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FOREST FIRE MAPPING USING REMOTE SENSING TECHNIQUE

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CONTENTS :

ABSTRACT:

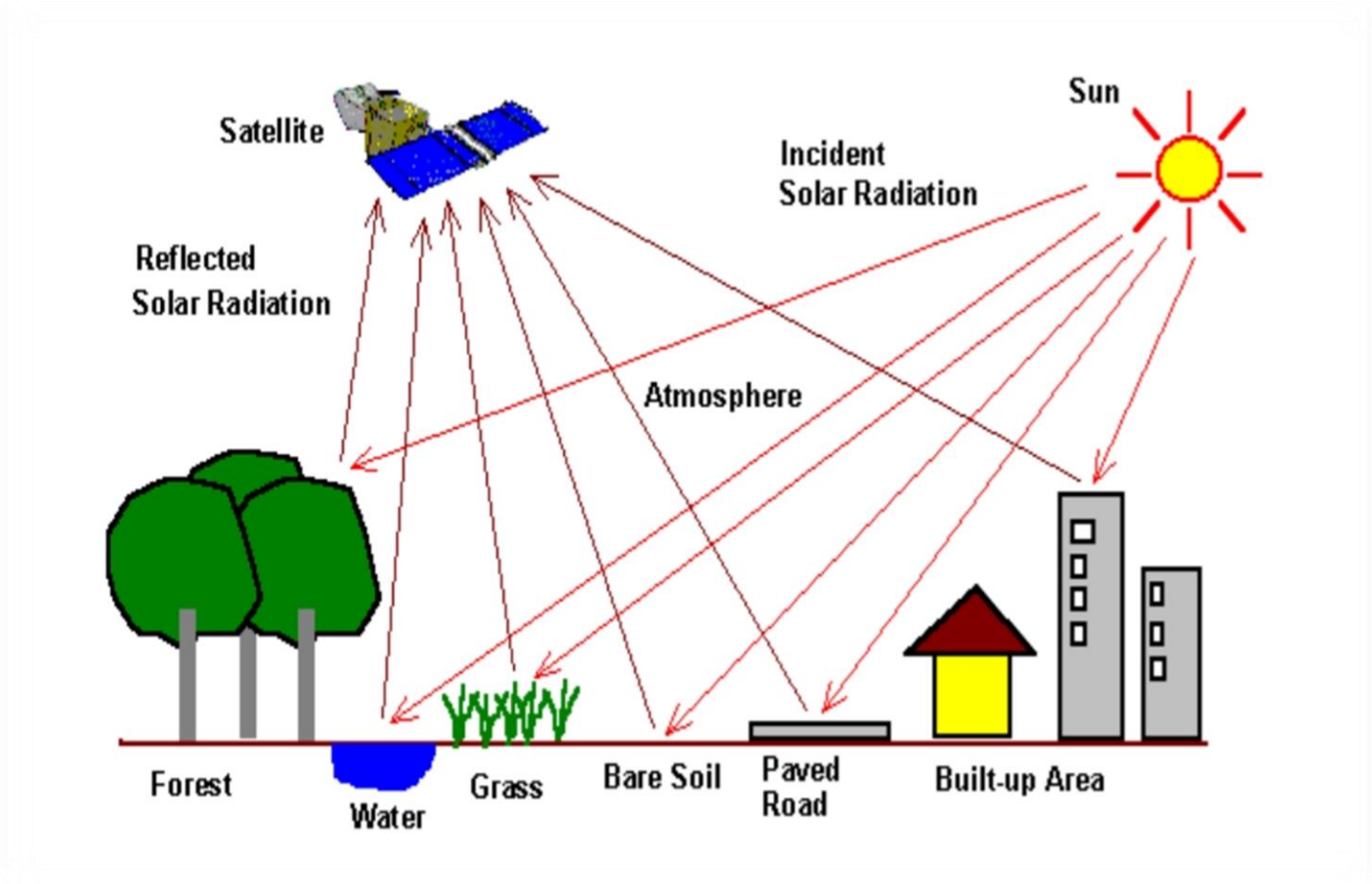
Forest fire is a major hazard around the world that seriously affects the terrestrial, aquatic, and atmospheric systems. Remote sensing methods are found to be efficient in mapping forest fires and analyzing the postfire effects through change detection. We use sentinal-2 satellite to collect data and mapping will be done through SNAP and QGIS tool. Also, we use various spectral indices such as Normalized Burn Ratio (NBR), Differenced Normalized Burn Ratio (DNBR) and Relativized Burn Ratio (RBR). We apply these spectral indices to sentinel-2 images, then it is possible to estimate the severity of the fire.

INTRODUCTION:

•Remote sensing, which is a cost-effective approach, is currently used to delineate fire events at different scales and to provide estimations on fire severity, monitor postfire vegetation regeneration, and analyze the significance of the physical environment in vegetation dynamics.

Remote Sensing :

- Active Remote Sensing
- Passive Remote sensing



STUDY AREA:

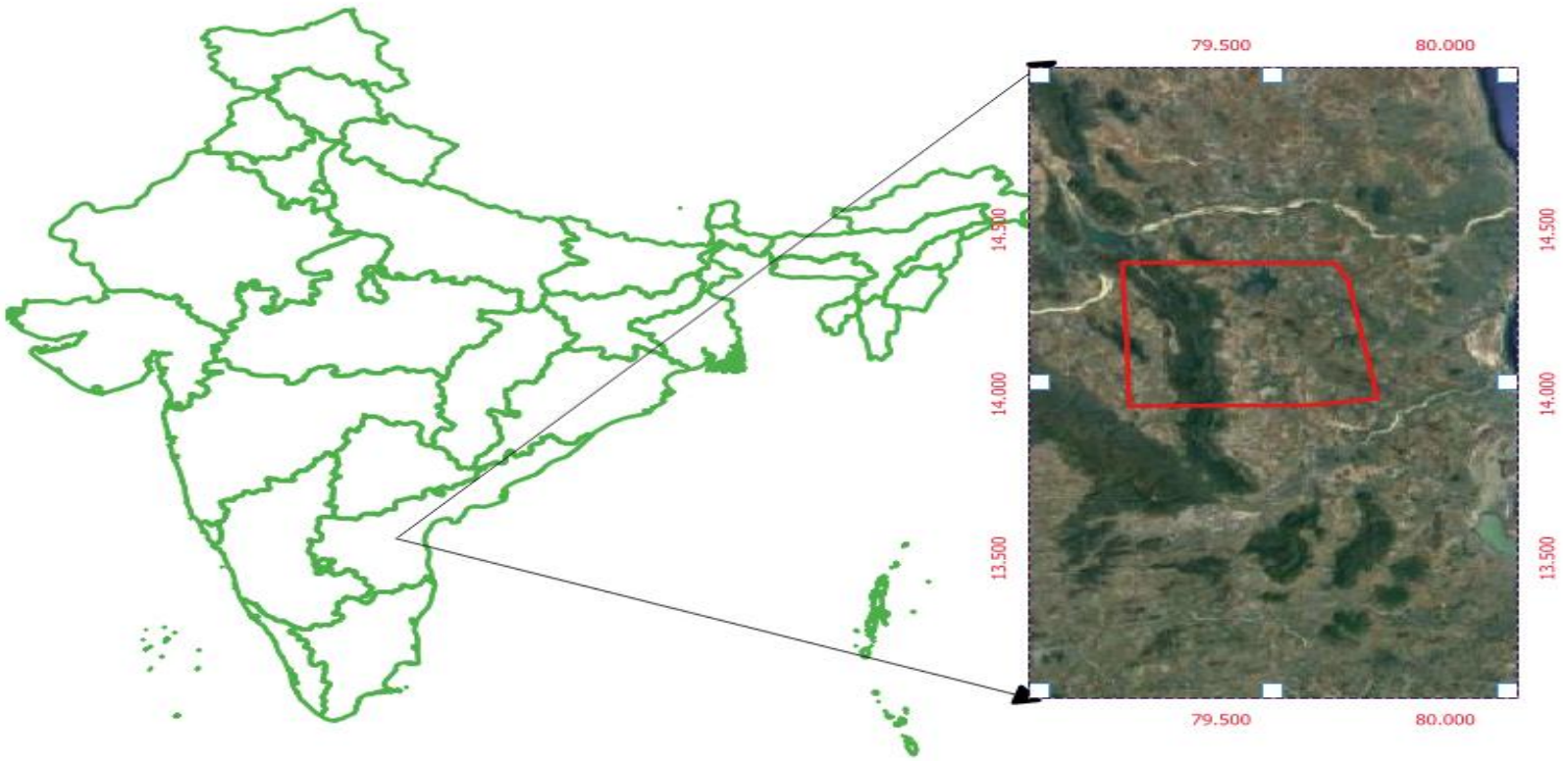


Fig: Between Nellore and Kadapa Region

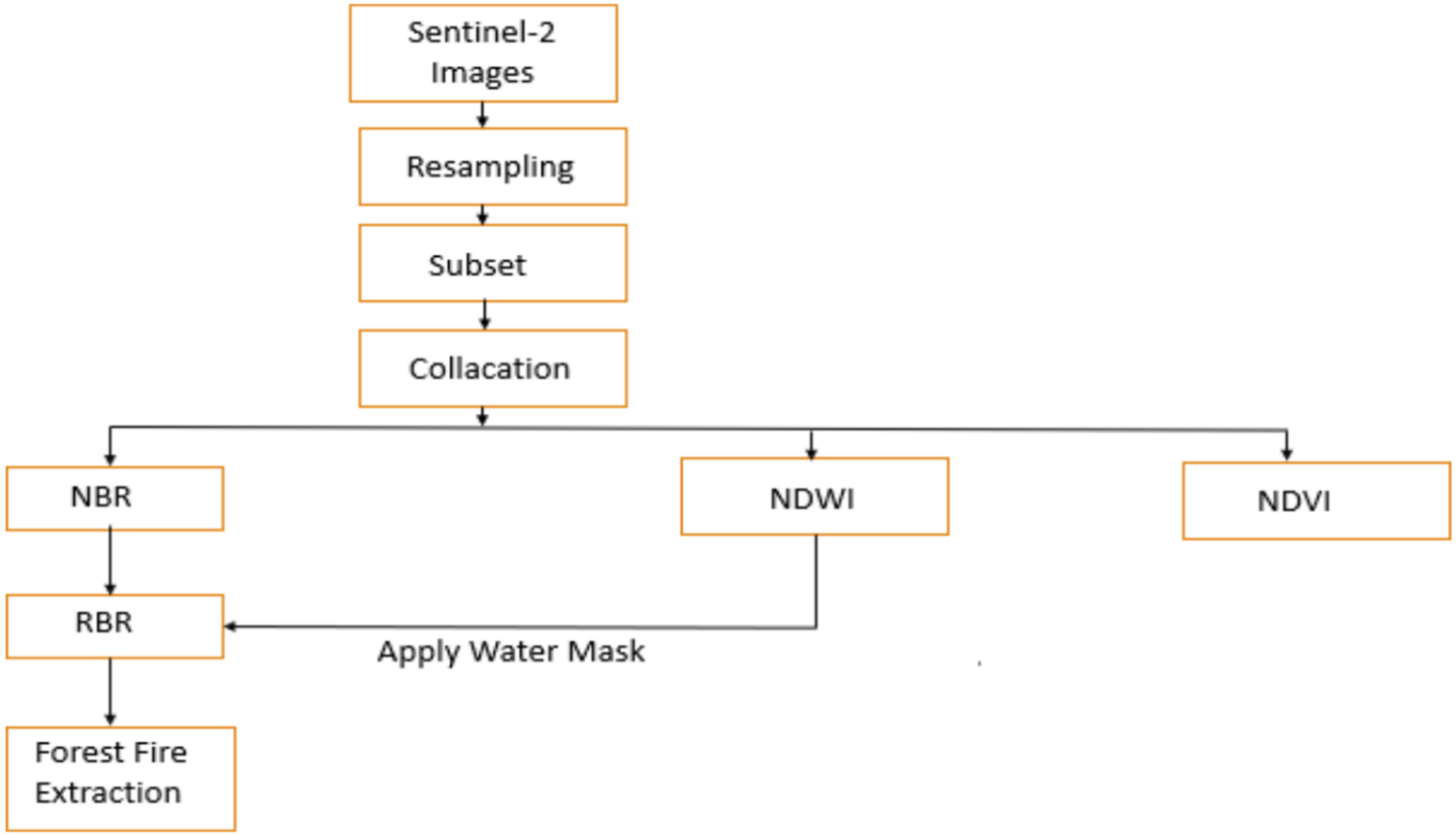
DATA USED : SENTINAL-2

The main objective of Sentinel-2 satellite are providing data for risk management, land use and land cover mapping, change detection, natural hazards, water management. Sentinel-2 gives global coverage every five days. It is equipped with a multispectral imager (MSI) with 13 bands

Sentinal–2 Bands:

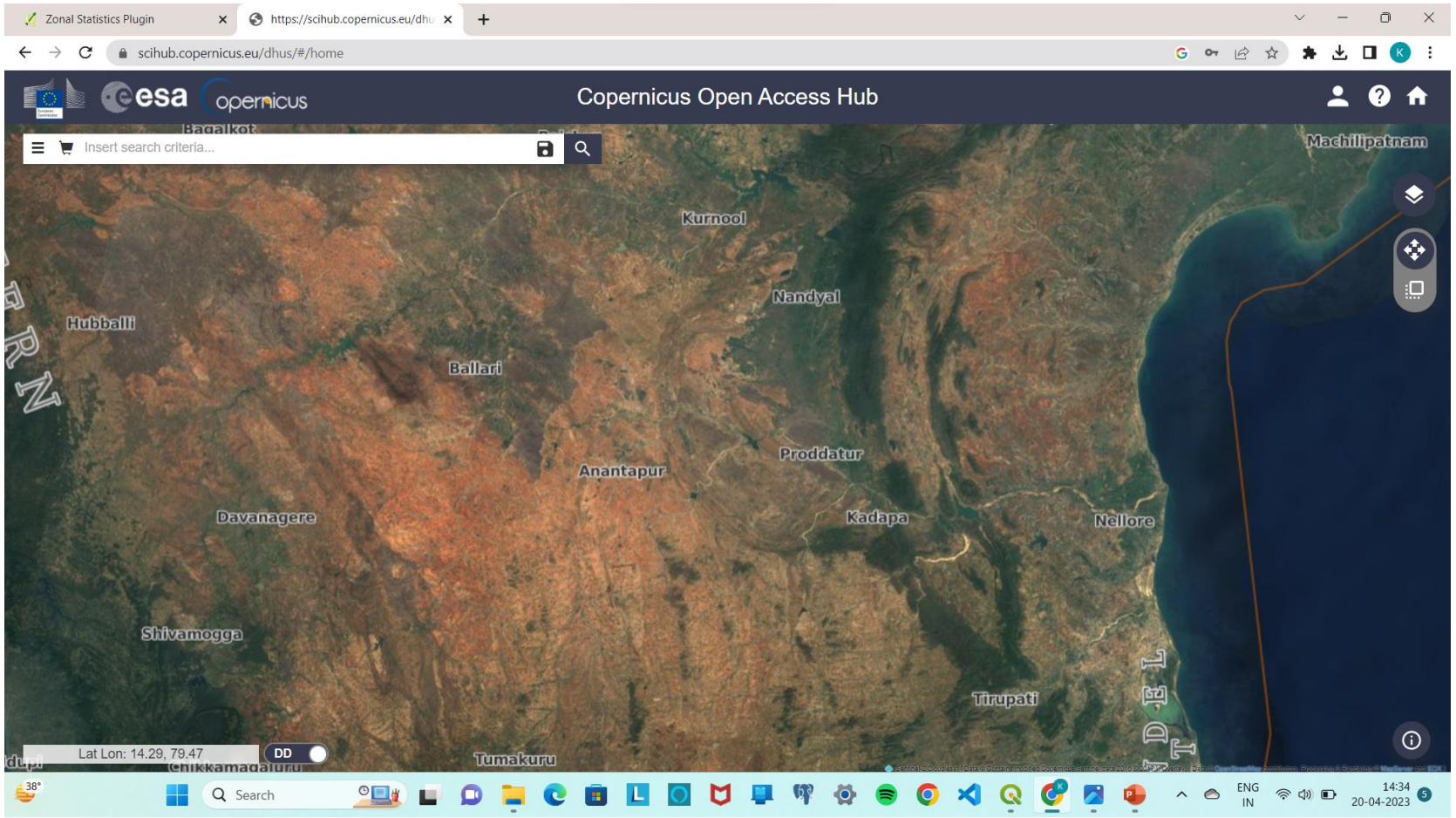
Band	Resolution	Central Wavelength	Description
B1	60 m	443 nm	Ultra Blue (Coastal and Aerosol)
B2	10 m	490 nm	Blue
B3	10 m	560 nm	Green
B4	10 m	665 nm	Red
B5	20 m	705 nm	Visible and Near Infrared (VNIR)
B6	20 m	740 nm	Visible and Near Infrared (VNIR)
B7	20 m	783 nm	Visible and Near Infrared (VNIR)
B8	10 m	842 nm	Visible and Near Infrared (VNIR)
B8a	20 m	865 nm	Visible and Near Infrared (VNIR)
B9	60 m	940 nm	Short Wave Infrared (SWIR)
B10	60 m	1375 nm	Short Wave Infrared (SWIR)
B11	20 m	1610 nm	Short Wave Infrared (SWIR)
B12	20 m	2190 nm	Short Wave Infrared (SWIR)

BLOCK DIAGRAM:

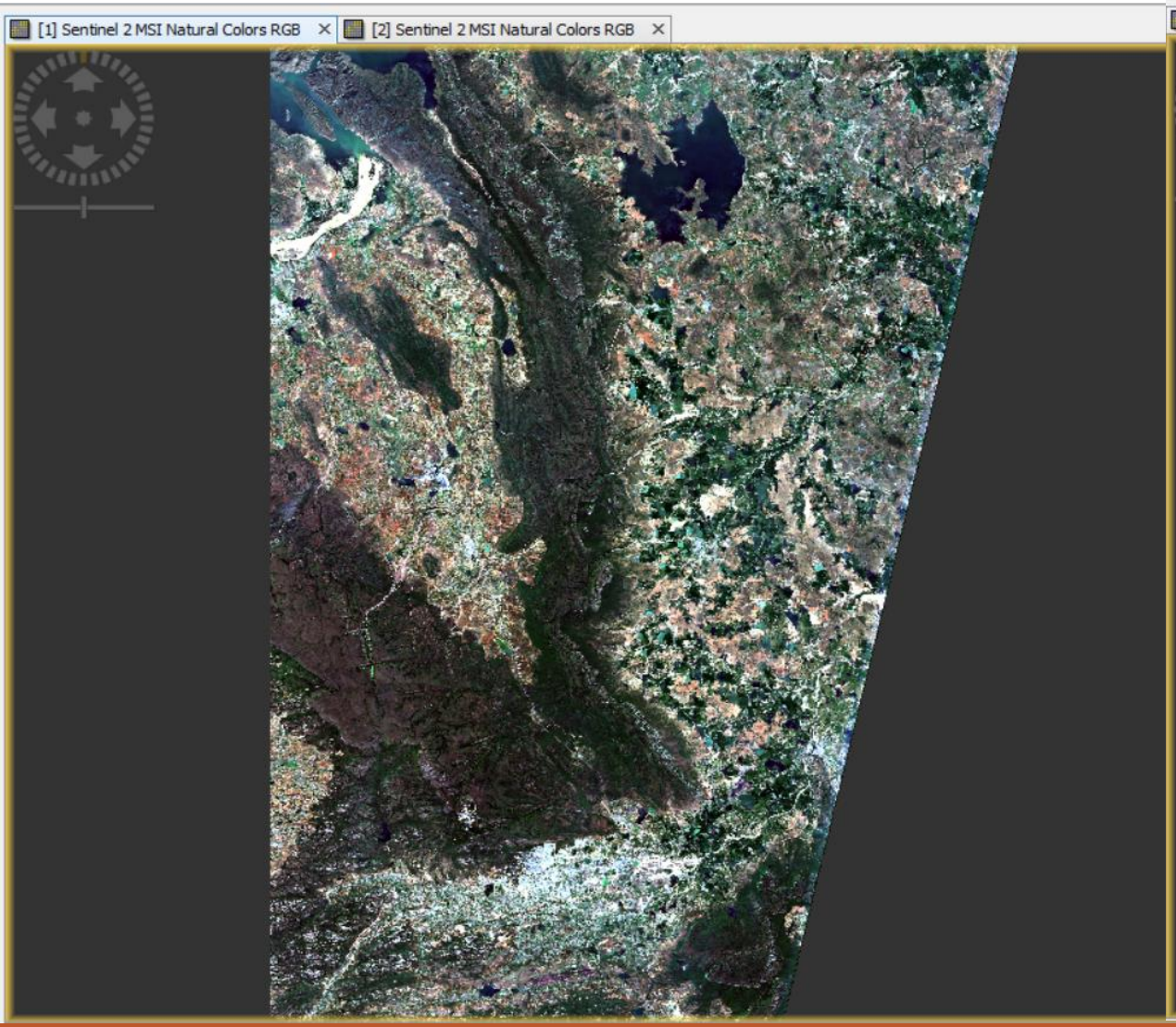


Procedure:

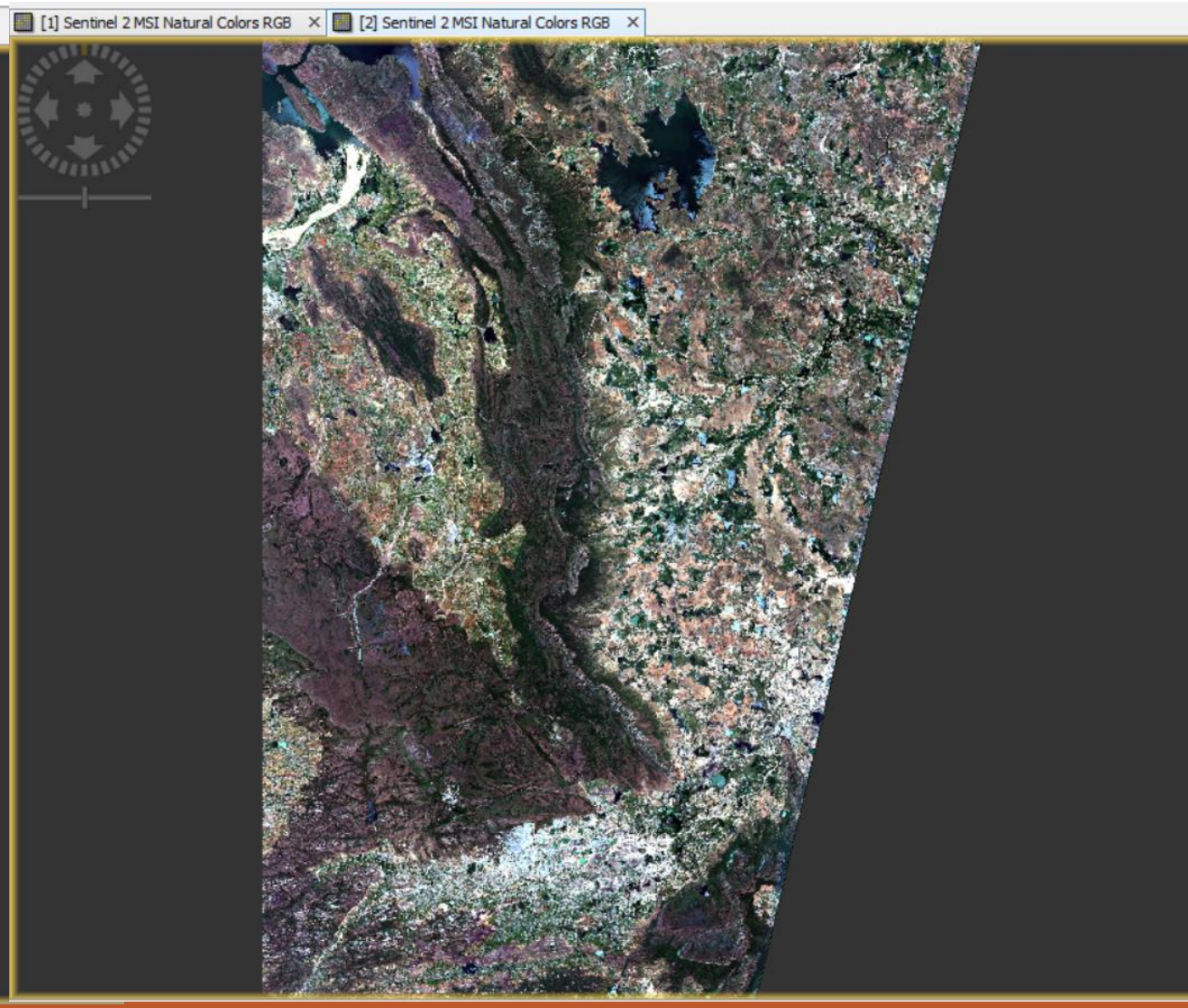
Step-1 : Firstly , We open the copernicus open access hub and select the interested region and download the data



Step-2 : By using SNAP Tool we can extract the satellite data that we have downloaded from the Copernicus open access hub.



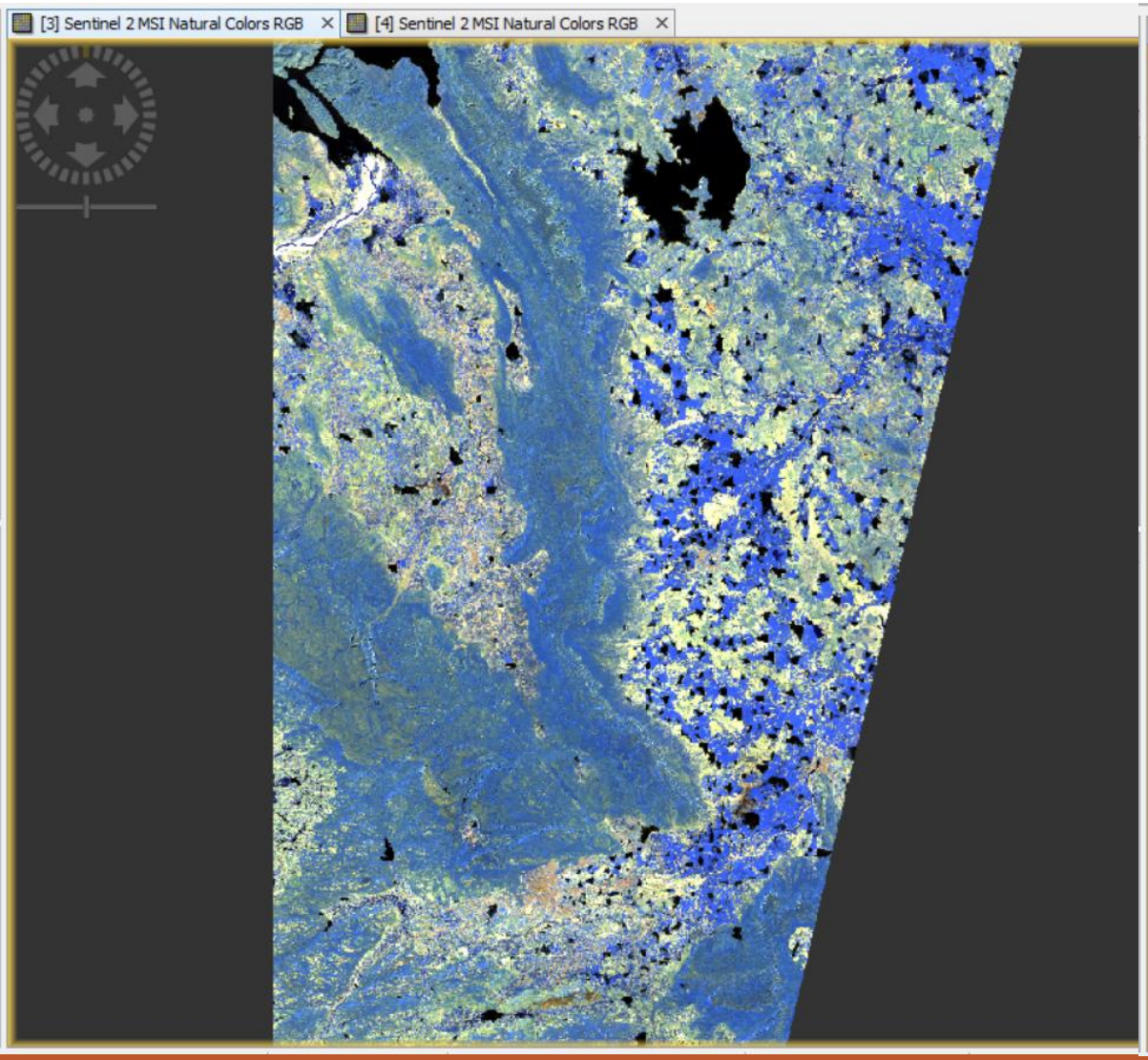
Pre Event Natural Colour Image



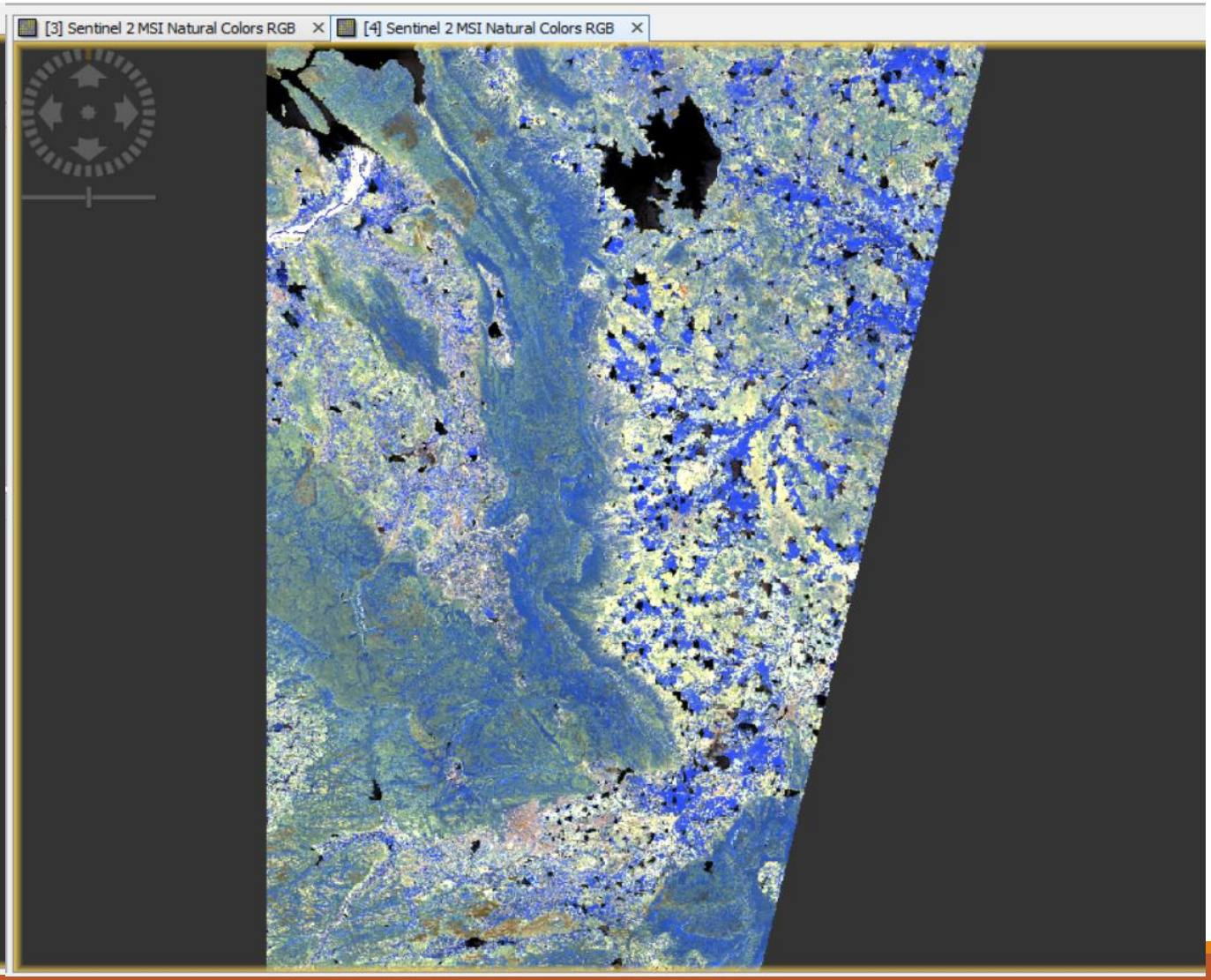
Post Event Natural Colour Image

Step-3: We convert Natural colour image to Resampled image using SNAP Tool

Raster -> Geometric -> Resampling



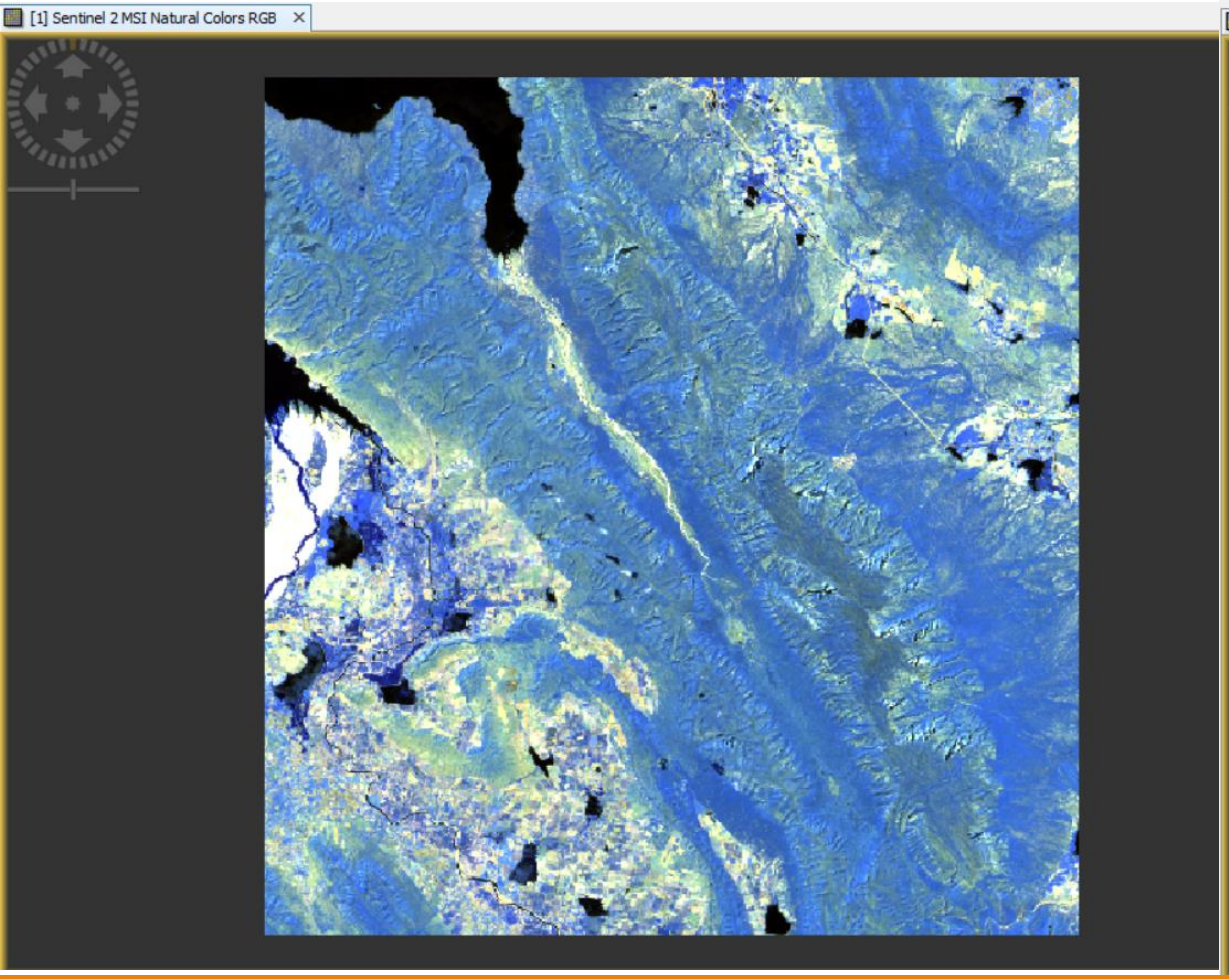
Pre Event Resampled Image

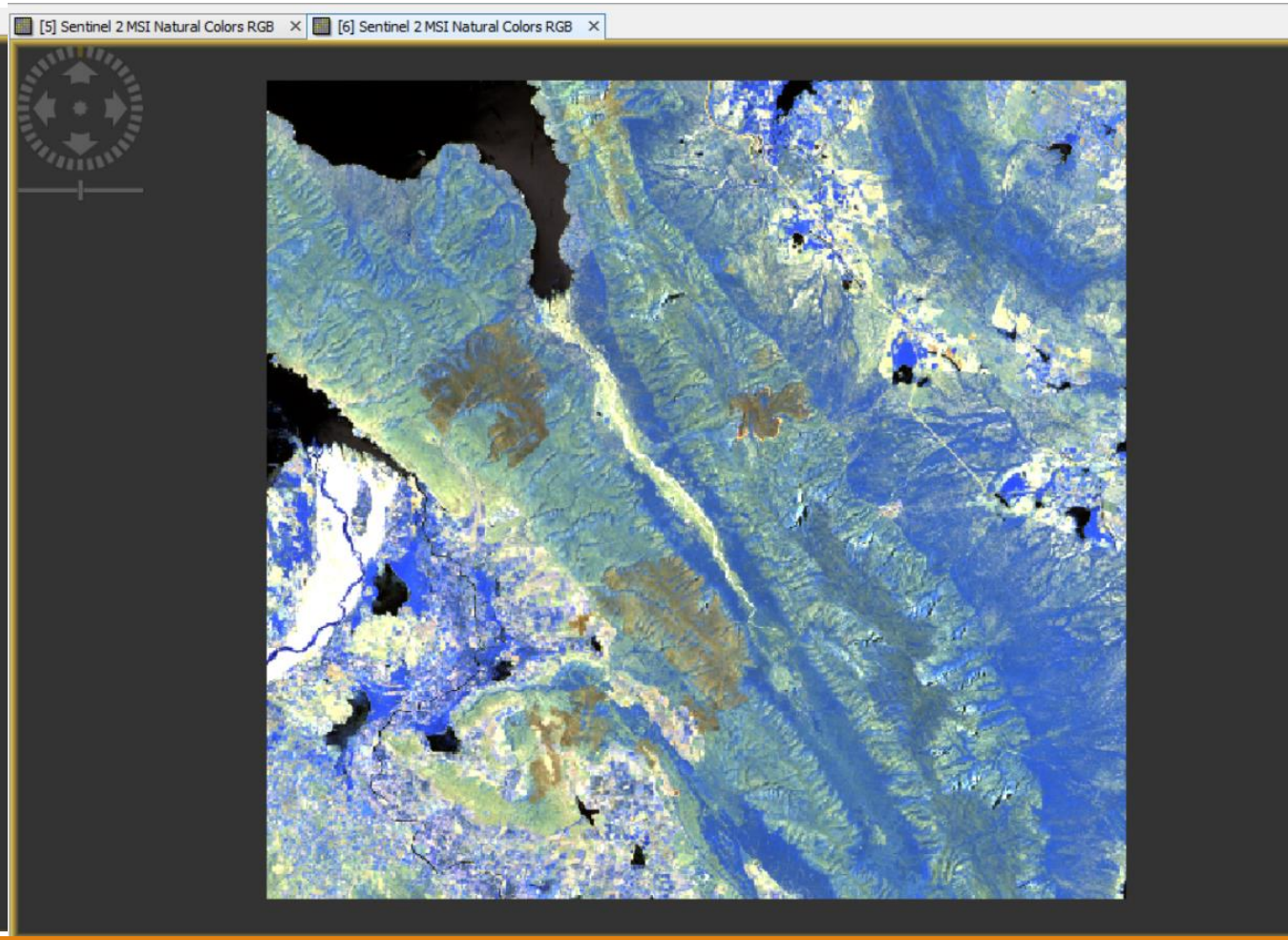


Post Event Resampled Image

Step-4 : We perform the Subset operation on the resampled image

Raster -> Subset





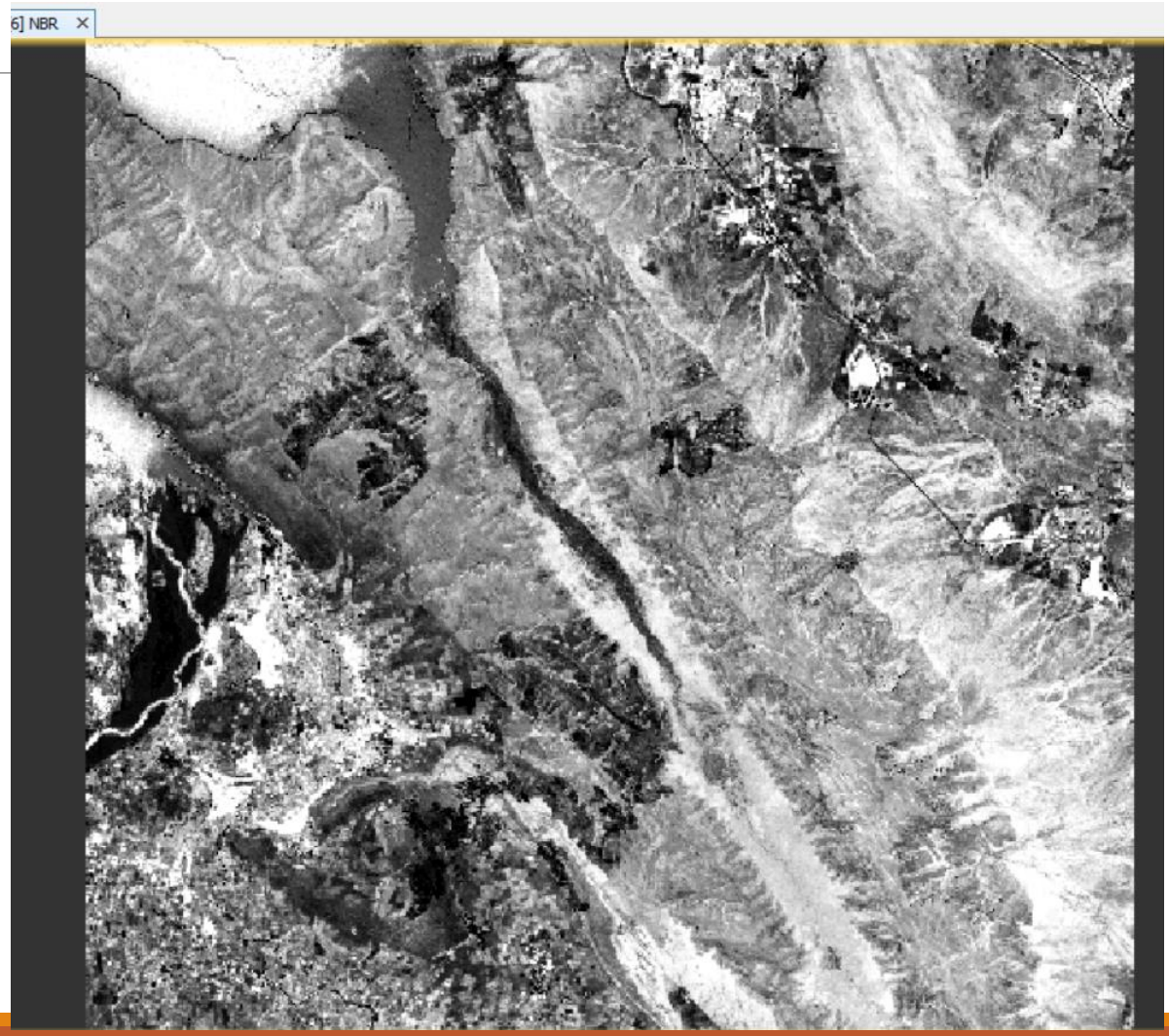
Pre Event Subset Image

Post Event Subset Image

Step-5 : We calculate NBR for both Pre & Post Subset images

NBR = (B8 – B12) / (B8 + B12)

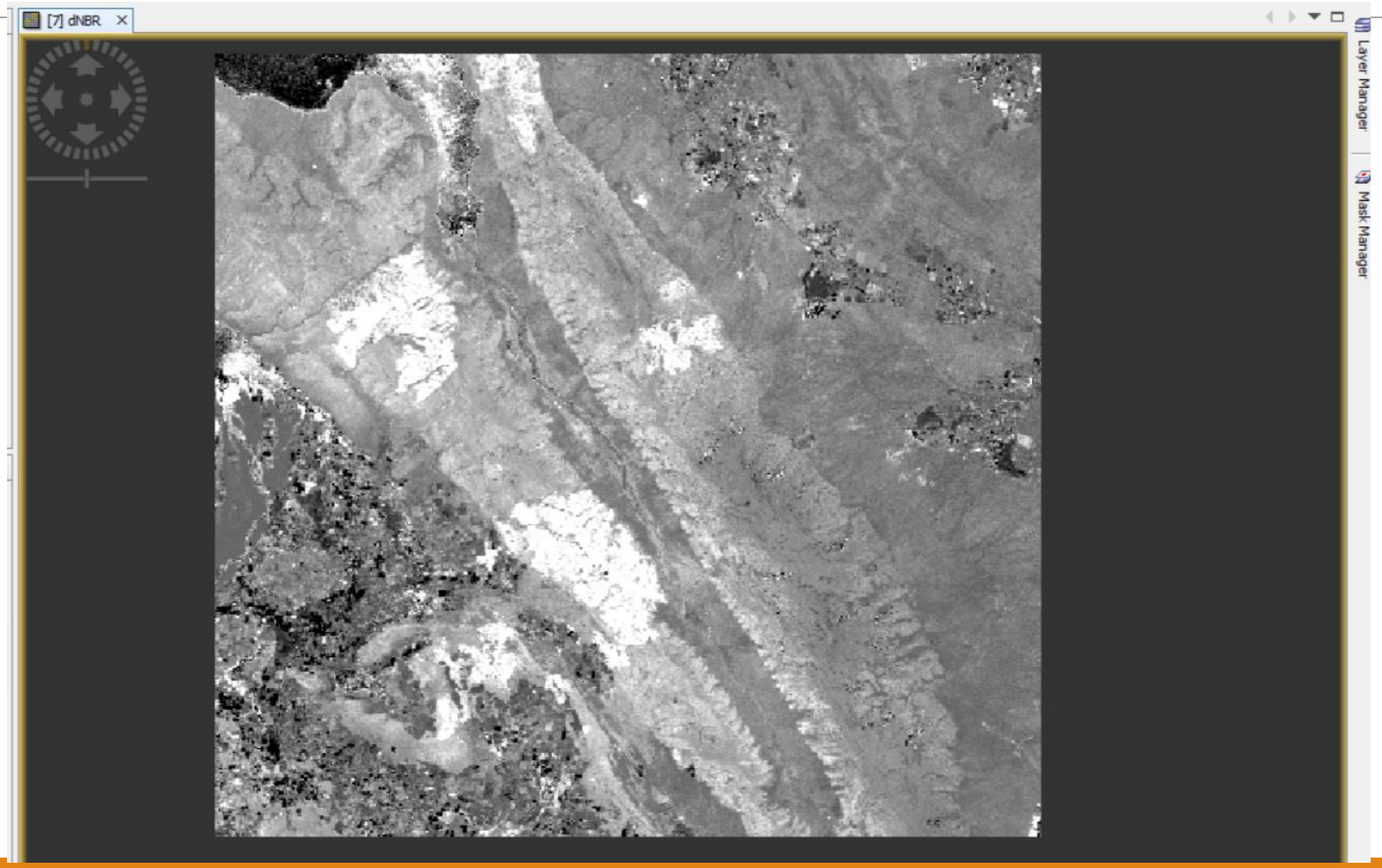
NBR for Pre Event Subset Image



NBR For Post Event Subset Image

Step-6 : We perform the Collacation Operation on the Subset images. In this collacation Process the bands in both pre & post event subset images will be merged So , we can calculate DNBR

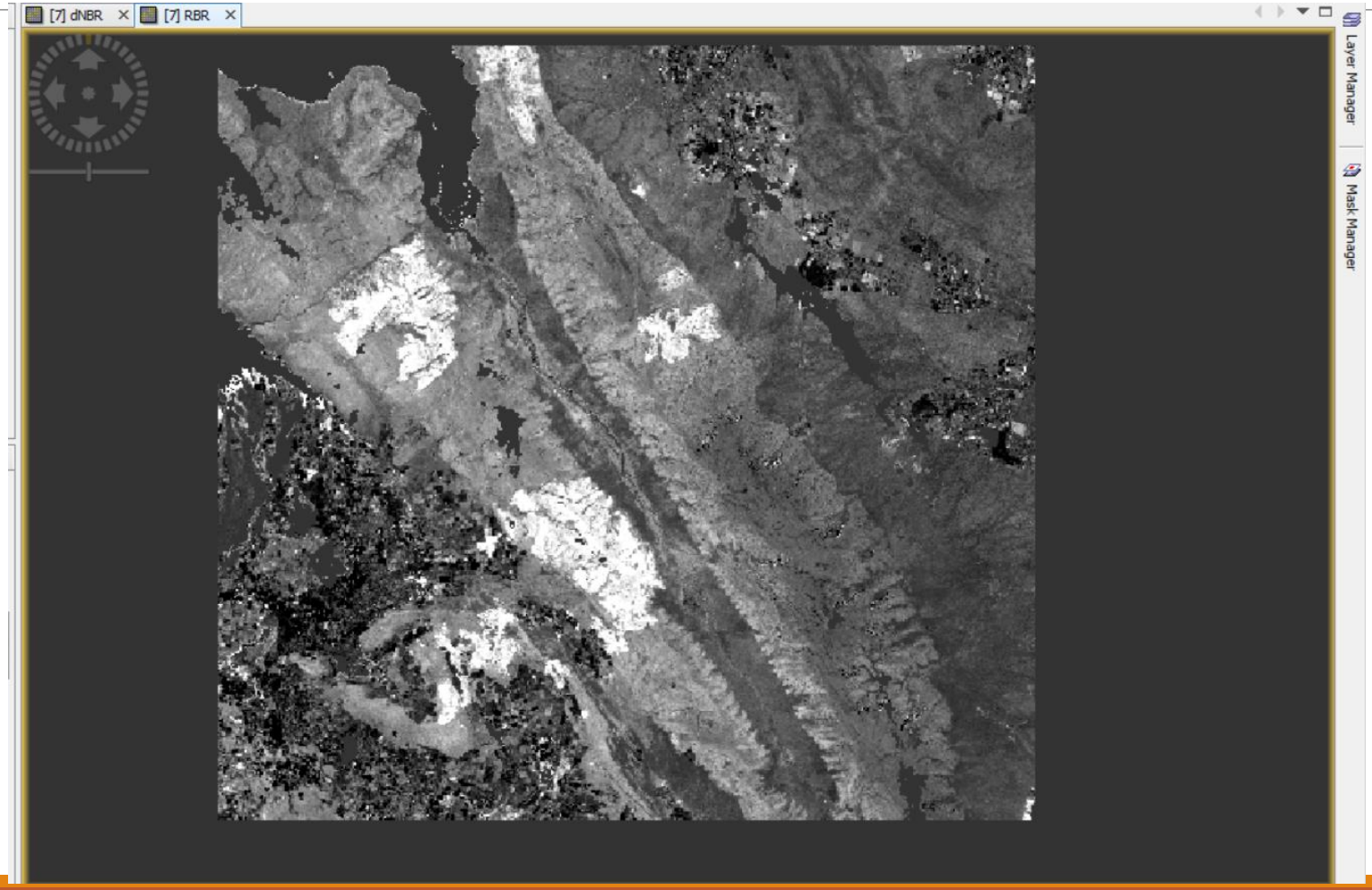
DNBR = NBR(pre-fire) – NBR(post-fire)



DNBR image

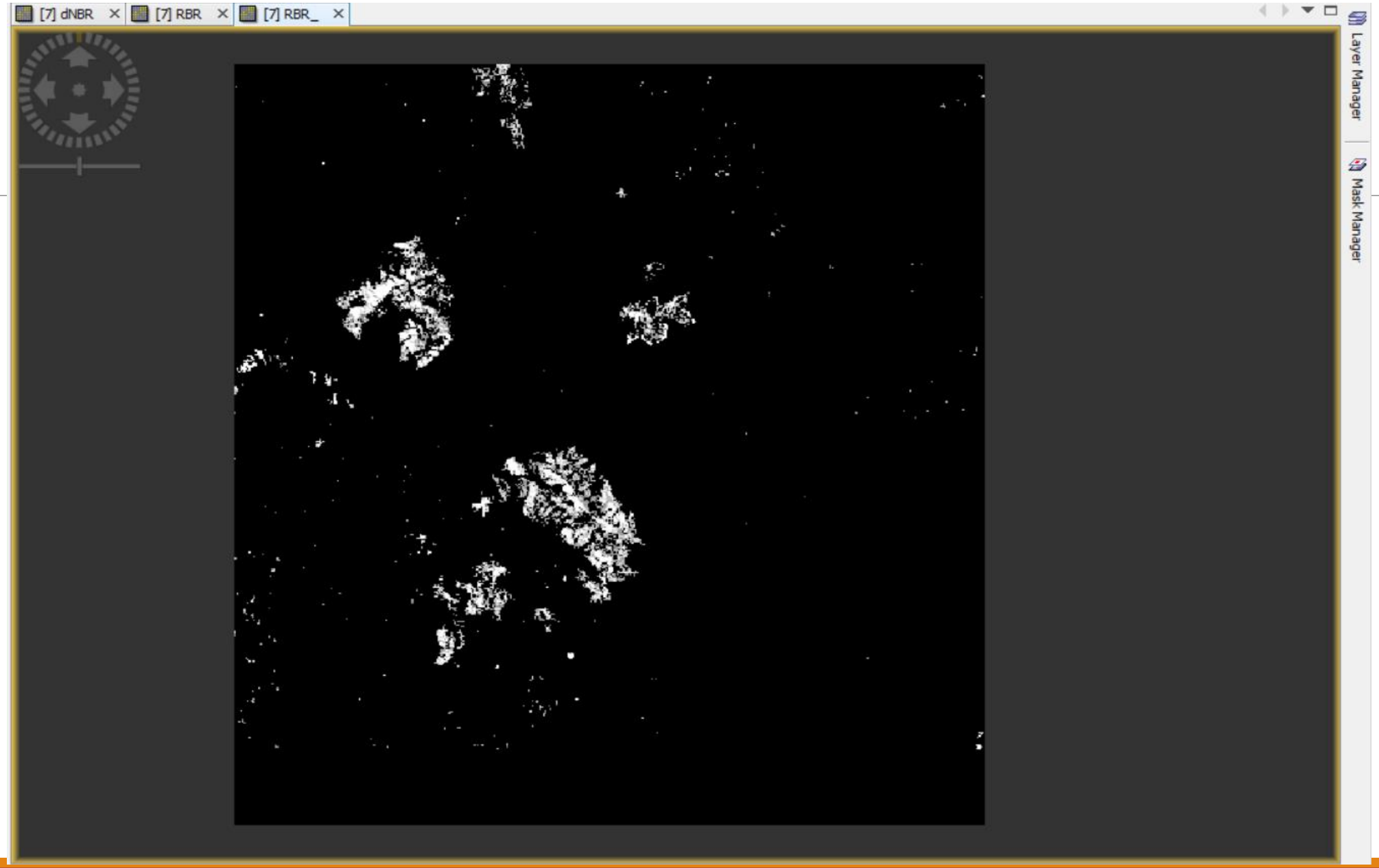
Step-7 : Then we calculate RBR.

$$RBR = (dNBR(NBRpre - fire + 1.001))$$

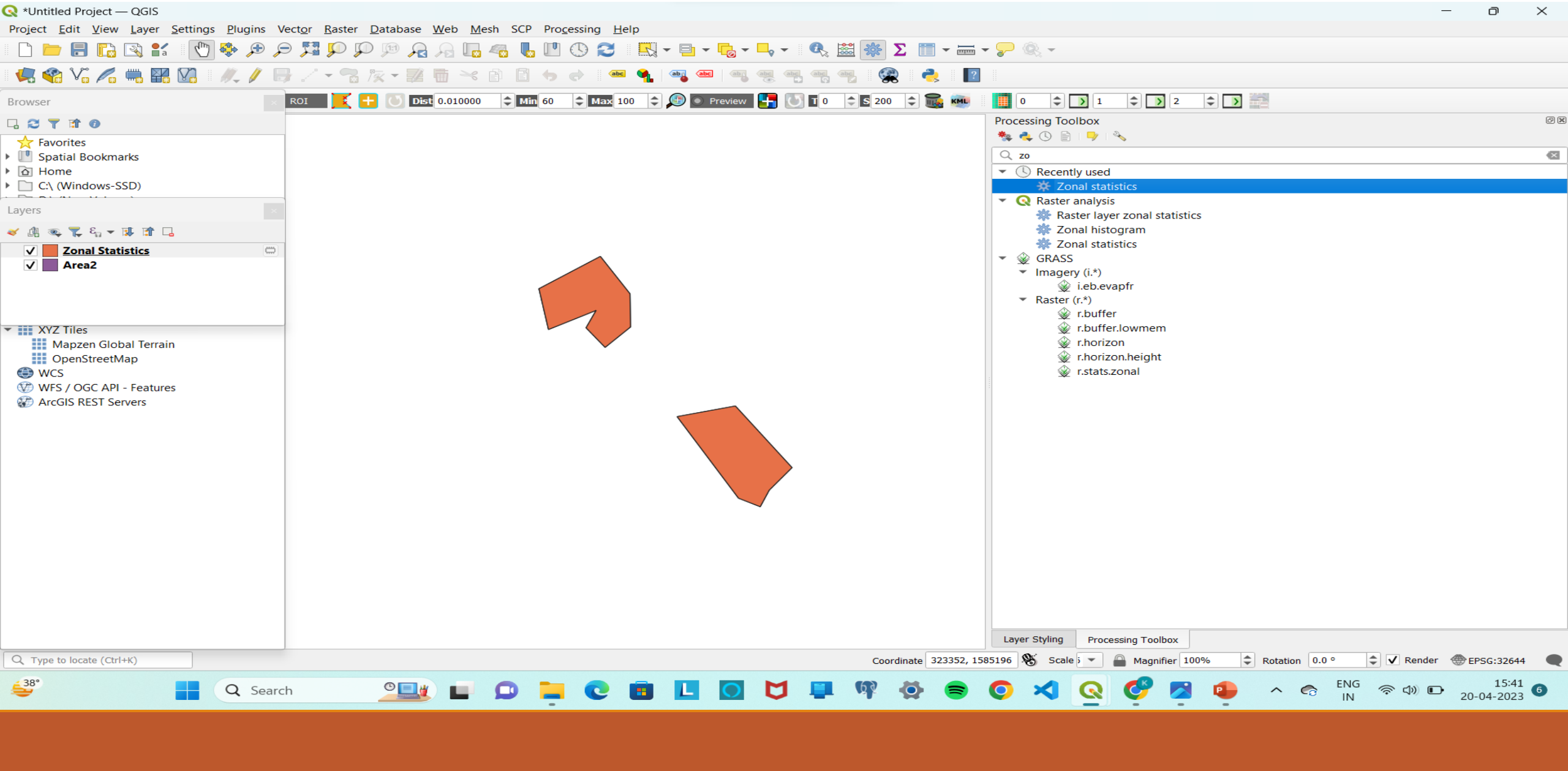


RBR Image

Step-8 : In this step we remove water bodies and thus the burnt area will be highlighted.



Step-9 : We export the above image to QGIS tool and we create the shape file and we perform Zonal Statistics on shape file.



RESULTS:

Zonal Statistics — Features Total: 2, Filtered: 2, Selected: 0

123 id = ε 123

	id	_count	_mean	_median	_variance	_Area
1	1	3678	0.26546147855...	0.28032198548...	0.00631688775...	13.328
2	2	3184	0.25624022646...	0.26745235919...	0.00791743718...	11.534

CONCLUSION:

- Wildfire will continue to affect source water quality resulting to increasing treatment, maintenance and operating costs.

- Therefore, forest and watershed managers and water suppliers have to be well informed about wildfire impacts so as to develop mitigation strategies to build resiliency to wildfire in water supply.

- Recommended strategies to be fully developed and implemented, they should collect substantial information about magnitude and timing of post-fire impacts.

- But the bottom line is that wildfire impacts should be incorporated into routine planning, protection and operations of forests watersheds and water sources.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