

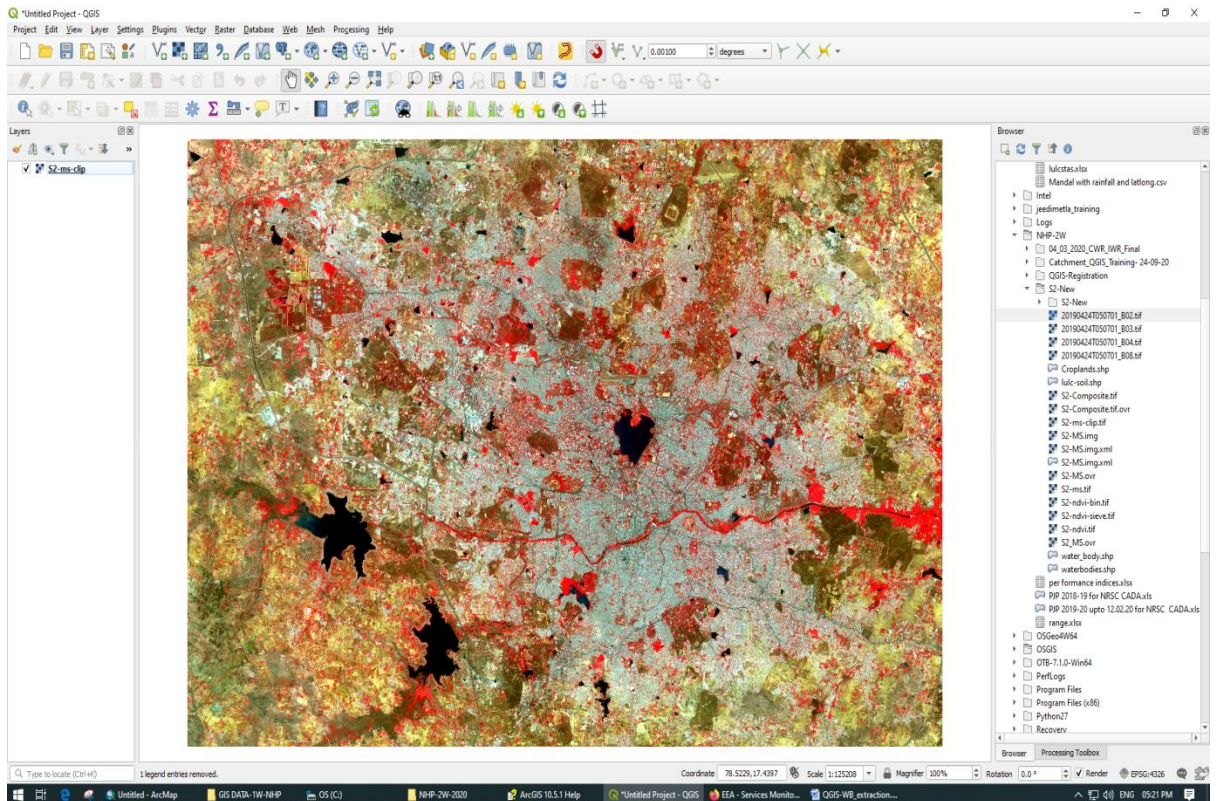
QGIS Hands-on Exercise

Water Body Extraction using QGIS

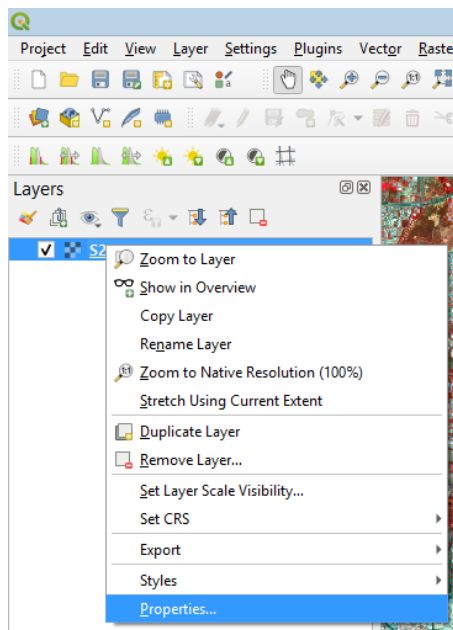
Raster data model is a pixel or grid based model suited for representing continuous data of any natural features, phenomenon, process or event. This exercise will help to understand how to use raster calculator for image analysis in QGIS.

Step I. Display Raster

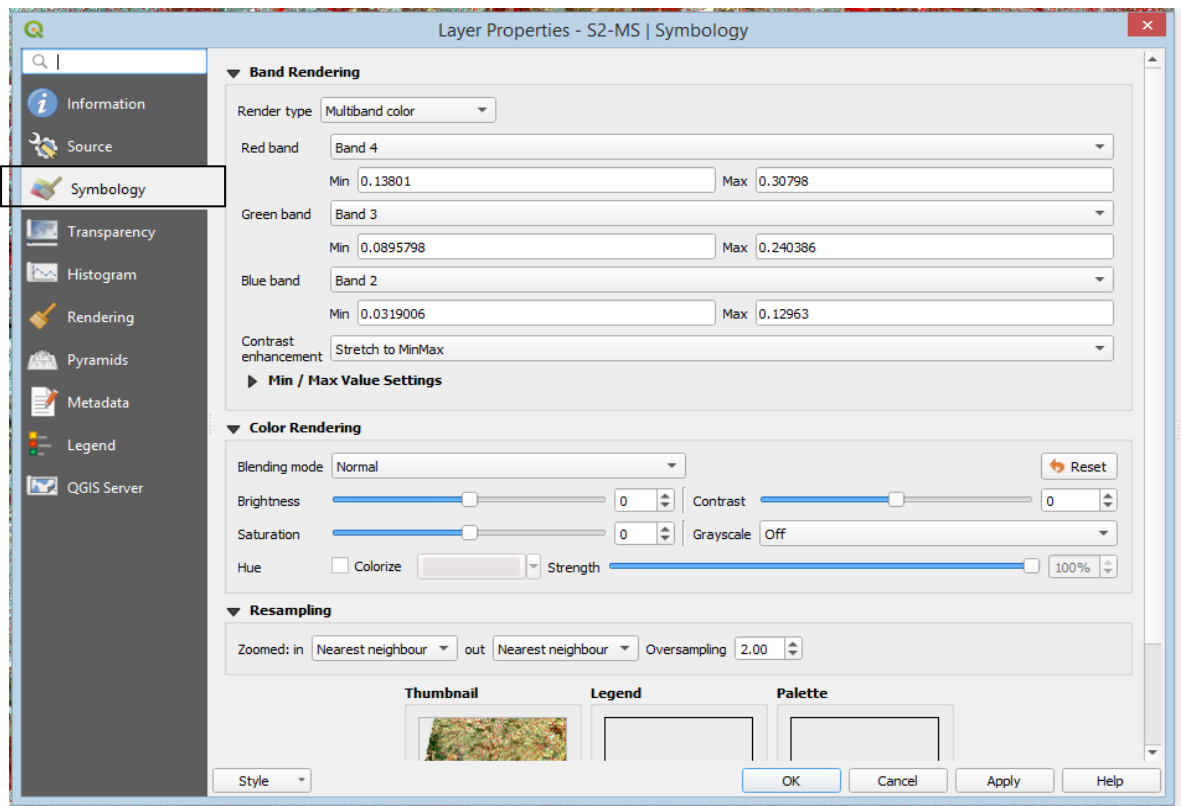
1. Load Sentinel 2 multispectral data S2-ms-clip.tif into QGIS canvas




2. Right click on the layer to invoke the context menu and click properties



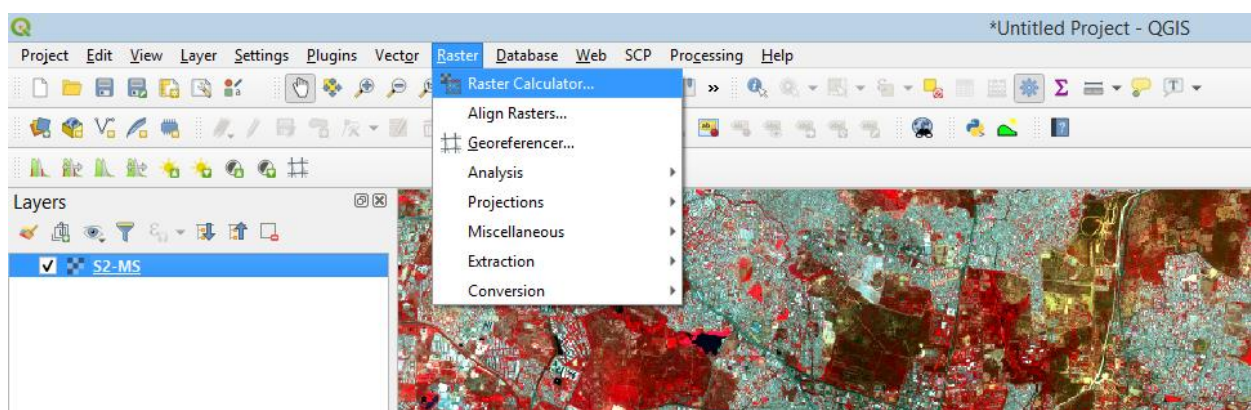
- Go to symbology and change the band combinations to Red – 4, Green – 3, Blue – 2 to and click apply to display false color composite.



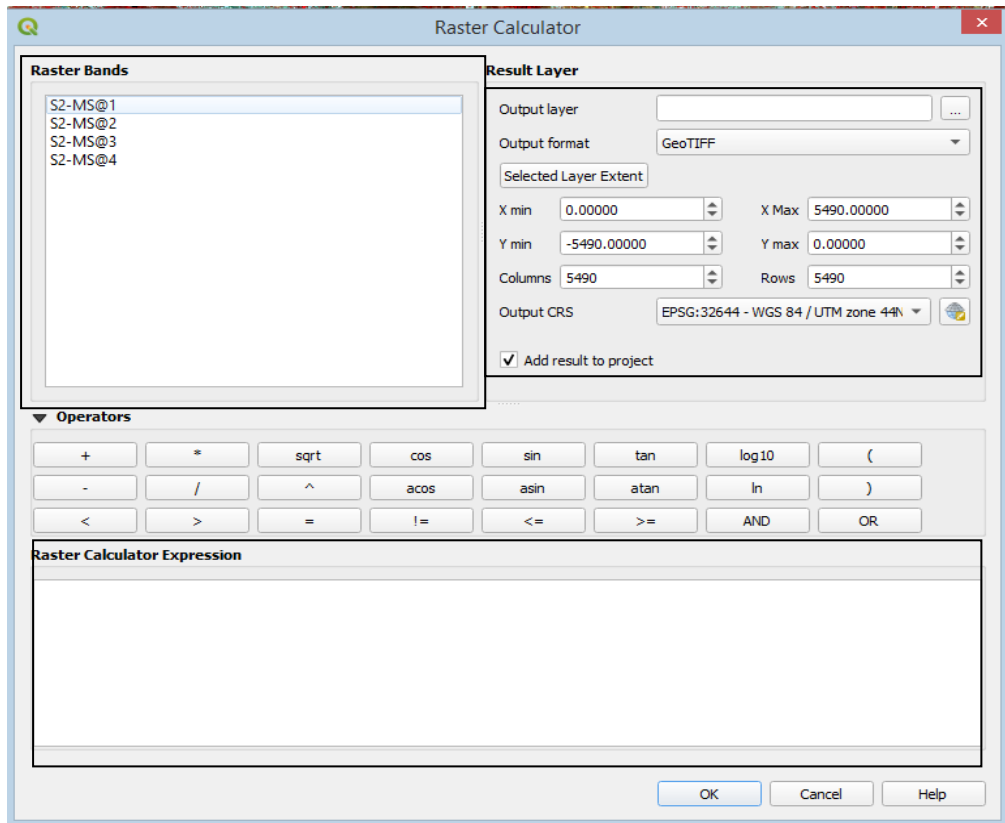
- From the context menu (right click on the menus) select Zoom to native resolution (1:1) and perform contrast enhancement using the Raster  enhancement toolbar

Step II. Calculating NDVI using Raster Calculator

- Raster data is suitable for representing features like natural resources that are continuous in nature. Each pixel represents a numerical value based on the spectral properties of the surface.
- Using Raster Calculator tool we can process the images using a mathematical expression or formula.
- Invoke the raster calculator from the Raster menu in QGIS Menu bar



4. Raster Calculator




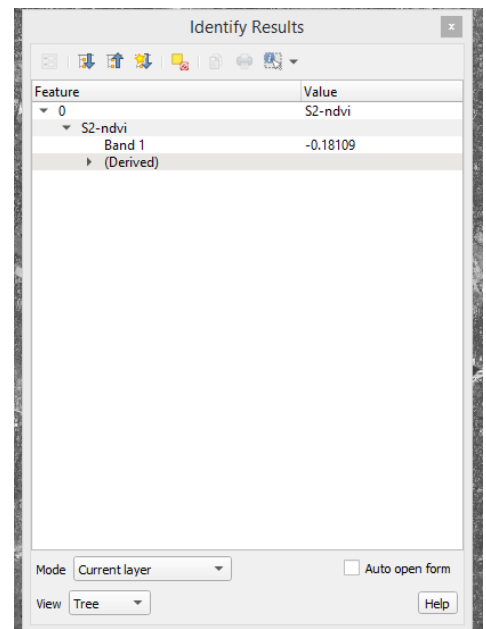
5. Frame the expression as follows for calculating the NDVI from the given bands in **Raster Calculator Expression** space. You can double click on the layers to enter them in the expression.

$$("S2-MS@4" - "S2-MS@3") / ("S2-MS@4" + "S2-MS@3")$$

6. Enter the Output layer name in the **Result Layer** space and click OK.

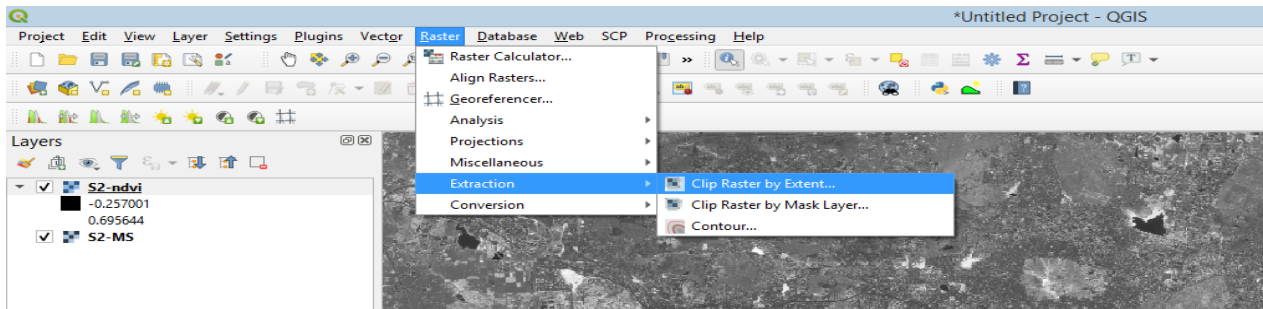
7. The ndvi output is a single gray scale image with the pixels values representing the ndvi values that ranges between -1 to +1. Because water absorbs energy in Near Infrared region, water bodies have ndvi that is negative or near to zero depending on their composition.

8. Use identify  features tool to know the ndvi value of each pixel by clicking on the ndvi image.

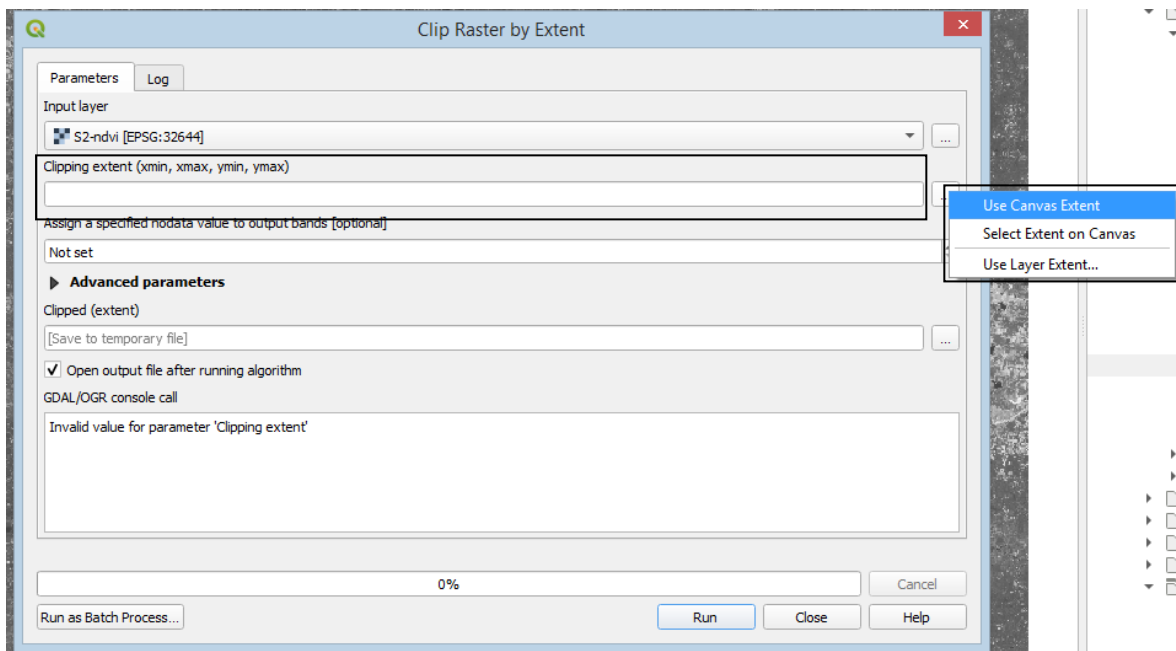


Step III. Clipping the NDVI Image

1. Open the Raster menu and pick the clip raster by extent tool under extraction sub-menu



2. Clip Raster By Extent tool



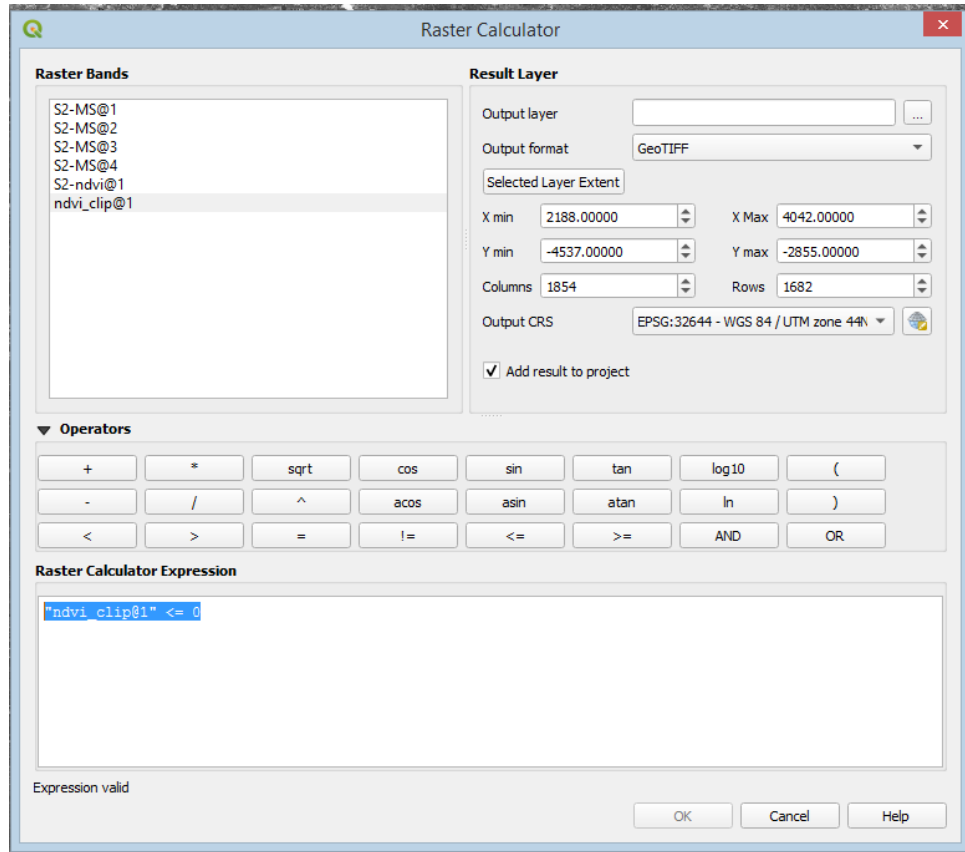
Select the clipping extent by using any three option given. For the exercise using the 2nd option select extent on canvas.

3. Examine the clipped image displayed in the canvas.

Step IV. Thresholding the NDVI Clipped Image.

1. The raster calculator is useful for segregating different land surface features based on ndvi value thresholds.
2. Open Raster calculator, in the raster calculator expression type the following expression

"ndvi_clip@1" <= 0, enter the output file name and click ok.



3. The output of the thresholding operation is a binary image (black & White)



4. The white pixels are representing water body features .

5. Compare the binary image with the color image in the background to know the level of pixel extraction,

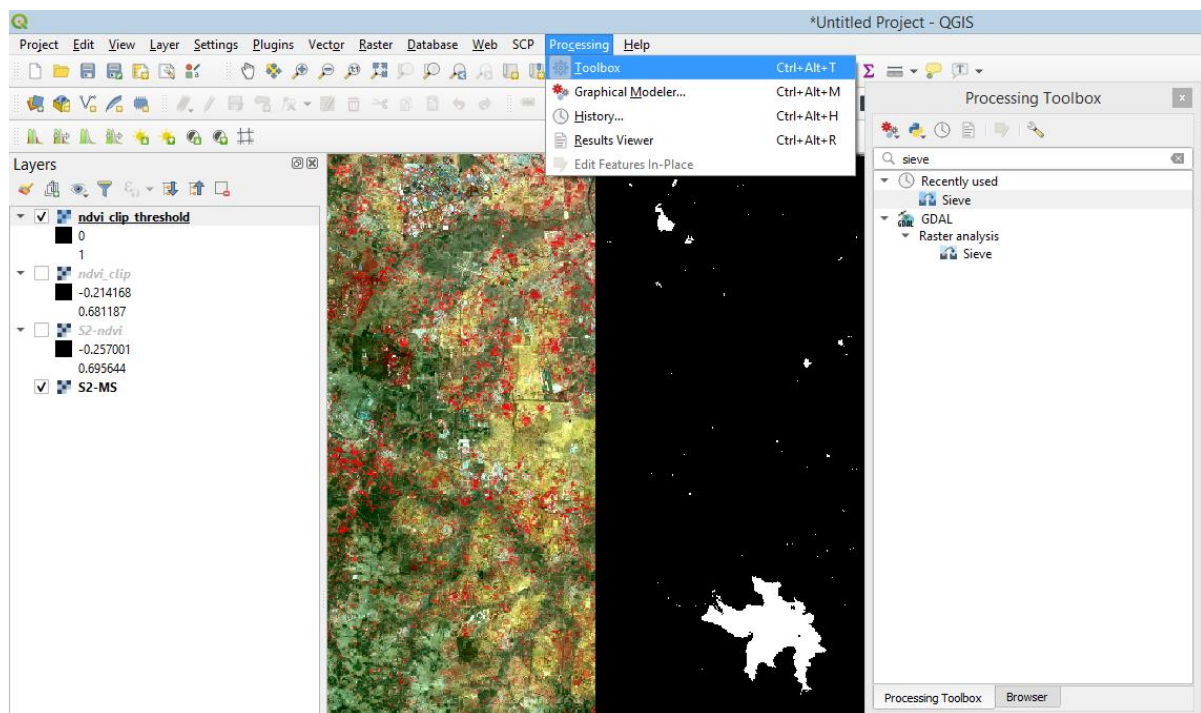
Step V. Removing small pixels using Sieve Tool

1. The Sieve tool is useful in removing small clusters of polygons from the raster map.

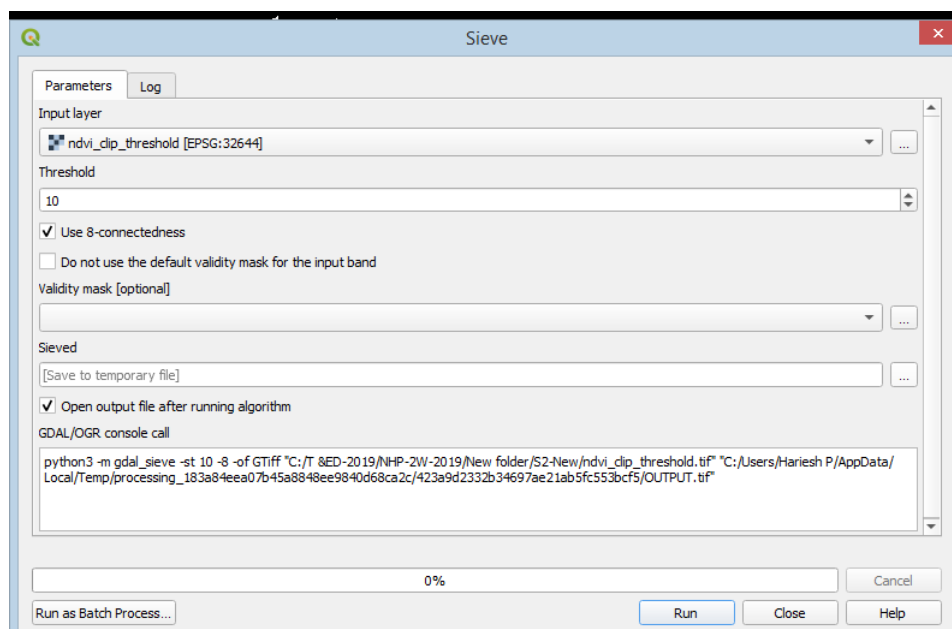
Sieve Description :

Removes raster polygons smaller than a provided threshold size (in pixels) and replaces them with the pixel value of the largest neighbour polygon. It is useful if you have a large amount of small areas on your raster map.

2. Open the processing toolbox from the Processing menu.



3. Invoke the tool and enter the input map and other parameters and save the output file to a suitable location.

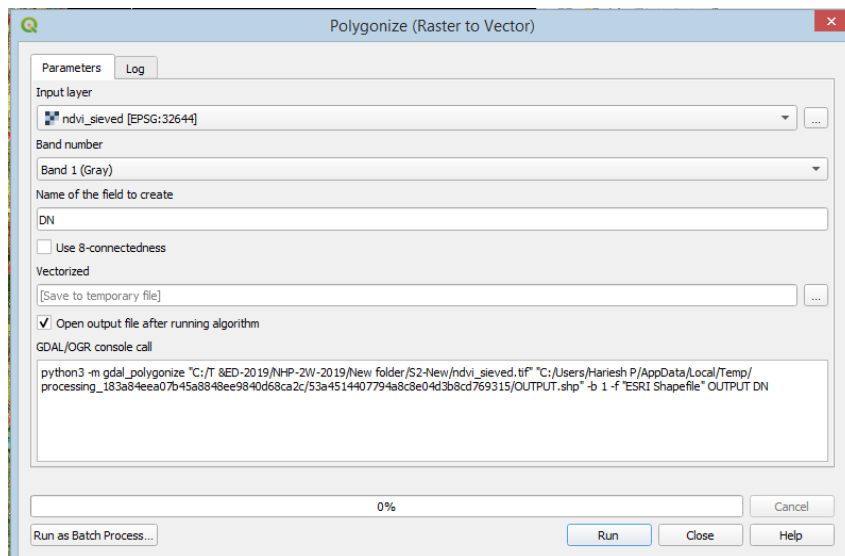


4. Compare the output of the sieve tool with the input raster map.



Step VI. Convert the Raster map to vector.

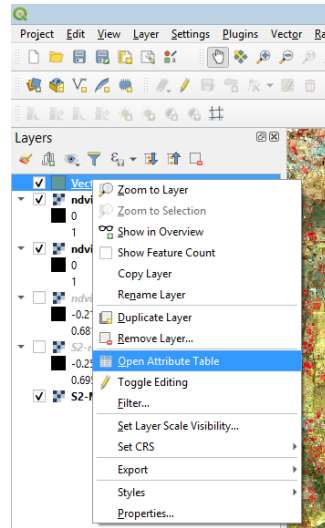
1. From the processing toolbar open the polygonize tool.



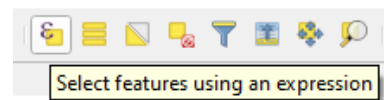
2. Select the input layer and leave the other values default. Enter the output file name, and save the vector file as shapefile. The boundaries of the waterbodies are apparent in the output.



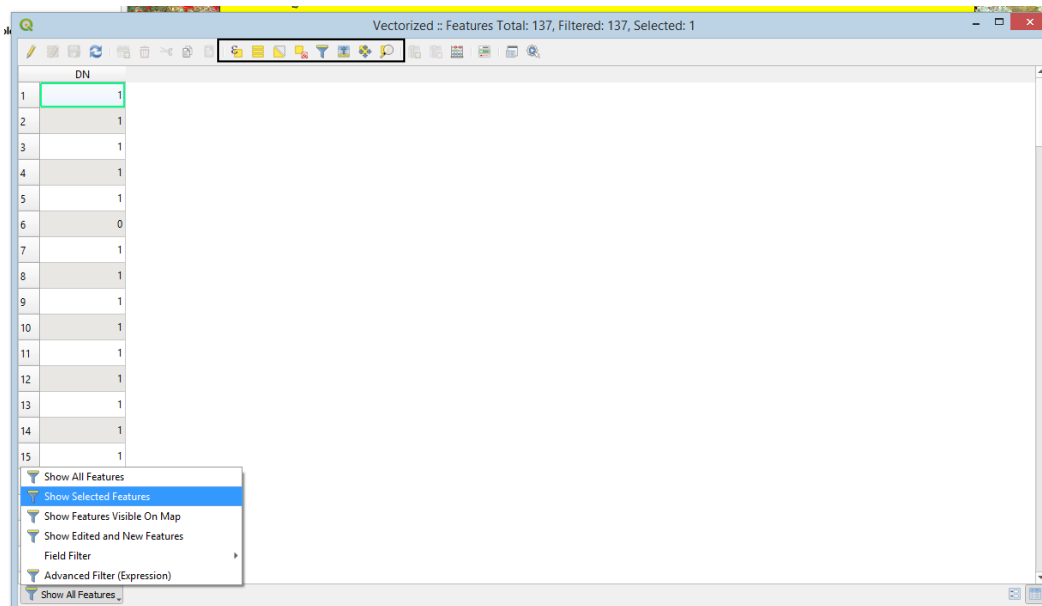
3. Open the attribute table of the waterbody shapefile layer.



4. Filter the water bodies using selection using select features using expression found in the attribute table menu tool.

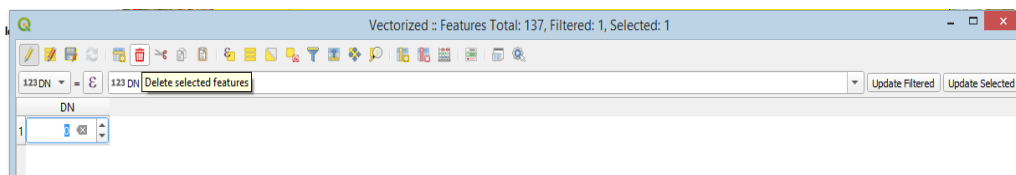


5. Open the attribute table and from show all feature options in the bottom left, click the show selected

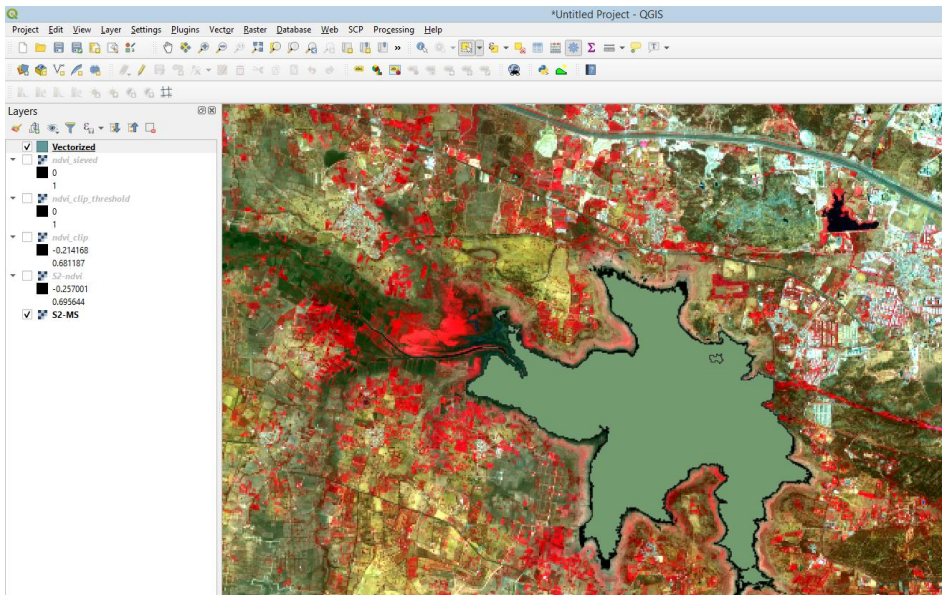


features.

6. Delete the features by using Delete selected features option.



7. Display the original color (multispectral) image in the back ground and compare the output.



END OF EXERCISE