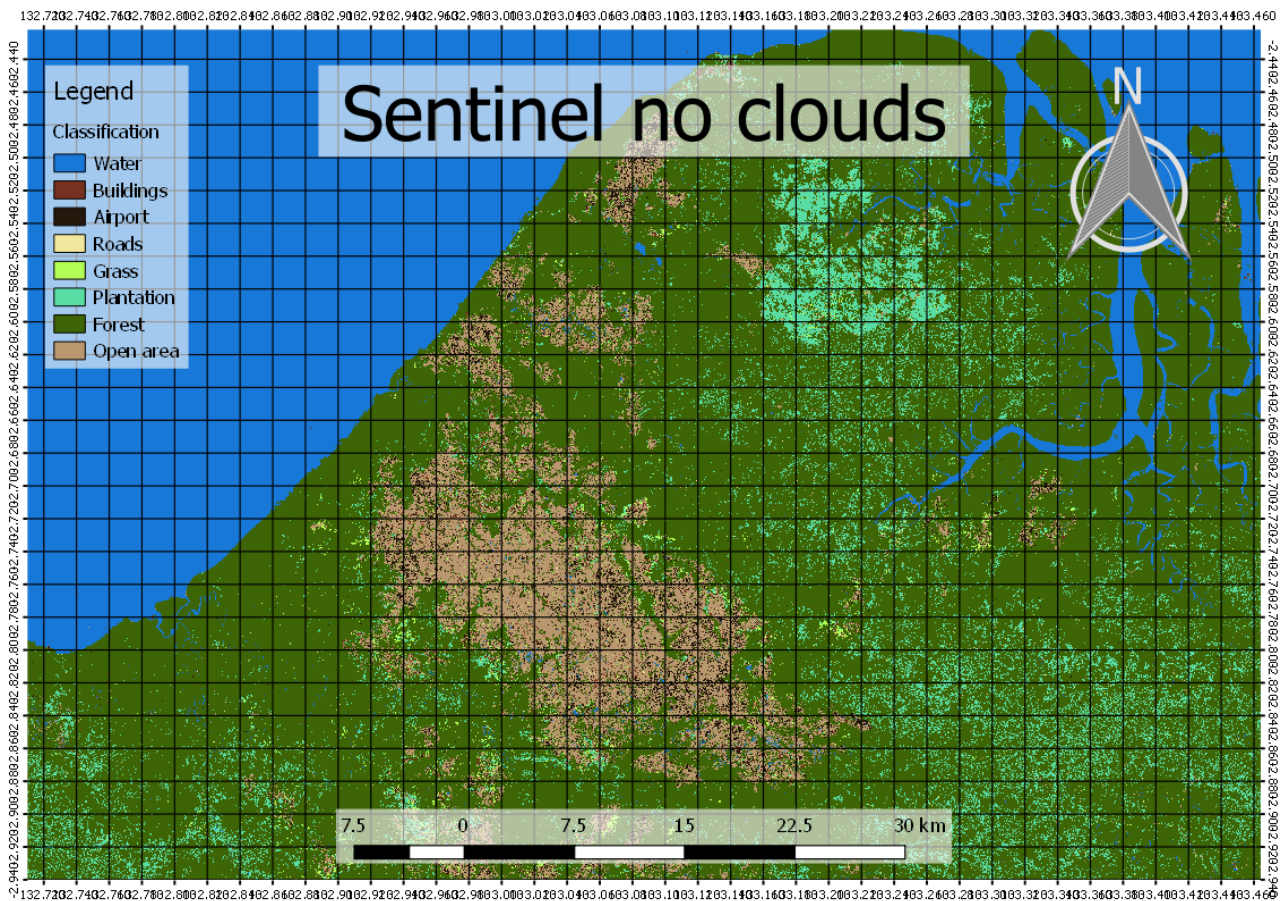


Figure 44 Sentinel-2 with cloud filter classification using CART excluding the equipment class

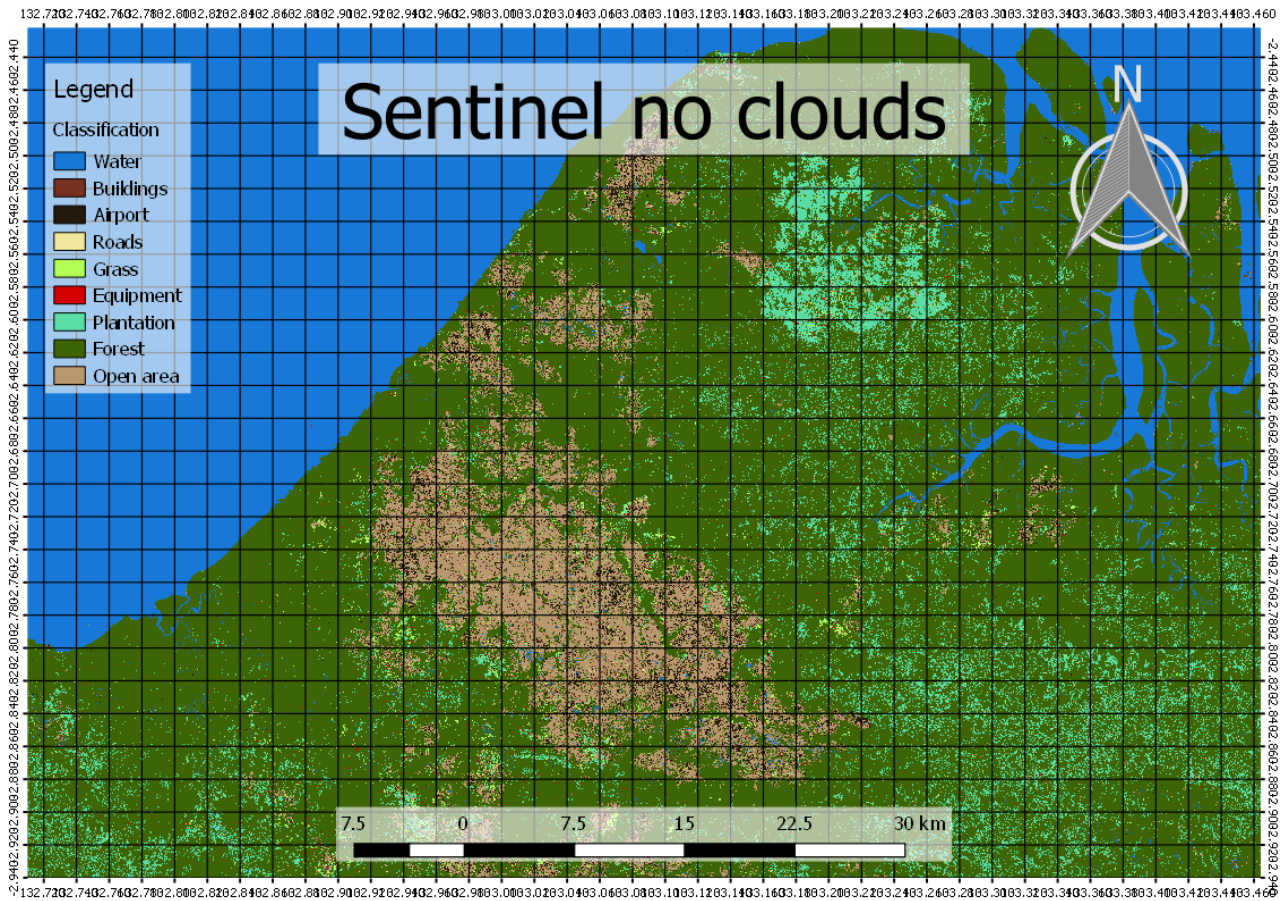


Figure 45 Sentinel-2 with cloud filter classification using CART including the equipment class

3 Thermals

Thermal bands of Landsat 8 and Sentinel-2 showing the top values.

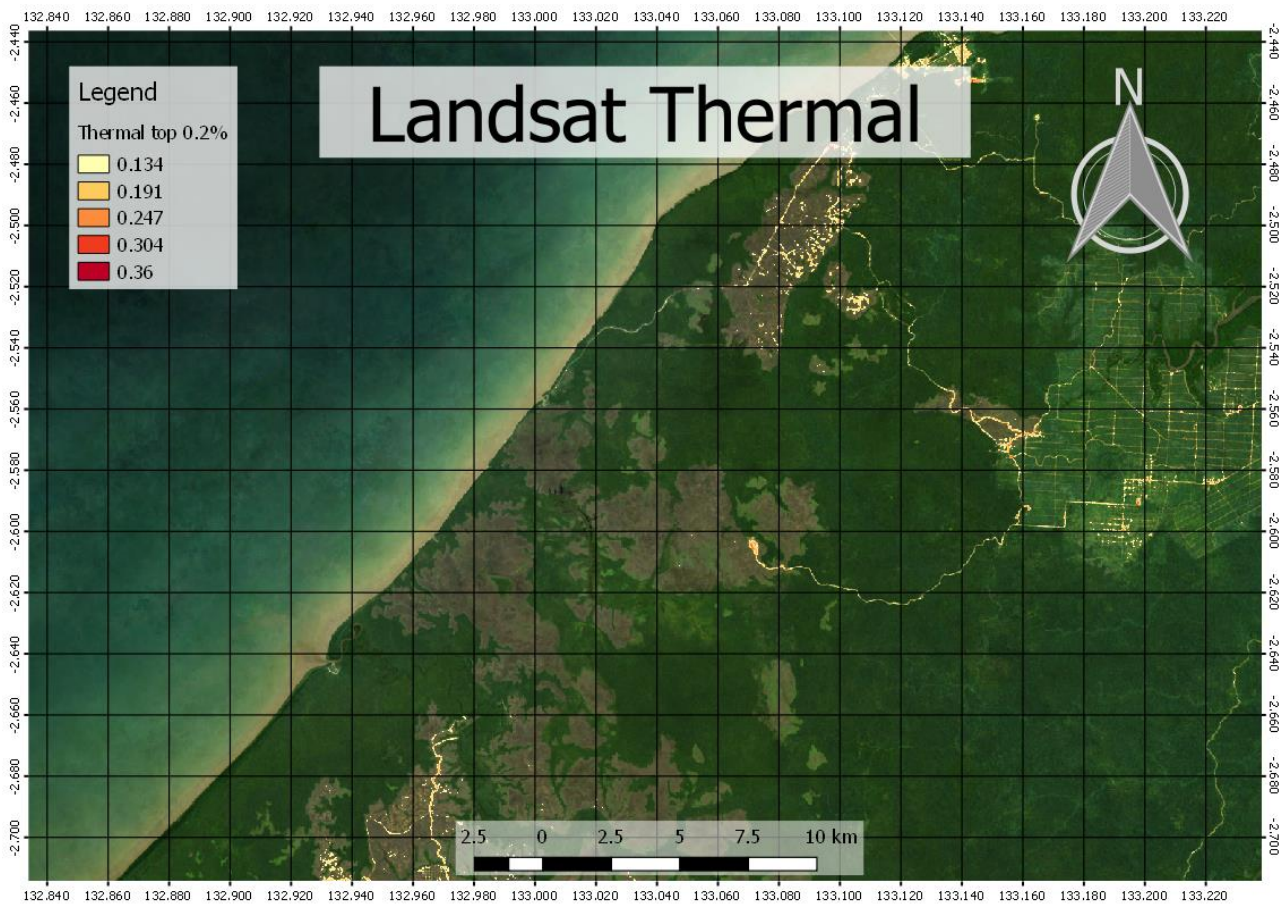


Figure 46 Landsat 8 thermal band 7 top 0.2% of the values

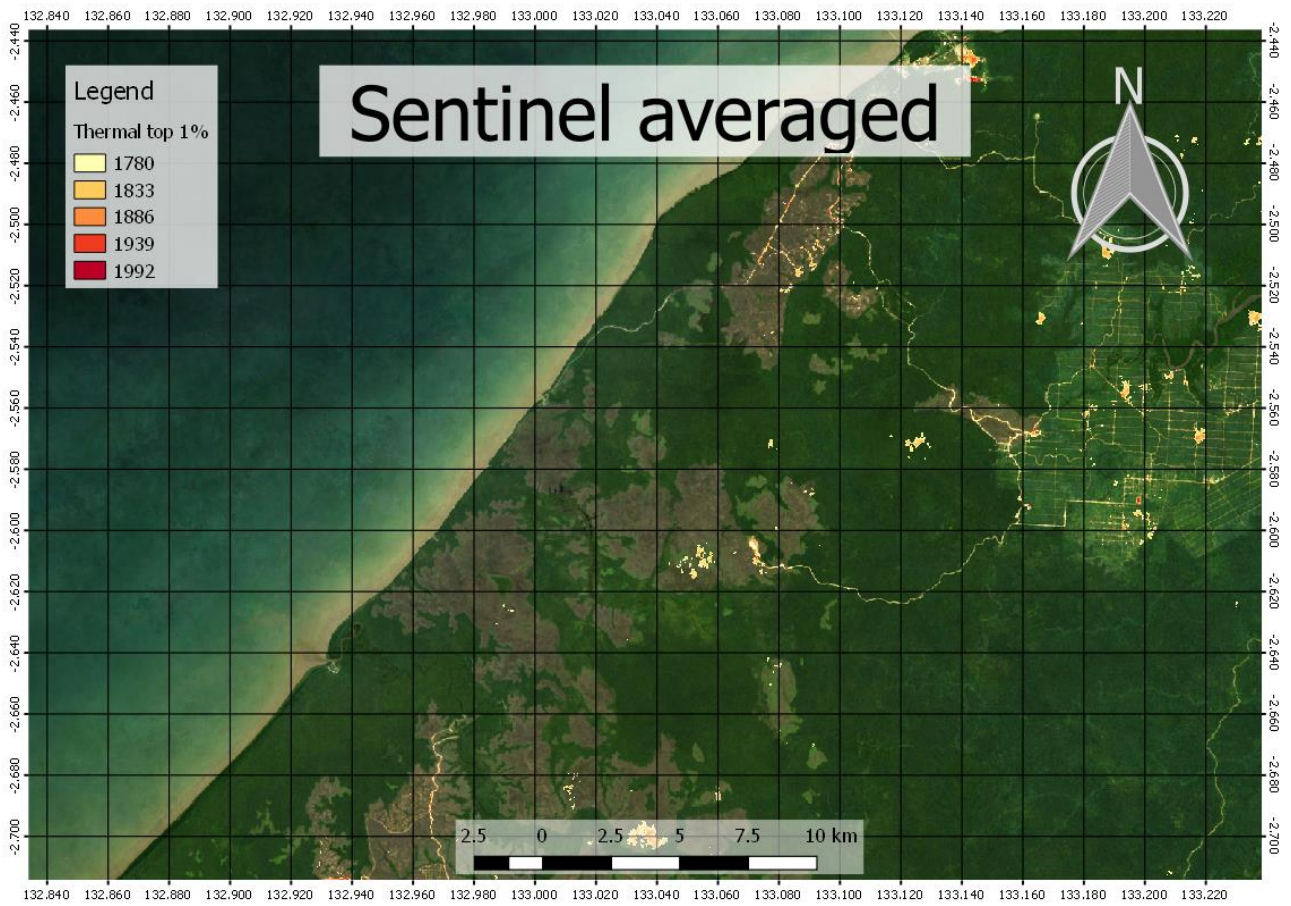


Figure 47 Sentinel-2 averaged clouds band 12 top 1% of the values



Figure 48 Sentinel-2 with cloud filter band 12 top 1% of the values