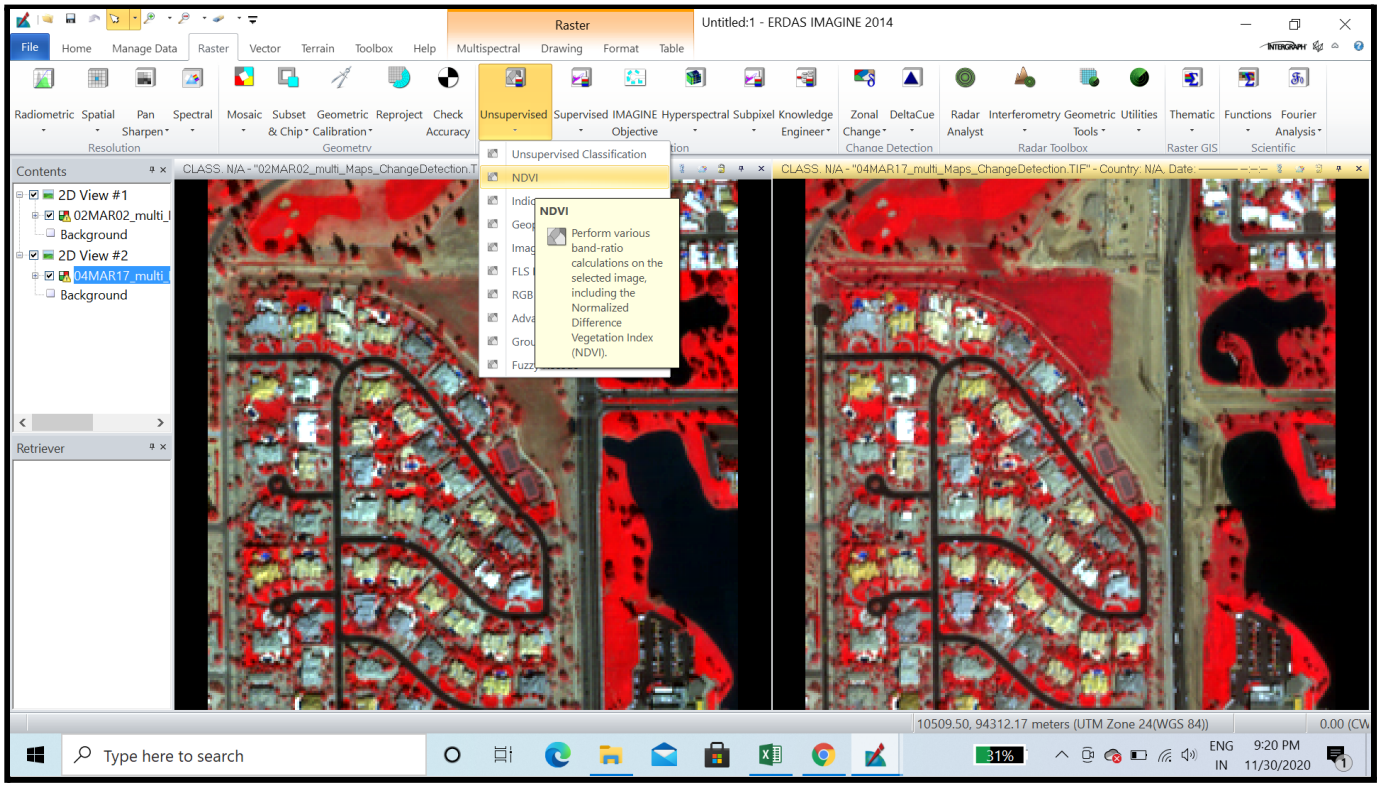
Part-1

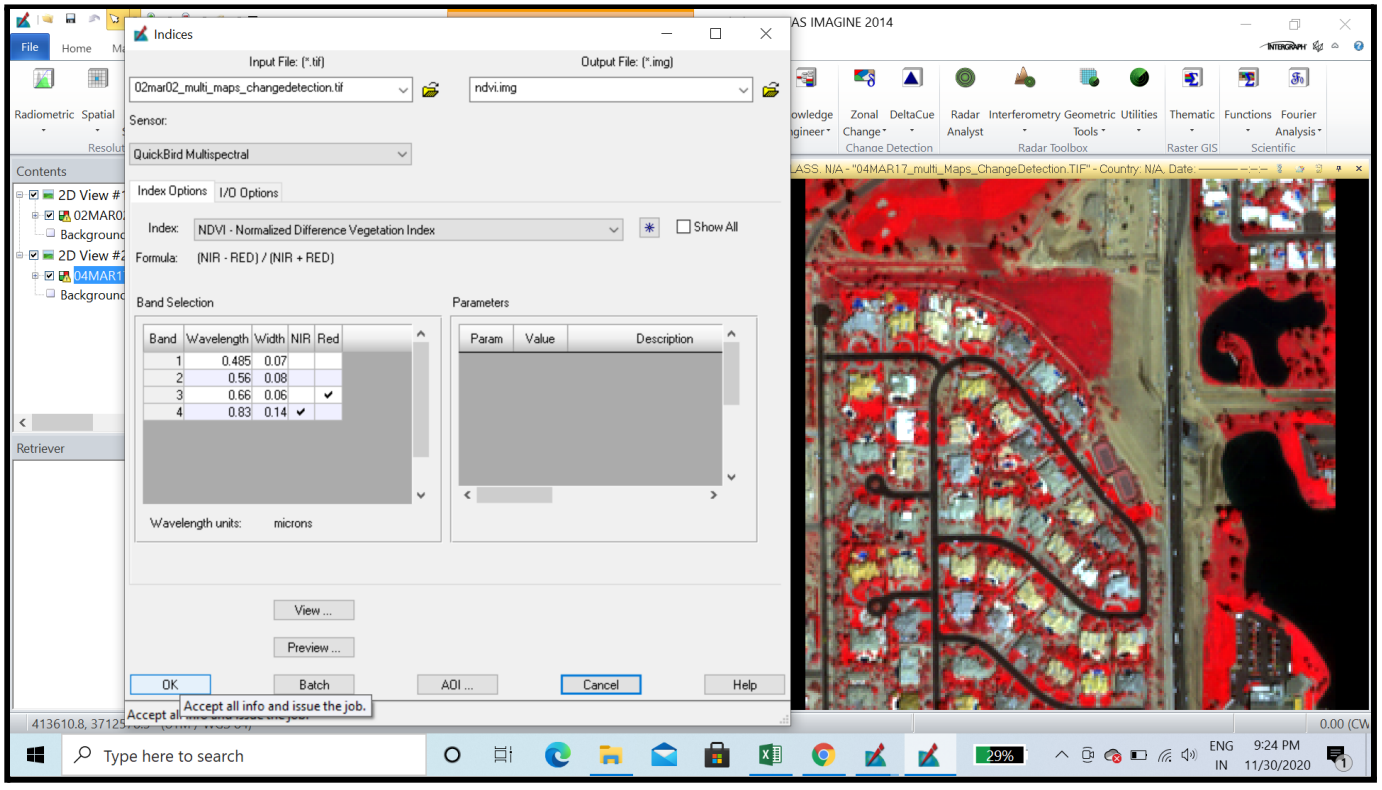
Change Detection Using NDVI

Step-1 Classify both the images (2002 and 2004).

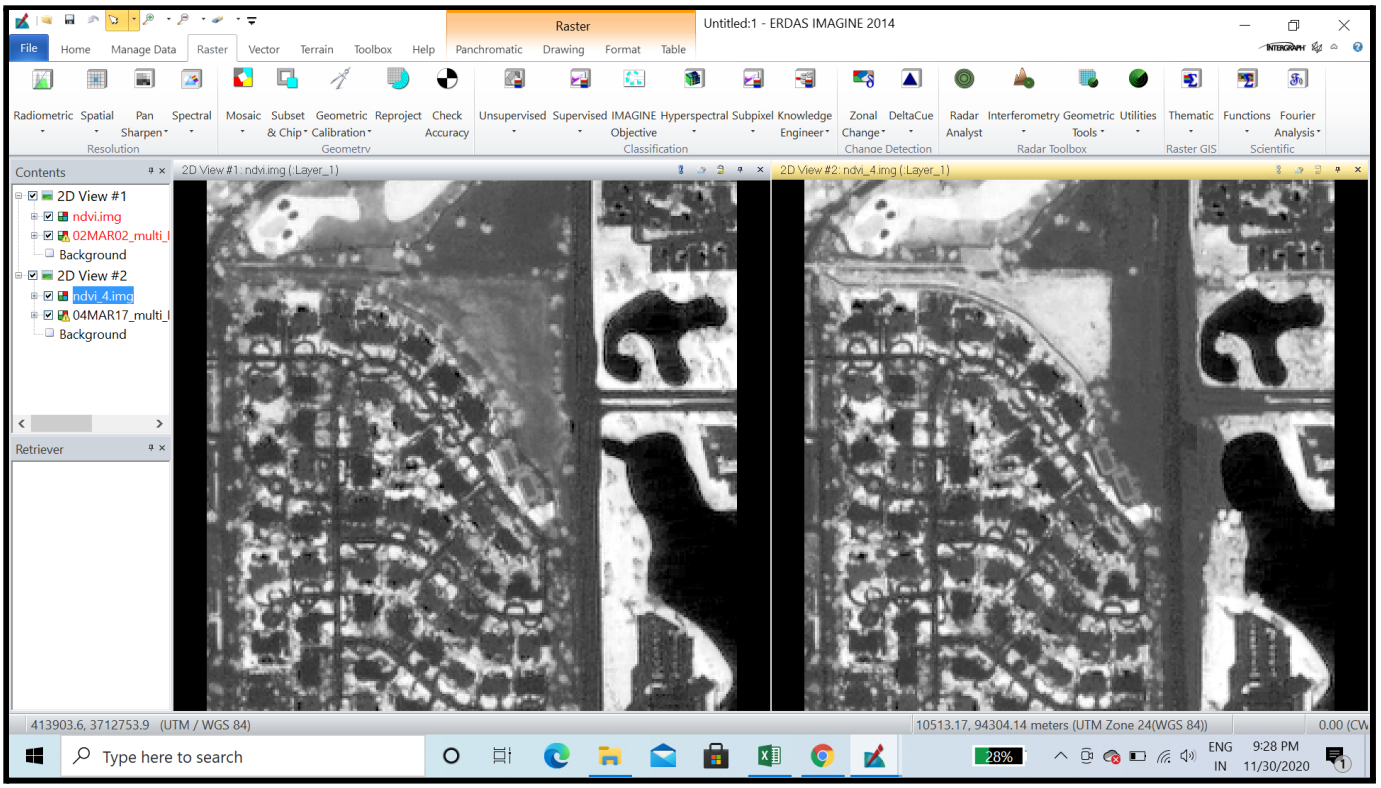
Go to **Raster > Unsupervised > NDVI**



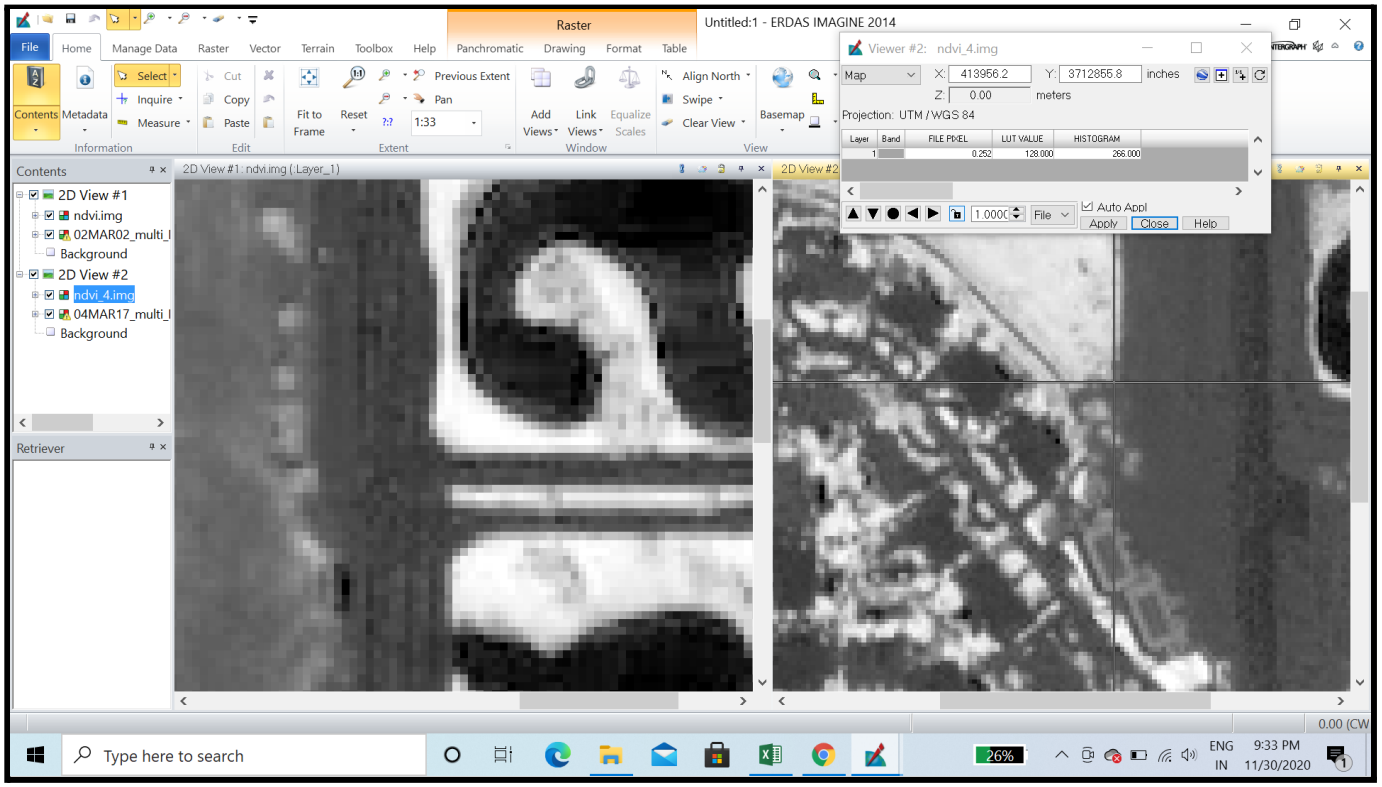
Step-2 Choose sensor: Quickbird MSS and give output file name and then click OK.



Step-3 Open NDVI created.



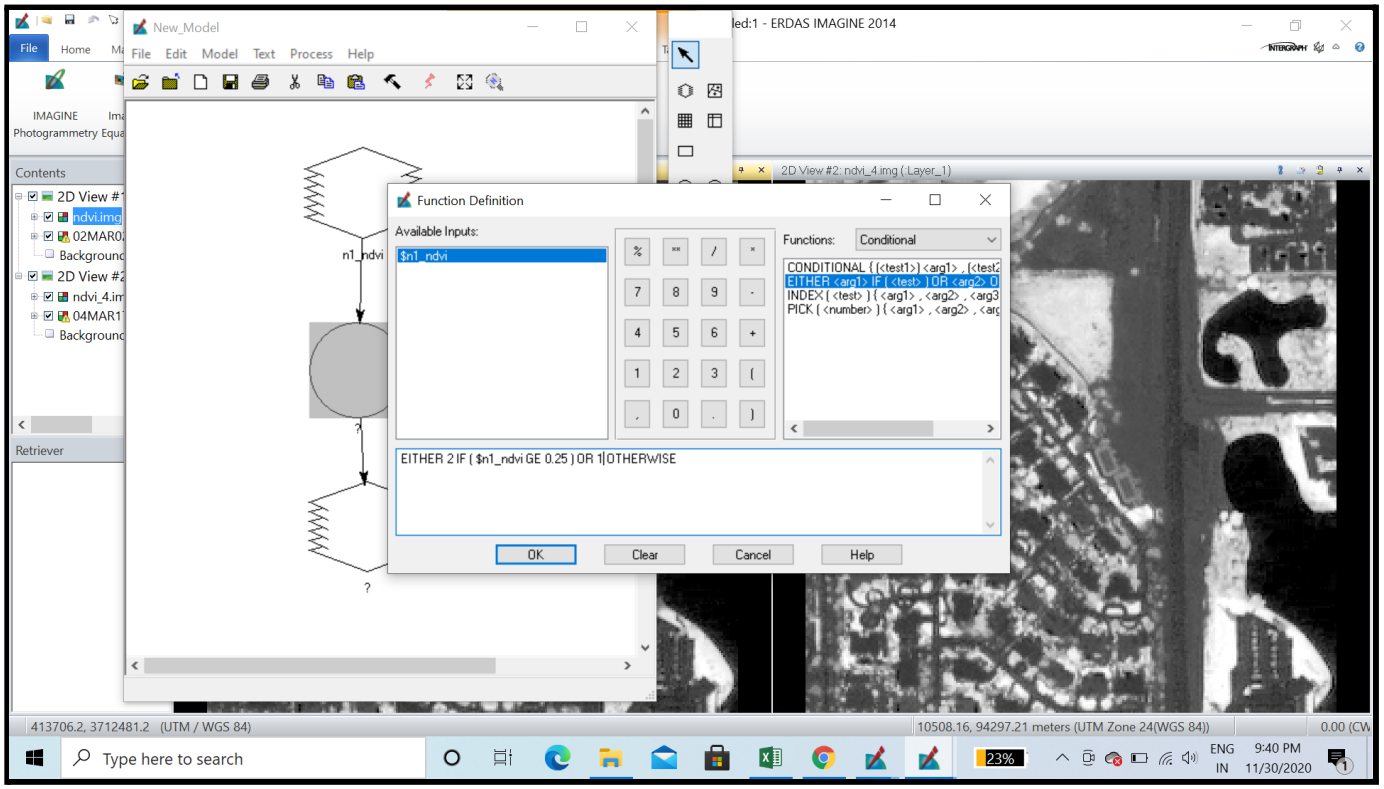
Step-4 Find the **threshold** value of vegetation using the **inquire.** Here the threshold value of vegetation is **0.25** for both images.



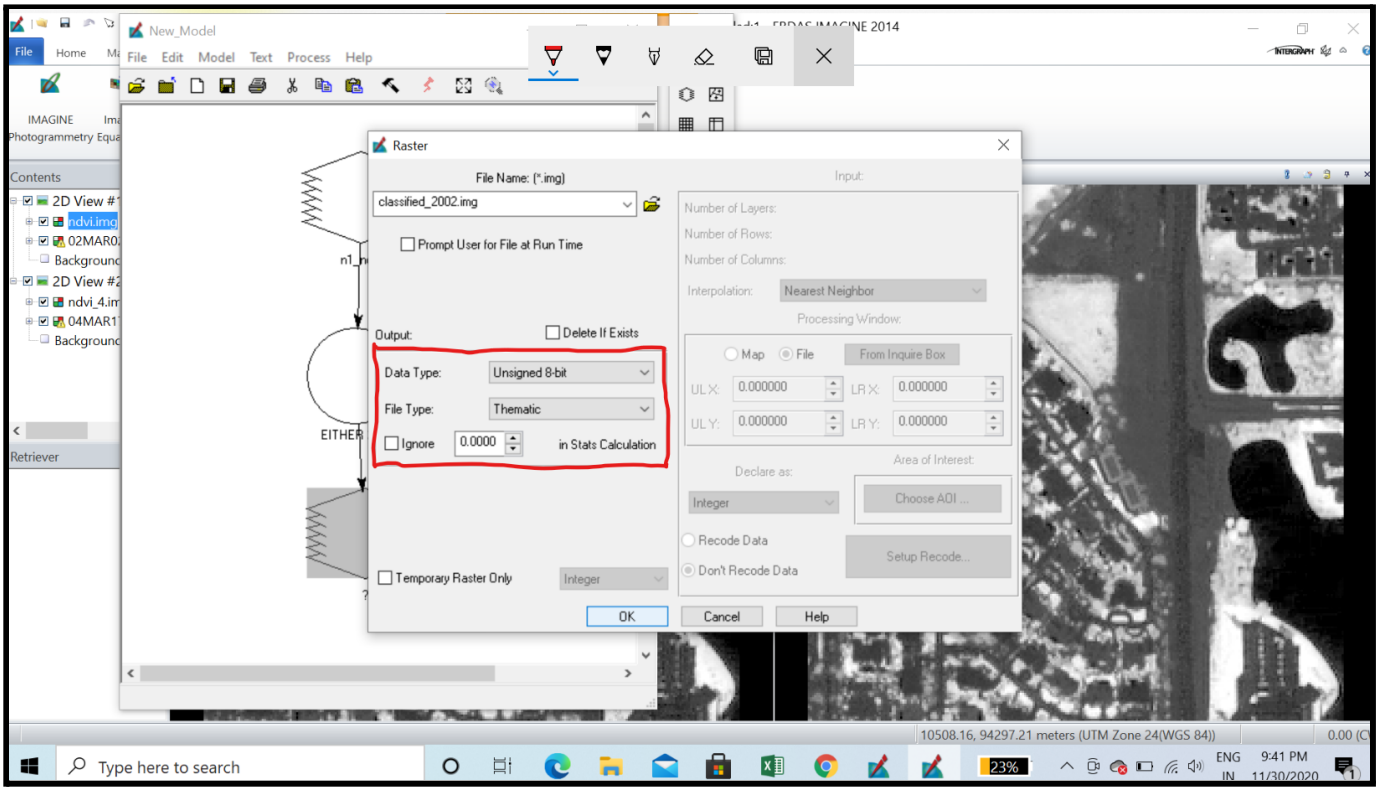
Step-5 To create **Classified Vegetation Map**

To go **Toolbox > Model Maker > Model Maker.** Create the model needed.

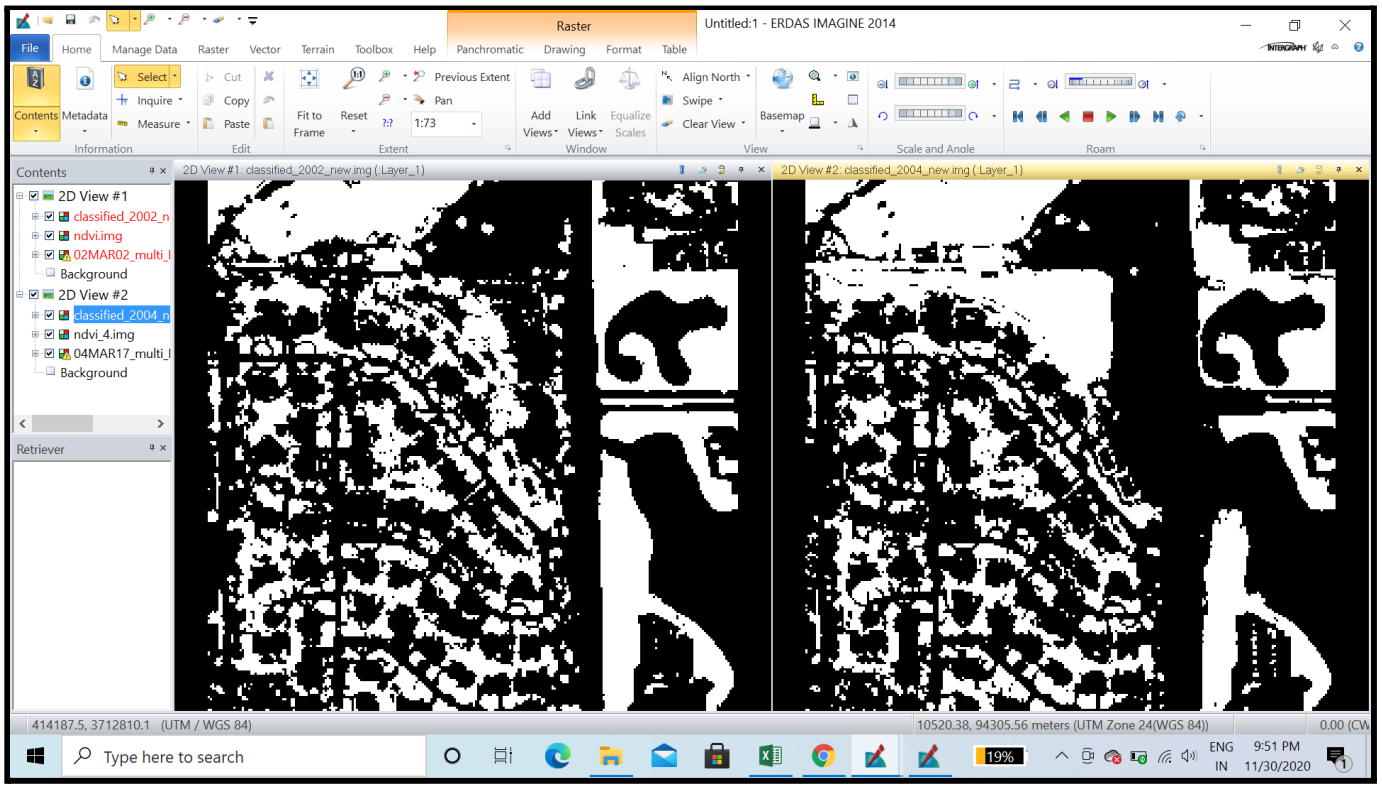
Browser the NDVI image in the input raster. In **functions, choose Conditional > Either.** Write the syntax. (**if its vegetation, return 2 otherwise 1 and threshold value is 0.25.** Therefore, **>=0.25 is vegetation)** And in the output raster, give the output file name. And then Execute the model.



Step-6 In the output file, change the file type to **Thematic**, Data Type: **Unsigned 8-bit** and click Ok**.**



Step-7 Open the **classified map** generated.



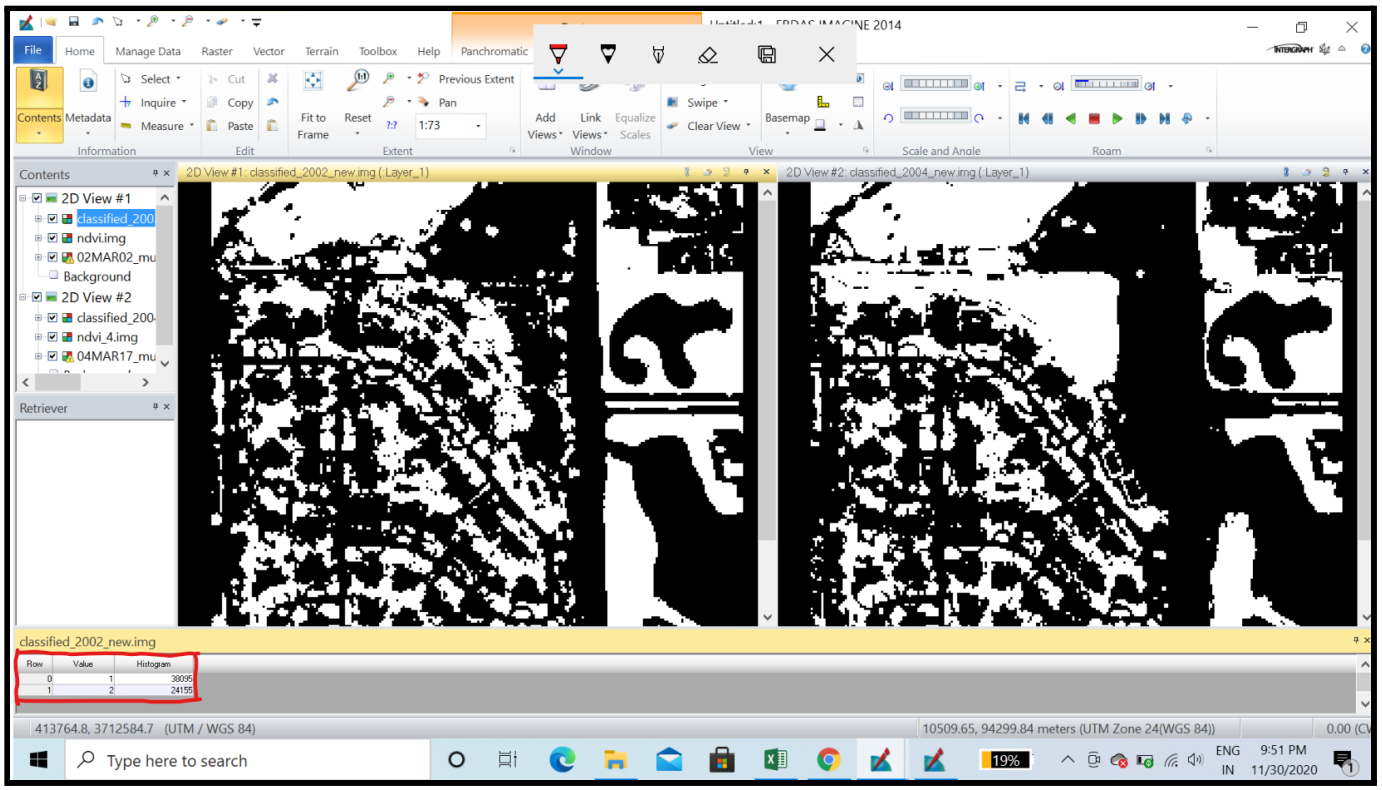
Here, the **bright part represents vegetation** and dark portions are other things which are not vegetation. From the classified map,it seems the **vegetation area has increased.** It shows where vegetation has changed to non-vegetation.

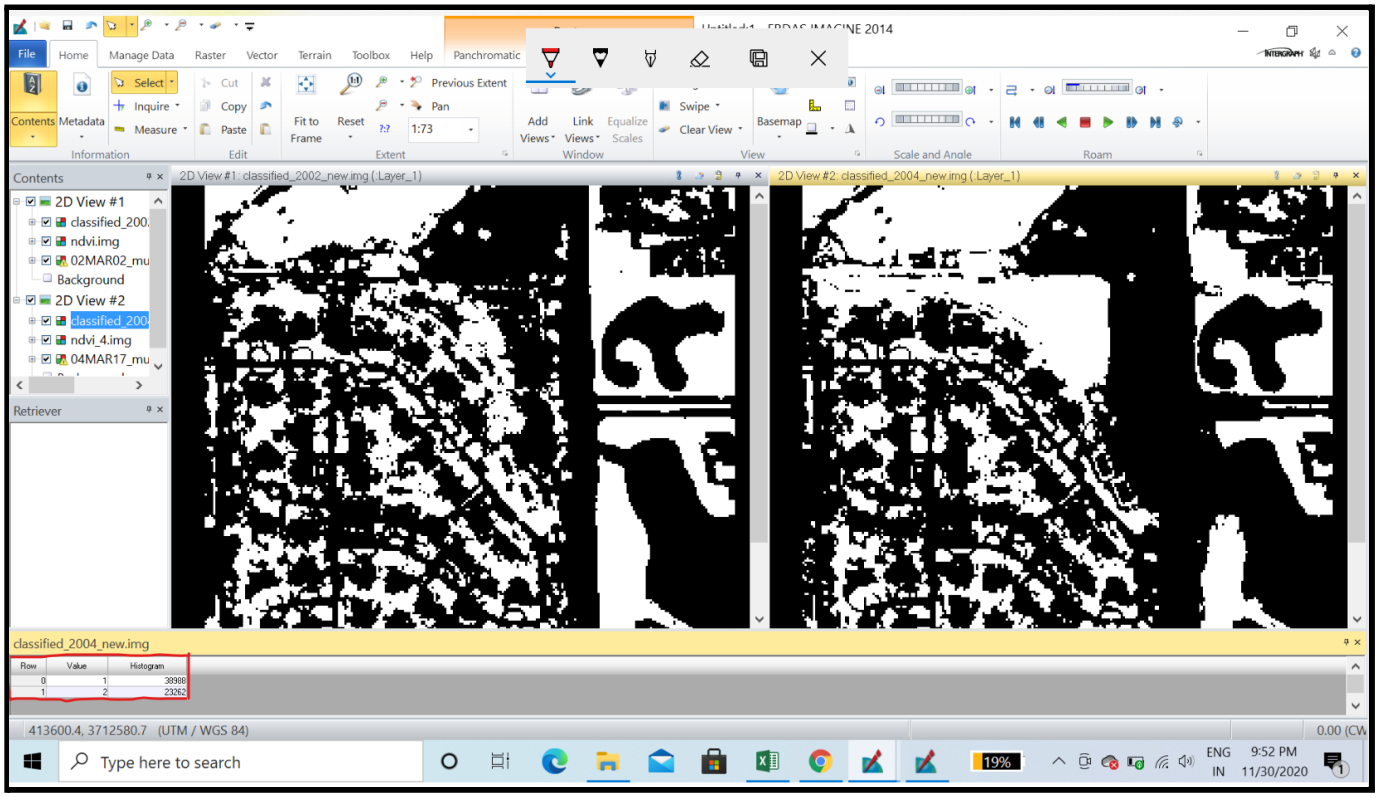
Hypothesis from visual interpretation: Vegetation has increased from 2002 to 2004.

Part-1a

QUANTIFICATION

Step-8 Open the attribute table of the classified maps.



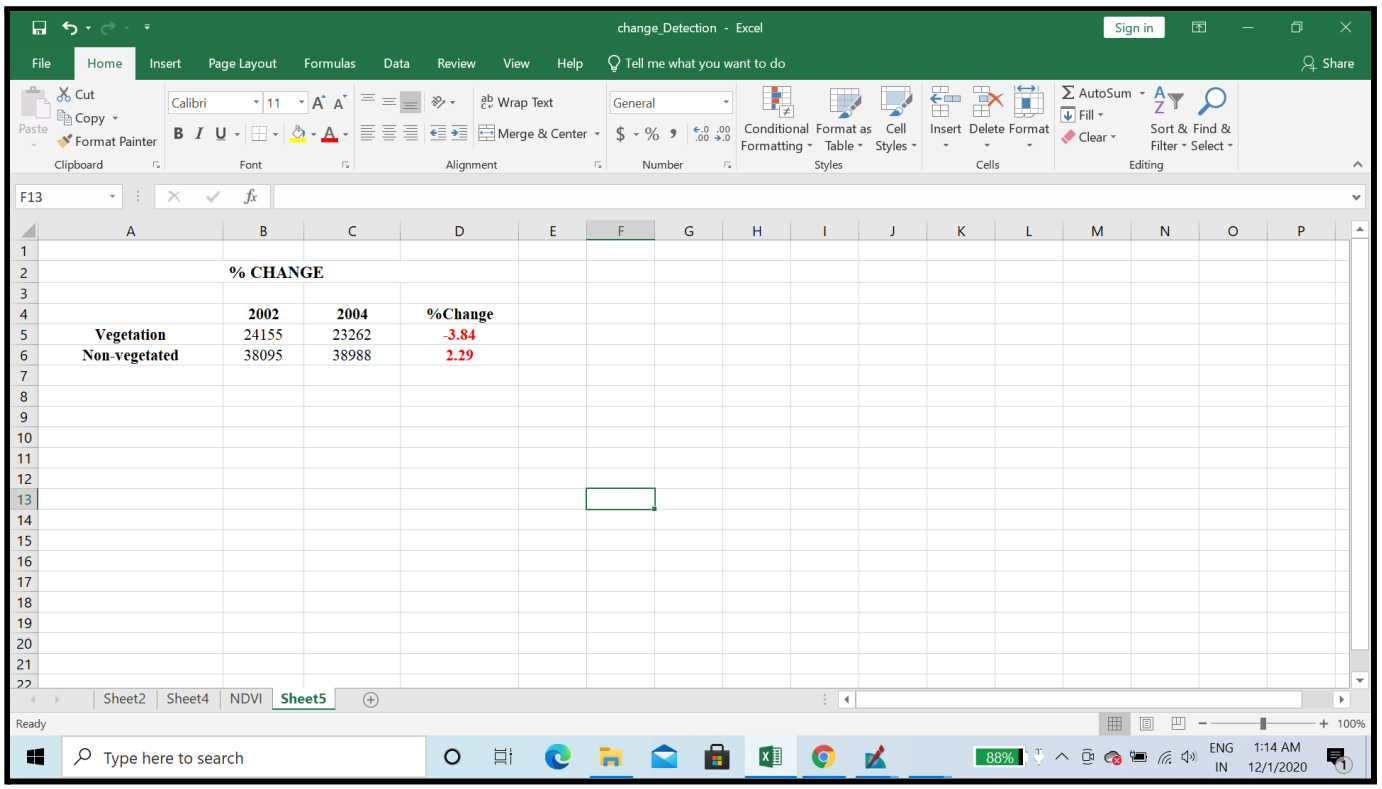


From the attribute table, note the pixel values. Here, **1 represents non-vegetation and 2 represents vegetation.**

Step-9 Open the excel sheet. And paste the pixel values here.

To calculate % change, use the formula: **((Base Year- Year)/Base Year)*100**

Here, formula is: **((2002-2004)/2002)*100**

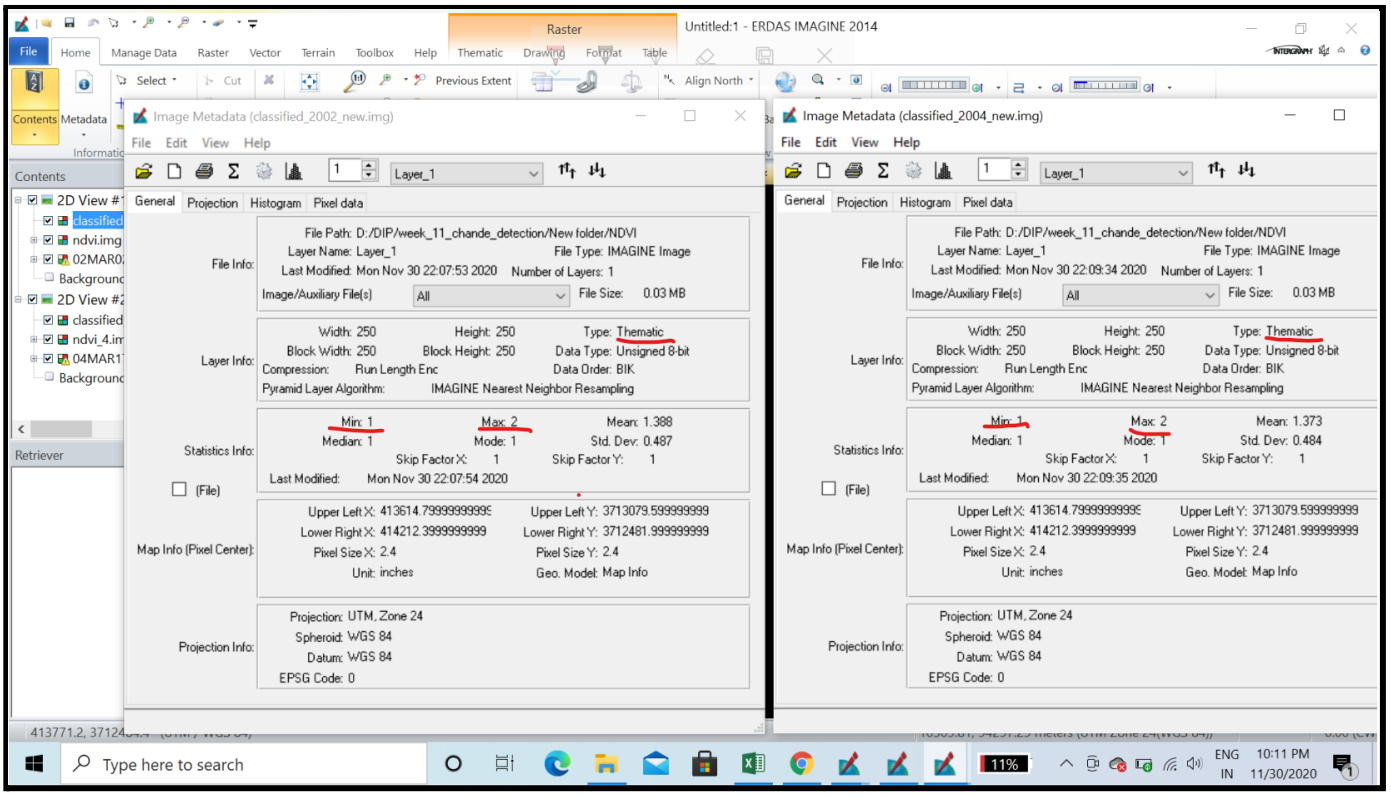


From the calculation, the **overall vegetation has decreased as it shows negative value.** The overall vegetation has decreased by **3.85%.** And the **non-vegetated area has increased.** The non-vegetated area has increased by **2.29%.** It does not tell anything about spatial distribution of any feature.

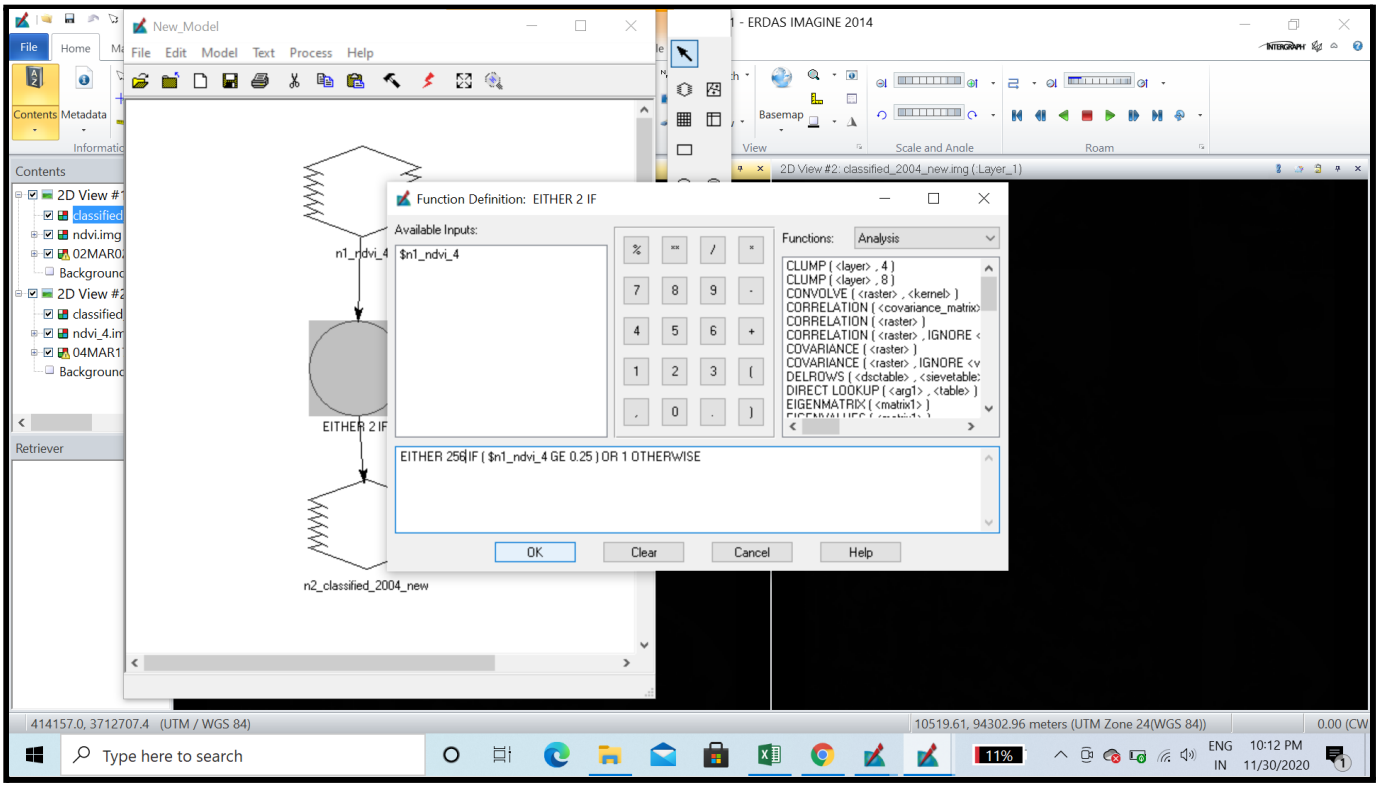
Part-1b

SUMMARY REPORT MATRIX

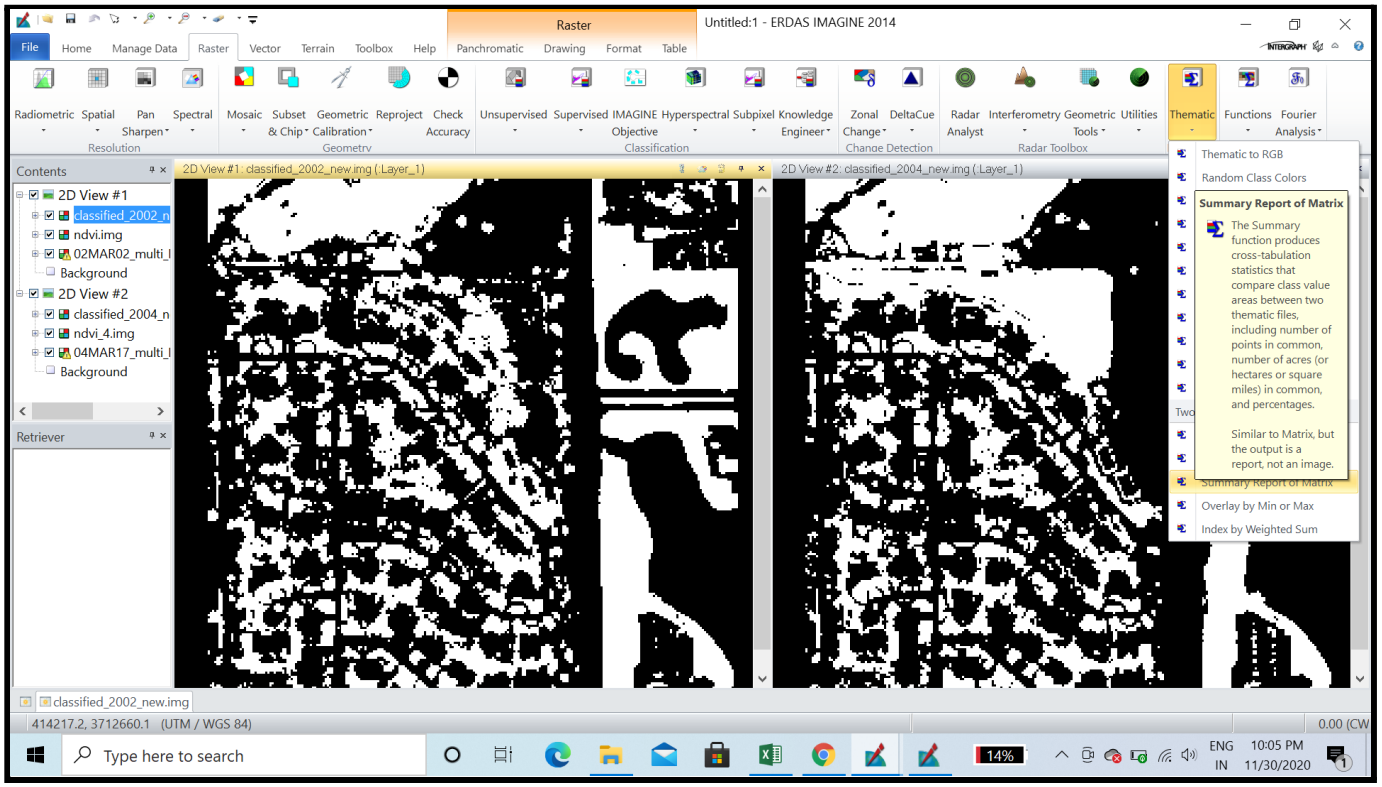
Step-1. Open the metadata file of the classified map. The range of values is very close i.e.1-2. Therefore, need to **change the range first**, to get the desired result. (Note- Also, check that it is thematic layer.)



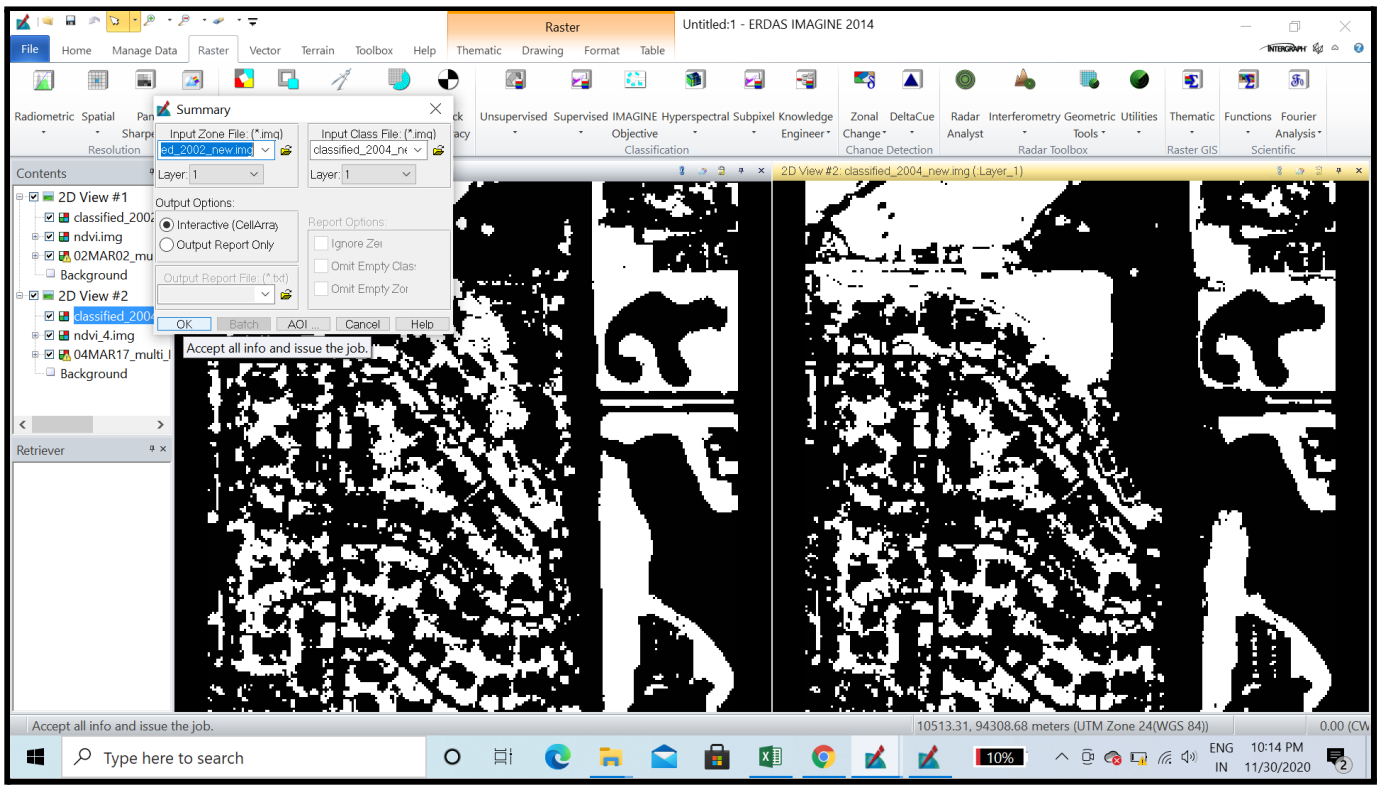
Step-2 Open the model maker of the previous NDVI created. Go to the Function part and make changes to the syntax. **Replace 2 by 256** (1 remains as 1 and changing the value of 2 beacuse 1-2, **range is very** low i.e. the entire screen becomes black and unable to distinguish features) and run the model. Do it for both the Classified map.



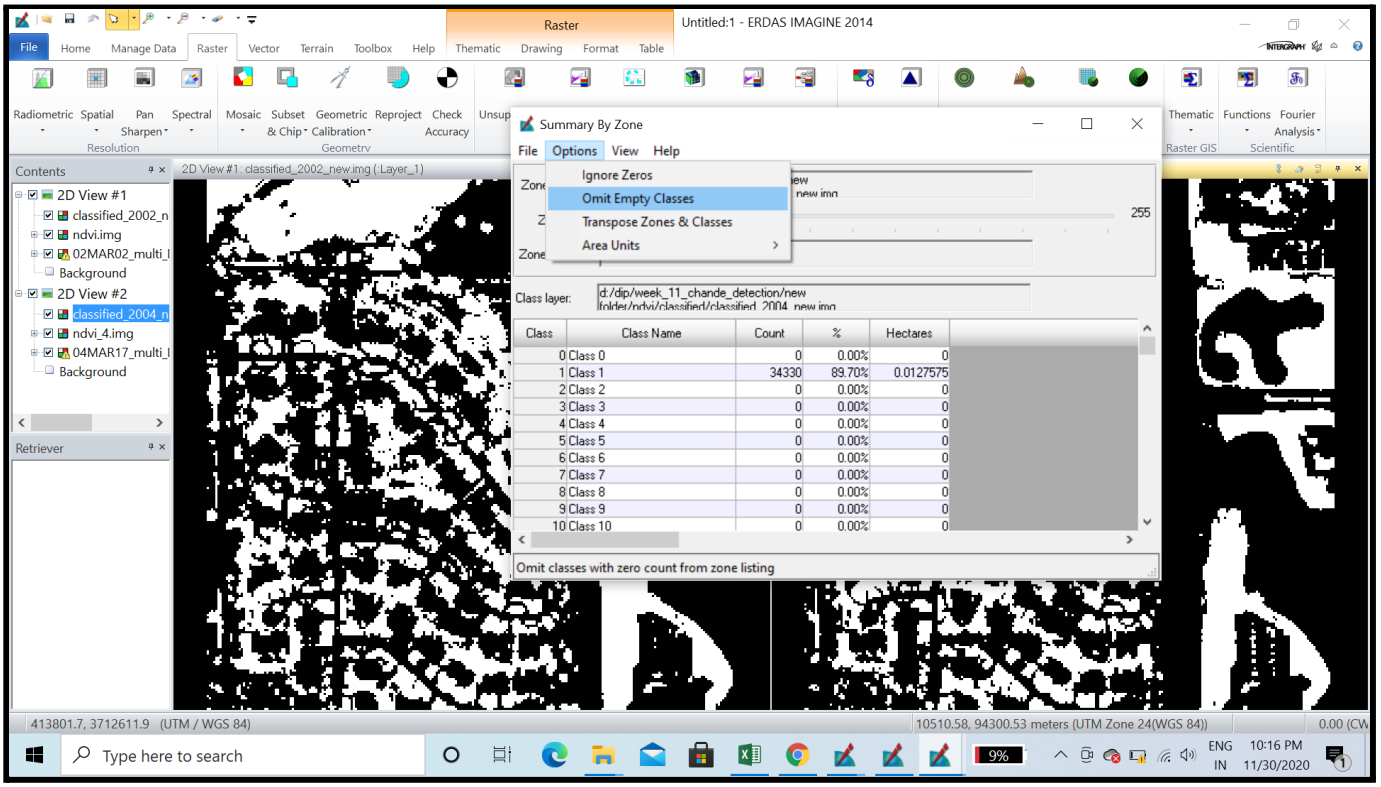
Step-3 After changing the range of pixel values of the classified map. Go to **Raster > Thematic > Two Layer Union Matrix > Summary Report Matrix**



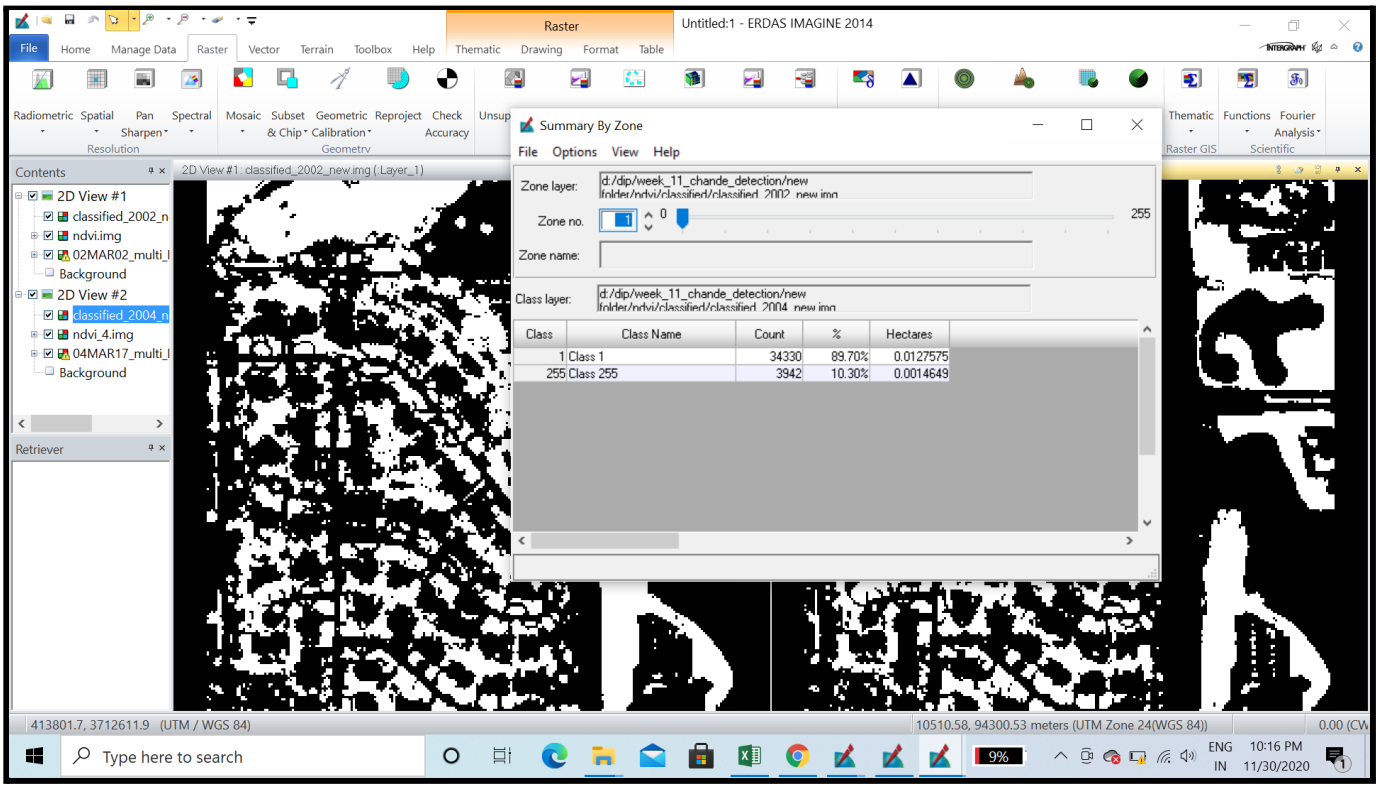
Step-4 Input classified map 1 in first input box and second classified map in second input box. Output Options: **Interactive (CellArray).** And click ok.



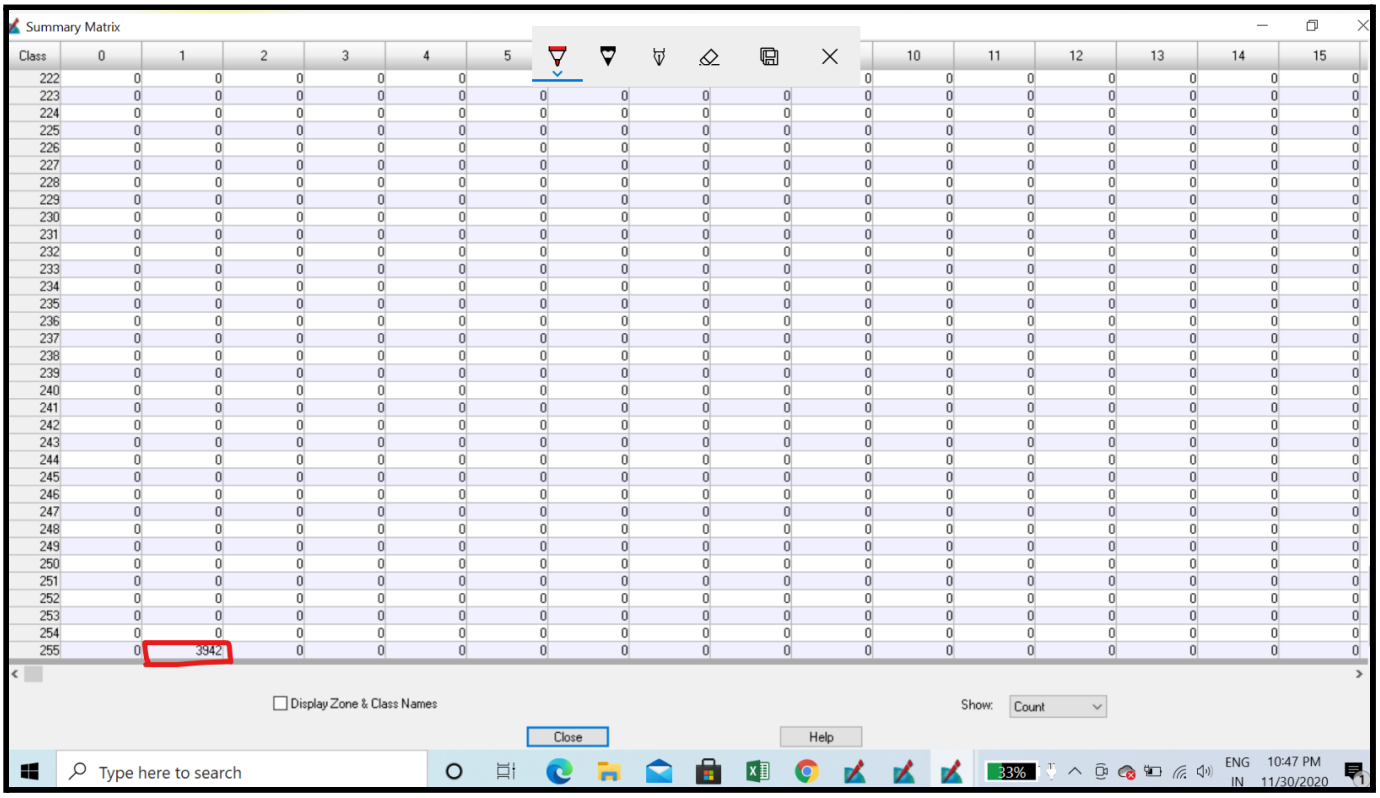
Step-5 the **Summary by Zone** tab will appear. Go to **Options > Omit Empty Classes.**



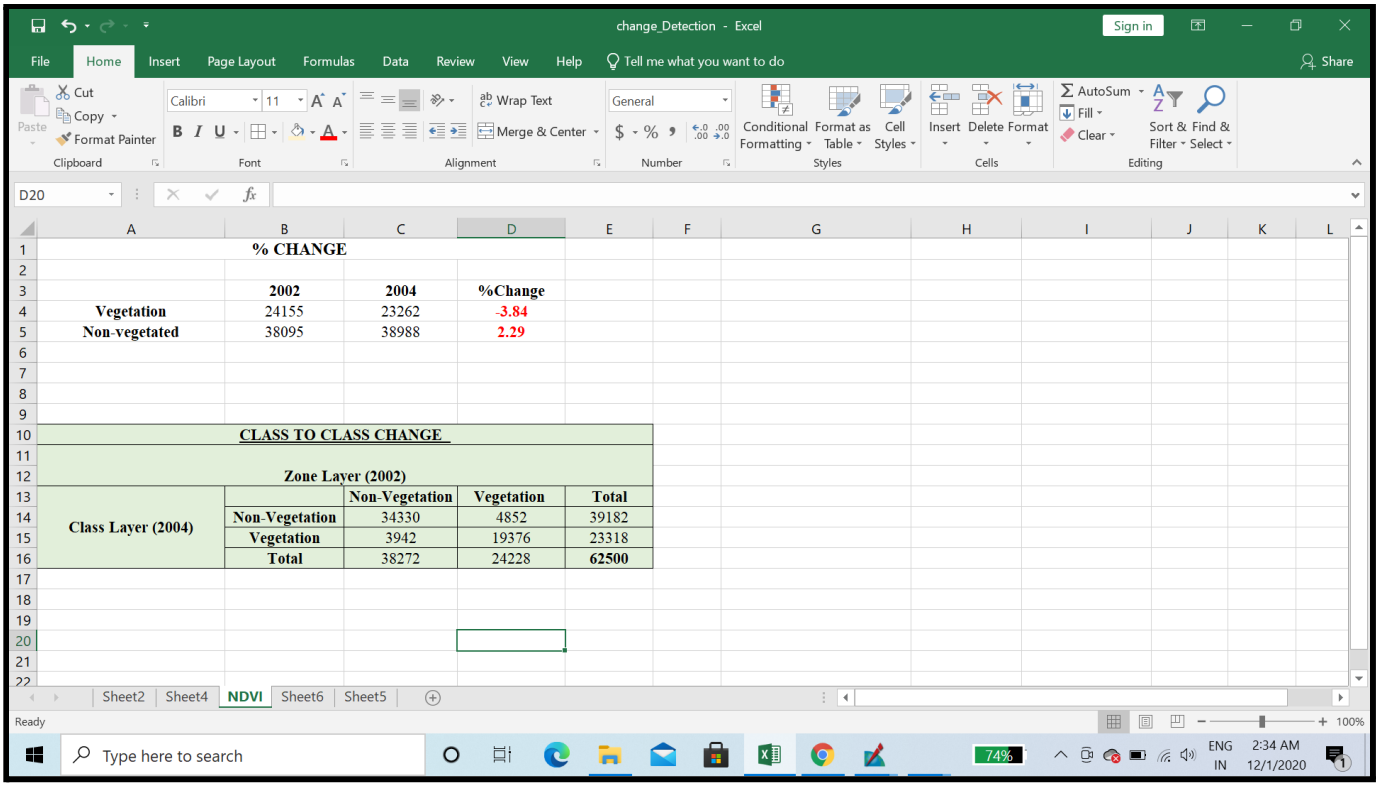
Step-6 Compressed Summary by zone will appear.



Step-7 Go to **View > Summary Matrix.** The summary matrix will appear. Note the pixel values. NV remains NV (1*1), NV-V(1*255), Vegetation remains vegetation (255*255), V-NV(255*1). The values are at the four corners.

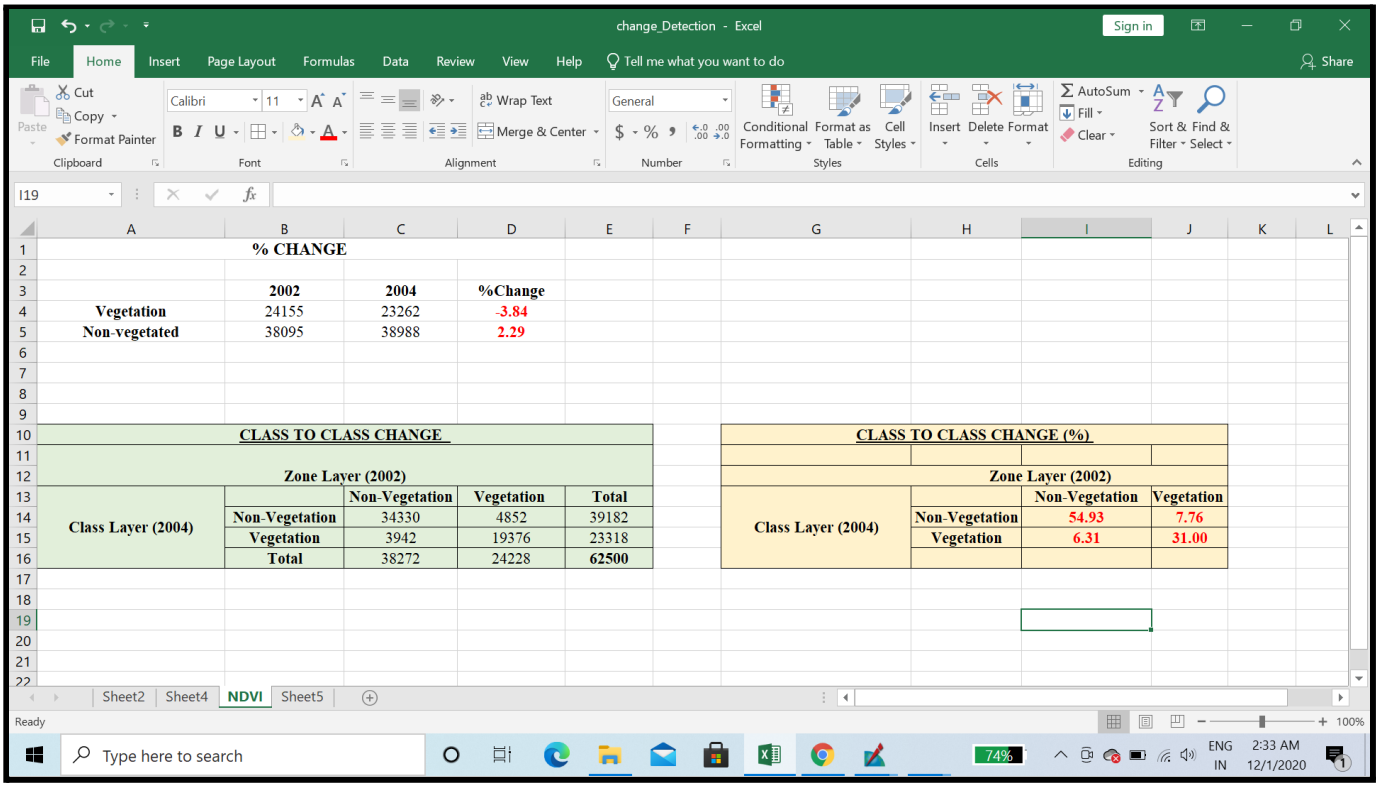


Step-8. Note the values and paste in the excel sheet.



Using Summary Report Matrix, **individual values** i.e. **class to class changes** can be determined, not just overall changes. Here, vegetation to Non-Vegetation, around 4852 pixels have changed. And from non-vegetated to vegetation, 3942 pixels have changed.

Class to class changes (in %)



change_Detection - Excel

	A	B	C	D
1		% CHANGE		
2				
3		2002	2004	%Change
4	Vegetation	24155	23262	-3.84
5	Non-vegetated	38095	38988	2.29

CLASS TO CLASS CHANGE

Class Layer (2004) \ Zone Layer (2002)	Non-Vegetation	Vegetation	Total
Non-Vegetation	34330	4852	39182
Vegetation	3942	19376	23318
Total	38272	24228	62500

CLASS TO CLASS CHANGE (%)

Class Layer (2004) \ Zone Layer (2002)	Non-Vegetation	Vegetation
Non-Vegetation	54.93	7.76
Vegetation	6.31	31.00

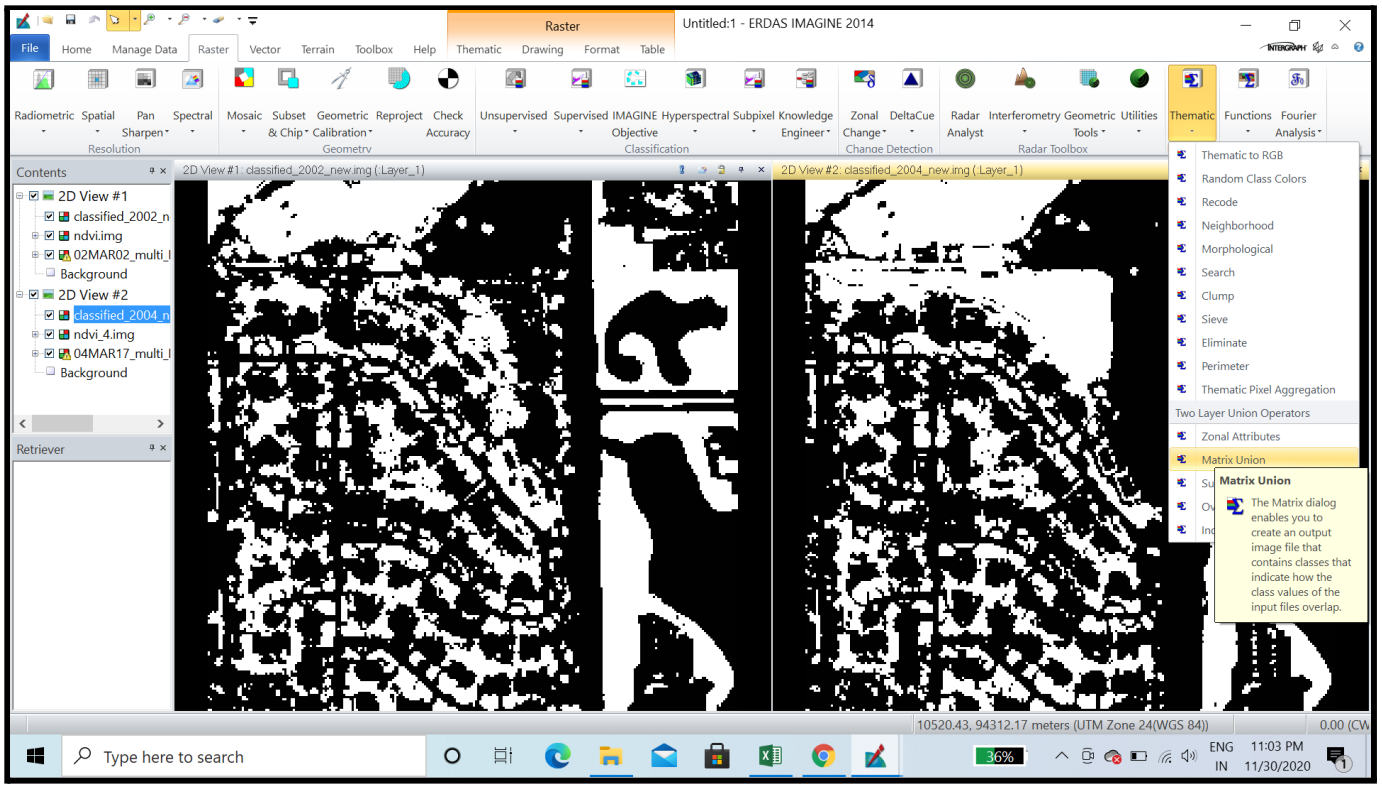
Similarly, the **percentage of individual class change** can be calculated. Here, approximately **54%** of the non-vegetated has remained non-vegetated. Around **7.75%** of vegetation has been converted to non-vegetated pixels. Similarly, **6.3 %** of the non vegetated pixels has been converted to vegetated pixels and **31%** of the vegetated area has been as vegetated area. Thus, there is a **decrease in vegetation** from 2002 to 2004.

Therefore, report summary matrix is an **efficient tool** to determine the individual class to class changes occuring in an area. However, it does not give a visual idea about the changes happening.

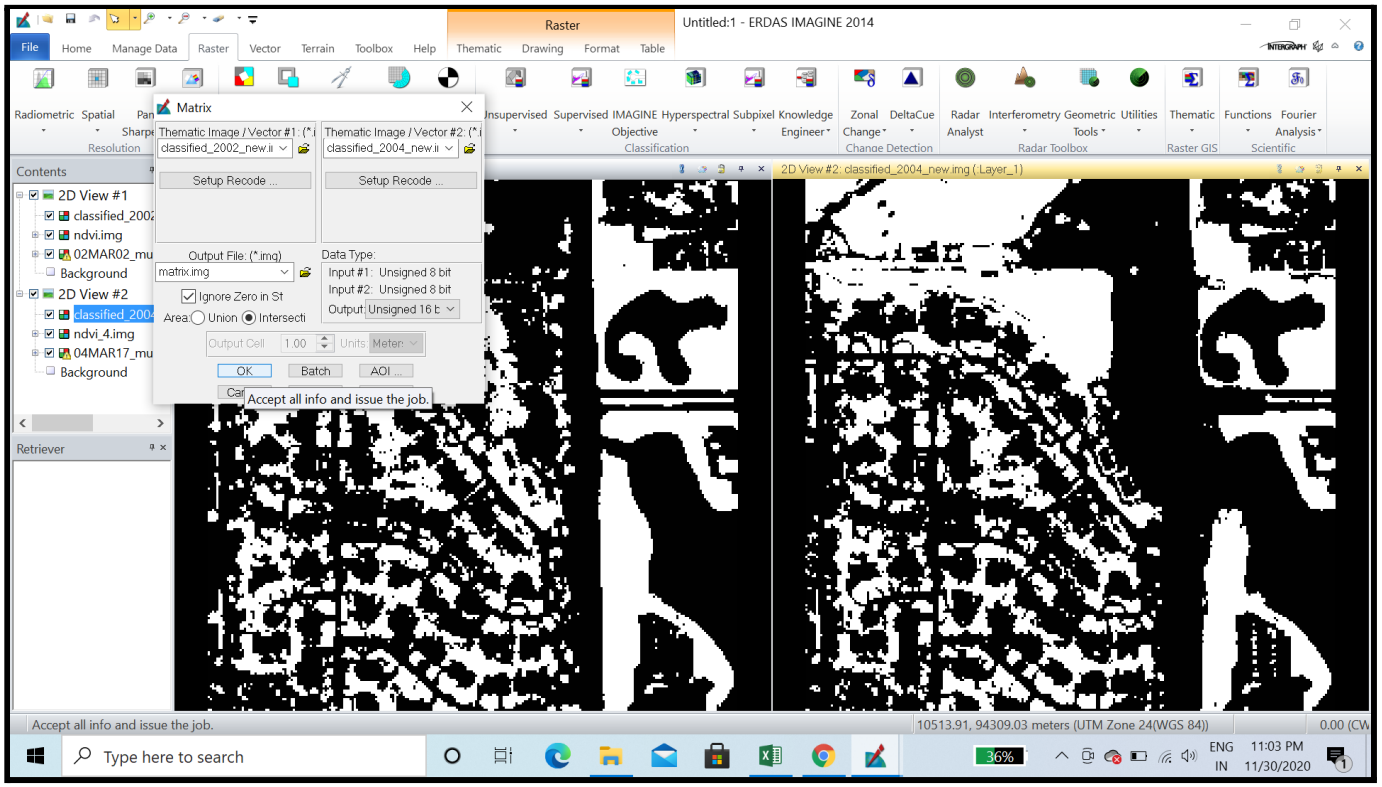
Part-1c

MATRIX UNION

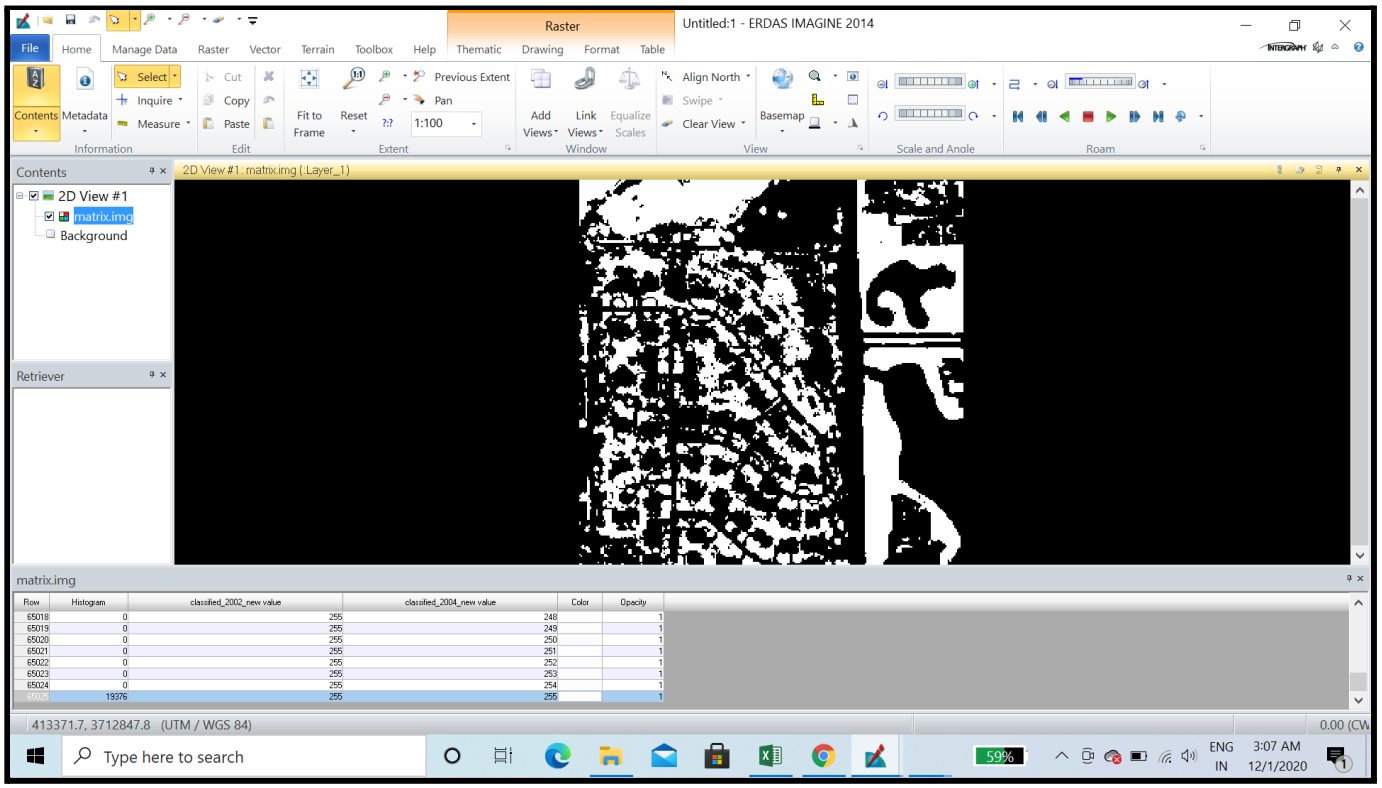
Step-1 Go to **Raster > Thematic > Two Layer Union Matrix > Matrix Union**



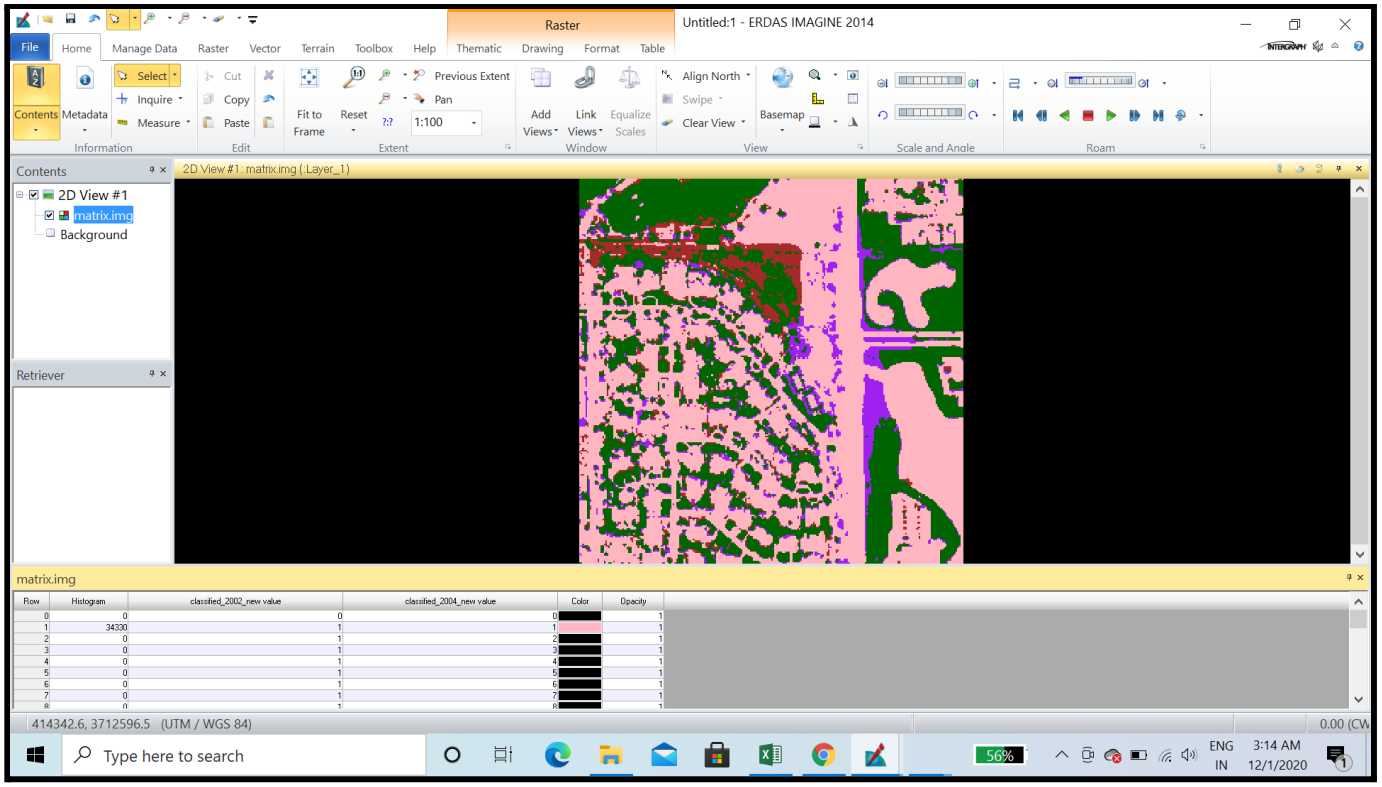
Step-2 Input both the thematic maps, give the output file name. Enable Ignore 0 statistics. And click OK.



Step-3 Open the image created and display the attribute table.

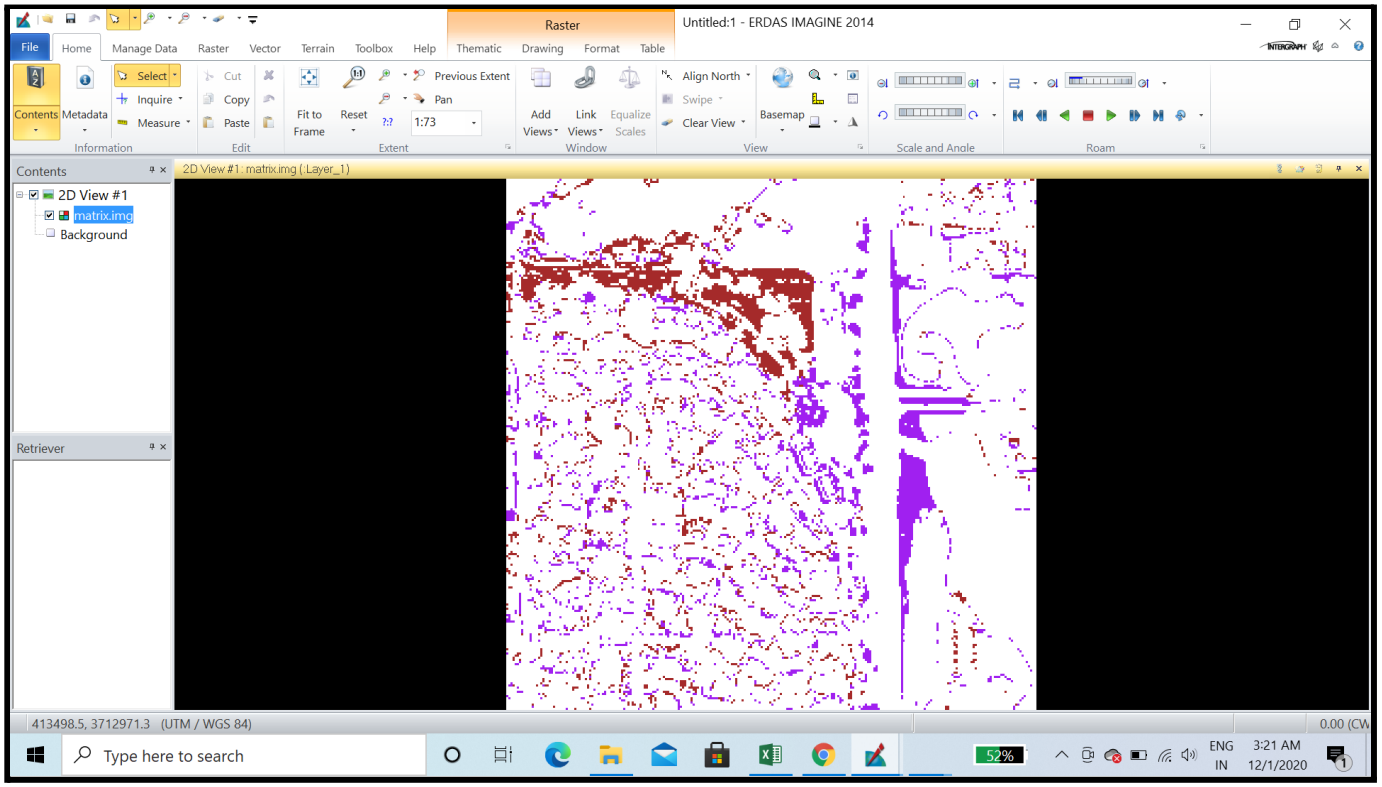


(**Note-** Change the colour coding to your needs. Also, one can note the pixel values from the attribute table and computate the changes occurring.)



The green and pink colours represent unchanged vegetation cover and non-vegetated portions respectively. The brown color shows non vegetated area converted to vegetation and purple represents vegetated area converted to non-vegetated area.

CHANGE DETECTION



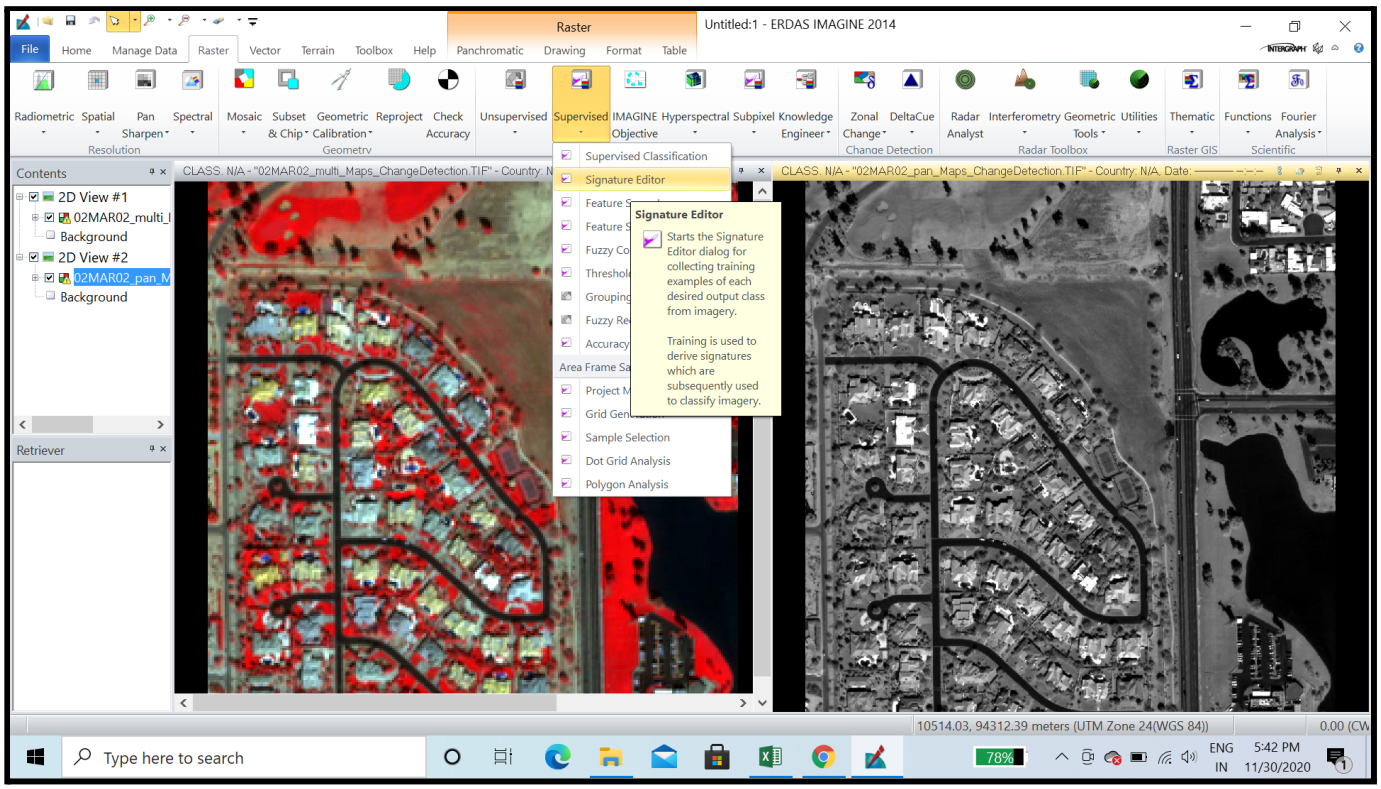
The above image represents the areas that have **undergone changes.** The brown color represents portions that have changed from non-vegetated to vegetated and purple color shows the vegetated to non-vegetated conversions. And the white color shows the area that remained unchanged from 2002 to 2004.

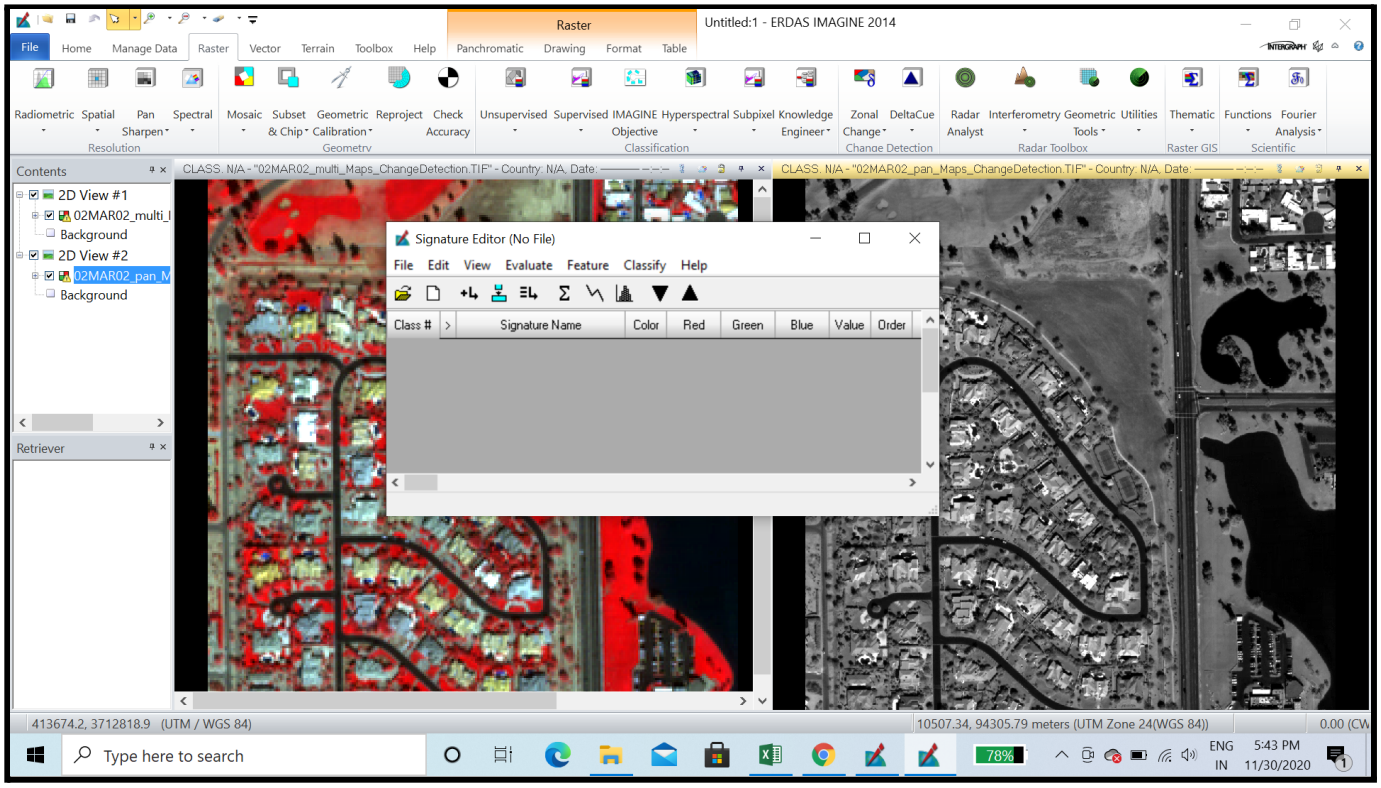
Thus, this method is **very good** as it gives both the **visual representation** of the changes occurring along with the **computation part.** Can detect **changes from one class to another** i.e. it is quantifiable (how much calculated by no. of pixels in particular category) and **where the changes are occurring** (by locating on map)

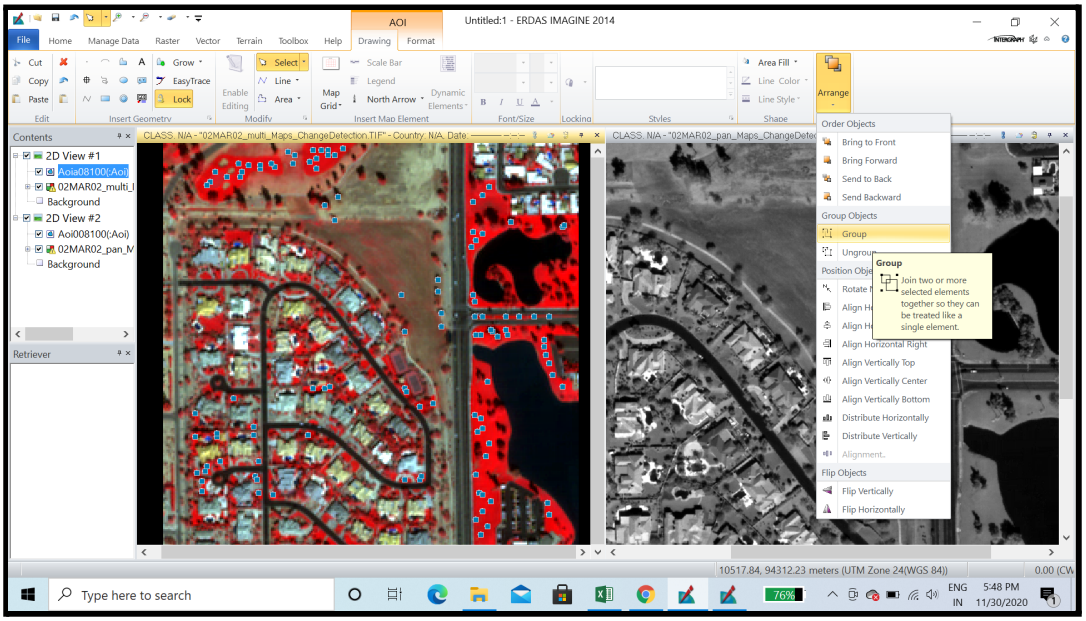
Part-2

Change Detection using supervised classification

Step-1 Open both the images. And perform **supervised classification**. Keep the name and order of features in the both images exactly the same. (The steps of supervised are the same as in the previous assignment, therefore, here only results are displayed.)






Untitled:1 - ERDAS IMAGINE 2014
AOI
Contents
2D View #1
2D View #2
Retriever
Order Objects
Bring to Front
Bring Forward
Send to Back
Send Backward
Group Objects
Group
Ungroup
Group
Join two or more selected elements together so they can be treated like a single element.
Align Horizontal Right
Align Vertically Top
Align Vertically Center
Align Vertically Bottom
Distribute Horizontally
Distribute Vertically
Flip Objects
Flip Vertically
Flip Horizontally
Type here to search
ENG
IN
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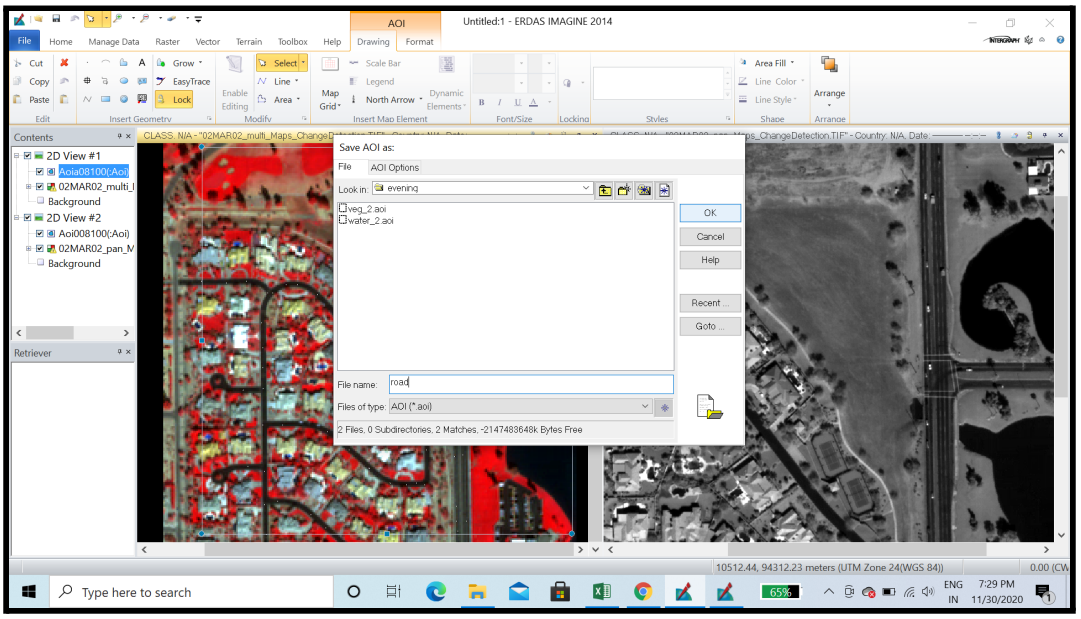
11/30/2020


Untitled:1 - ERDAS IMAGINE 2014
AOI
Save AOI as:
File
AOI Options
Look in:
evening
veg_2.aoi
water_2.aoi
OK
Cancel
Help
Recent ...
Goto ...
File name:
road
Files of type:
AOI (*.aoi)
2 Files, 0 Subdirectories, 2 Matches, -2147483648k Bytes Free
Type here to search
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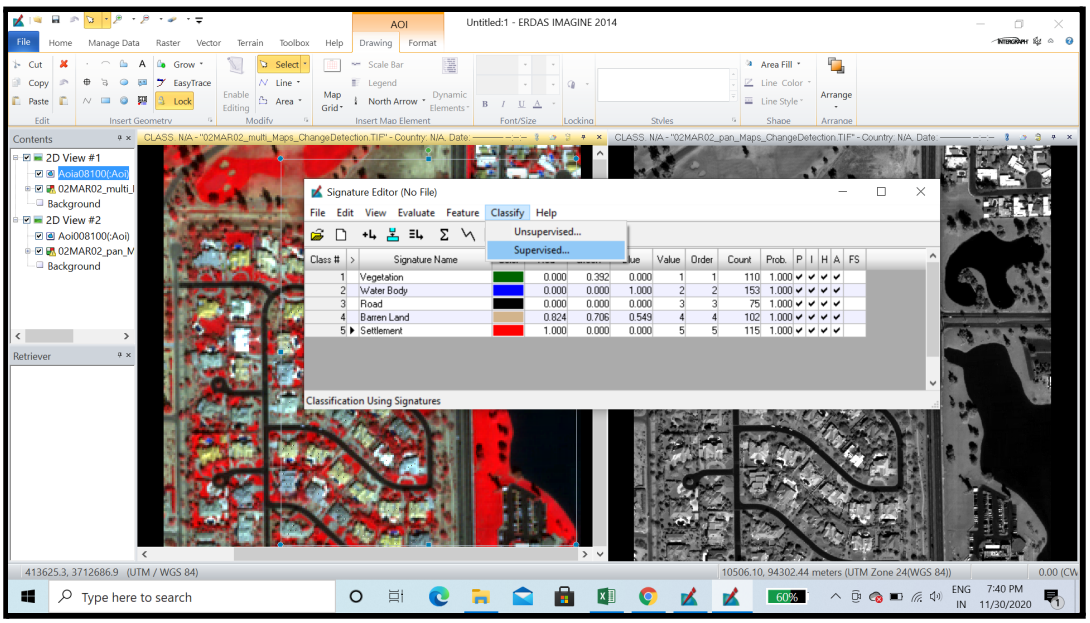
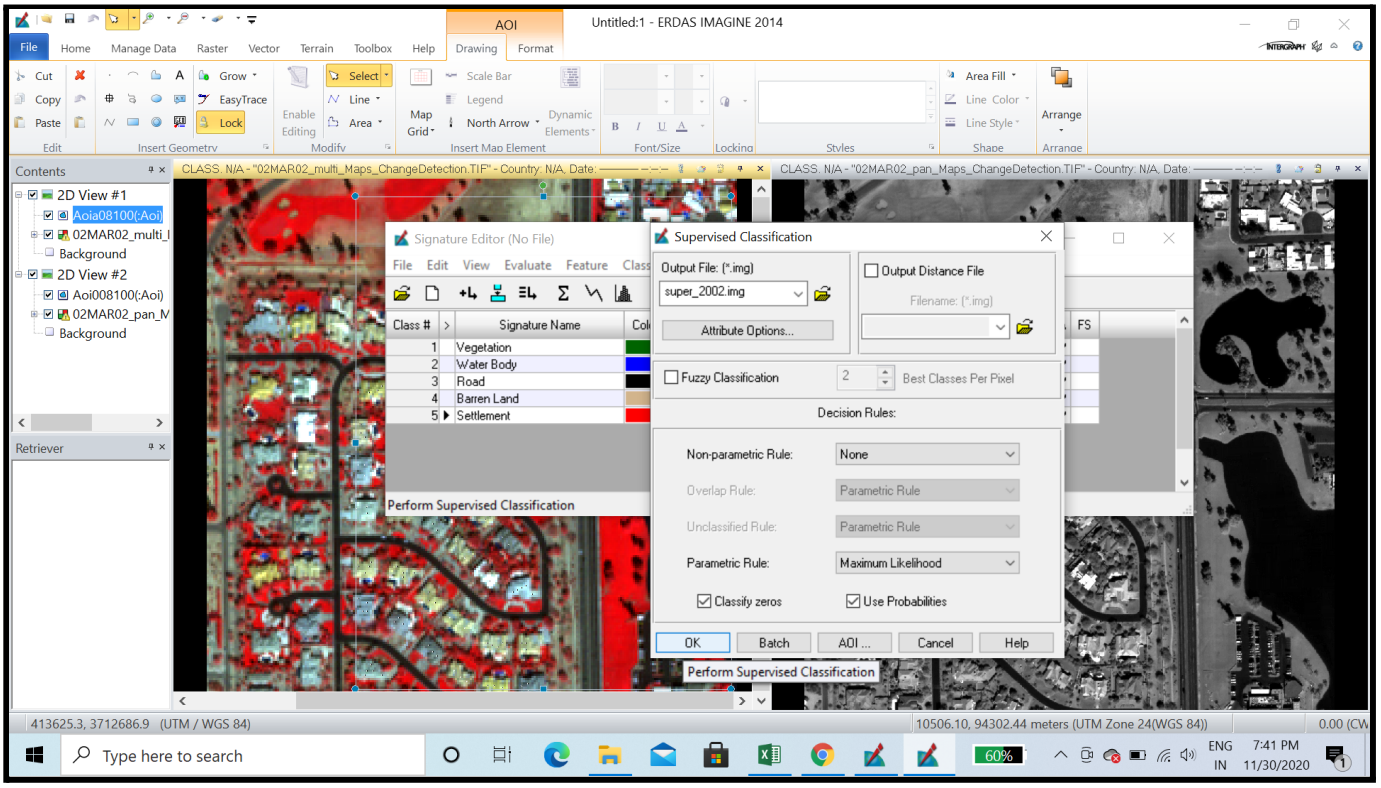
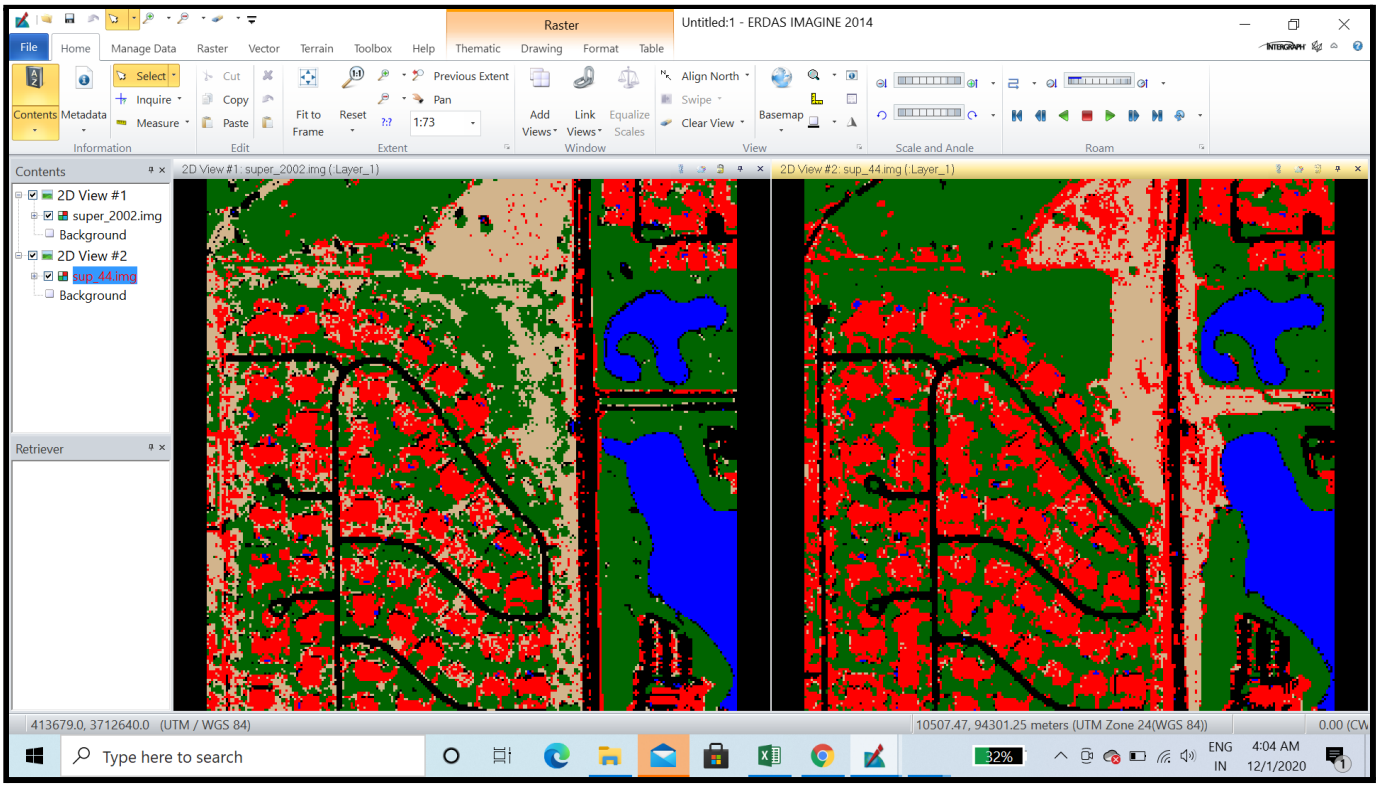
11/30/2020


Untitled:1 - ERDAS IMAGINE 2014
AOI
Signature Editor (No File)
File
Edit
View
Evaluate
Feature
Classify
Help
Unsupervised...
Supervised...
Class #
Signature Name
Value
Order
Count
Prob.
1 Vegetation 0.000 0.392 0.000 1 1 110 1.000
2 Water Body 0.000 0.000 1.000 2 2 153 1.000
3 Road 0.000 0.000 0.000 3 3 75 1.000
4 Barren Land 0.824 0.706 0.549 4 4 102 1.000
5 Settlement 1.000 0.000 0.000 5 5 115 1.000
Classification Using Signatures
Type here to search
ENG
IN
7:40 PM
11/30/2020



Supervised Classification (Maximum Livelihood) of 2002 and 2004

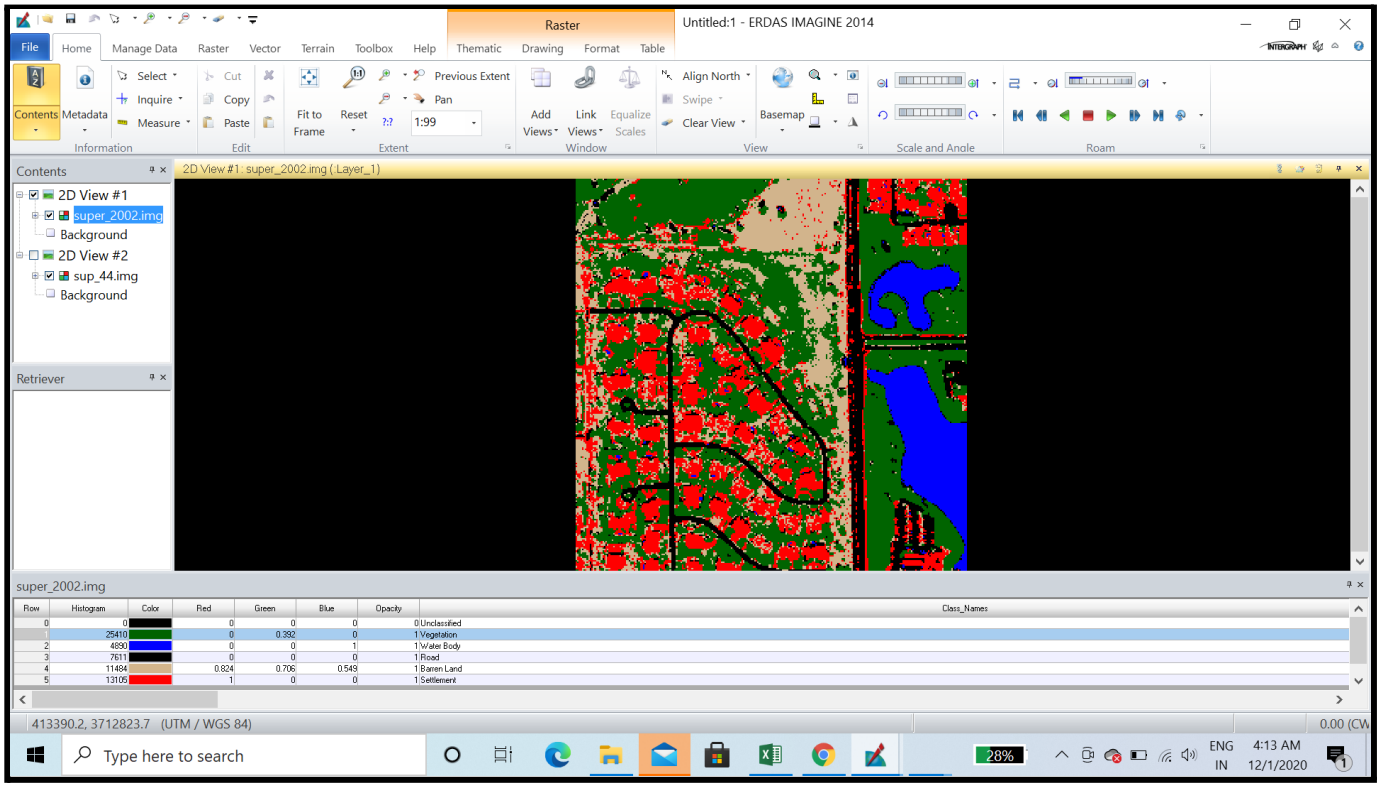


Part-2a

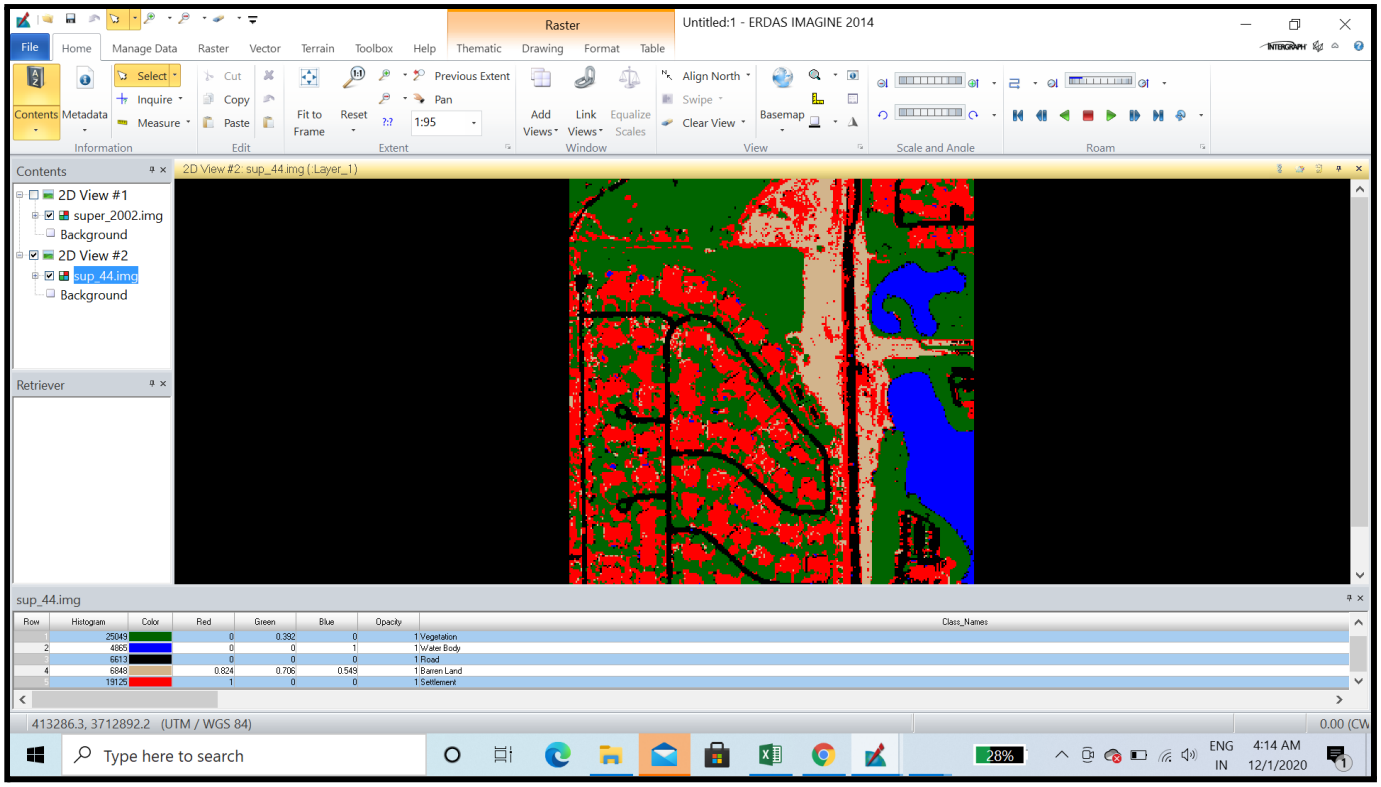
QUANTIFICATION

Step-1 Note the **pixel values** from the attribute table of both the images.

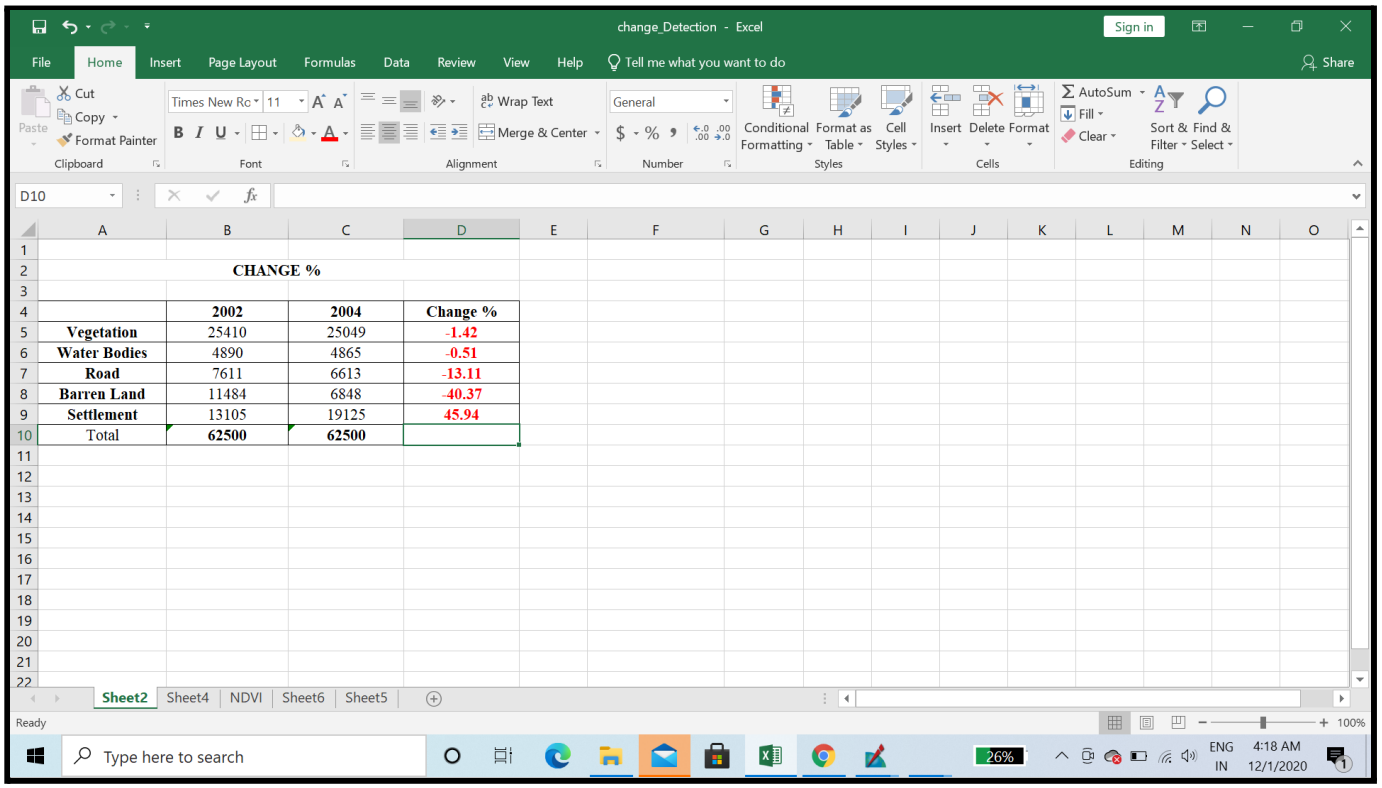
2002



2004



Step-3 Copy the pixel values of both the images and tabulate in excel sheet. And calculate change percentage



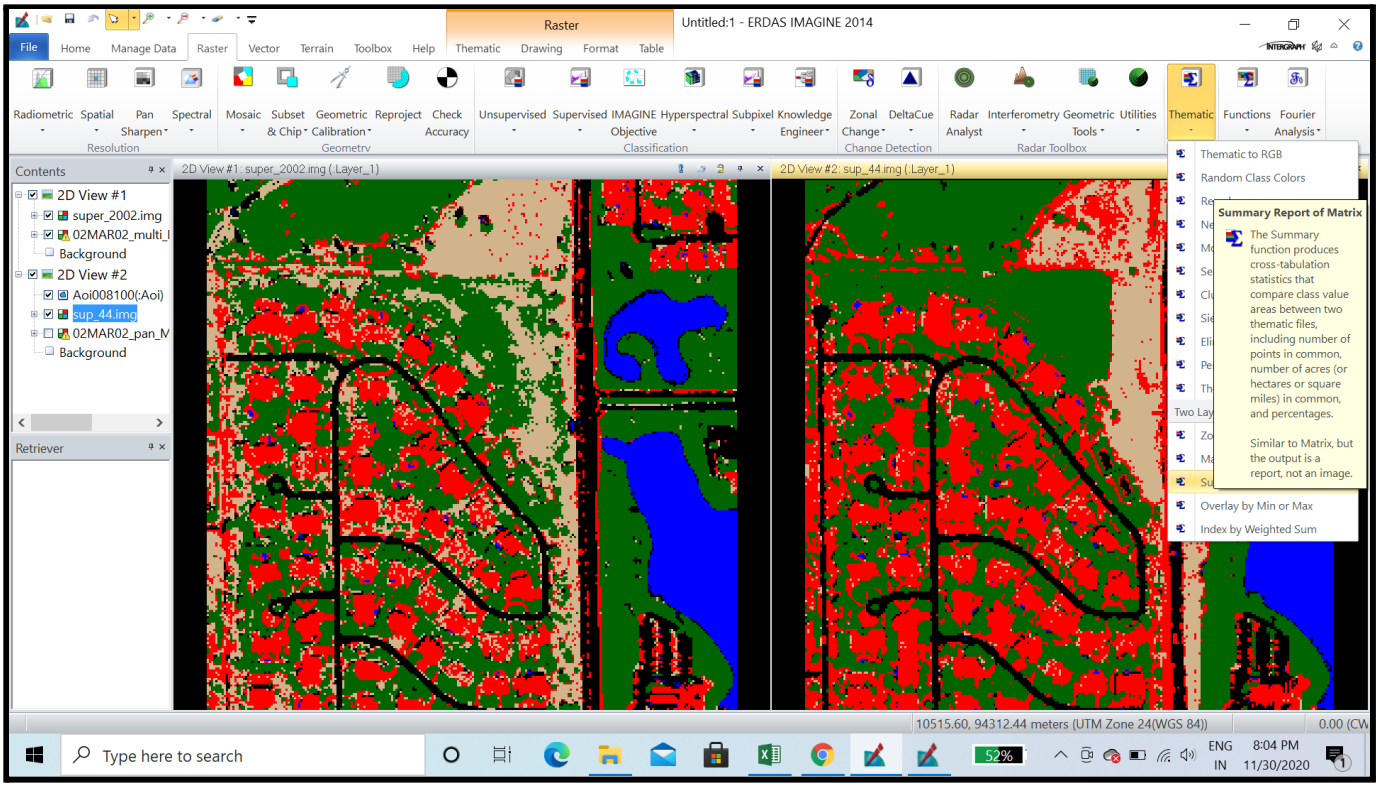
From the above calculation, the vegetation has decreased by 1.42%. The water body has shown very little decrease (0.5%). The road has decreased by 13% and barren land has tremendously decreased by 41%. The settlement has increased rapidly in two years by 46%.

In nutshell, **all the features have shown a decline except for settlement which has increased rapidly.** This indicates **large scale urbanization** going in the area during the last 2 years.

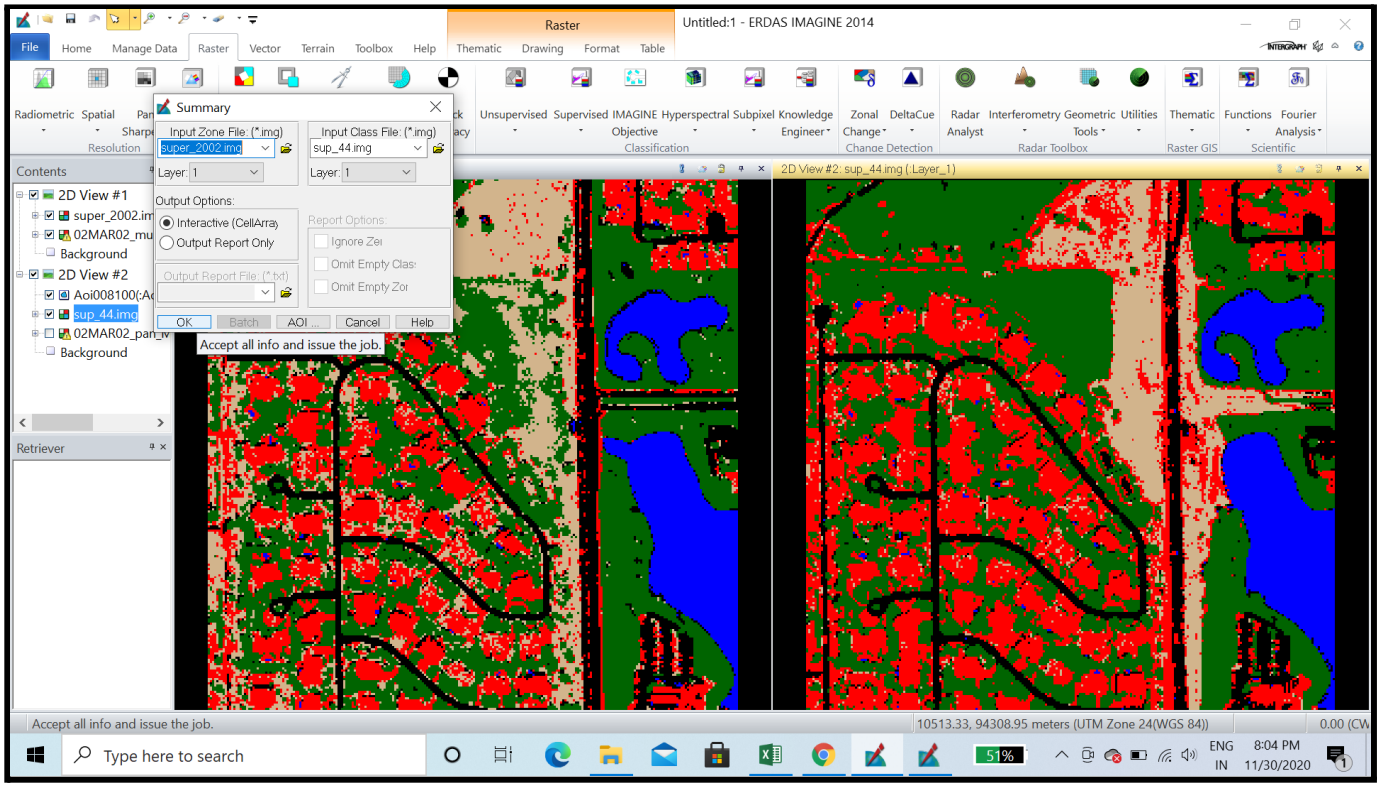
Part-2B

SUMMARY REPORT MATRIX

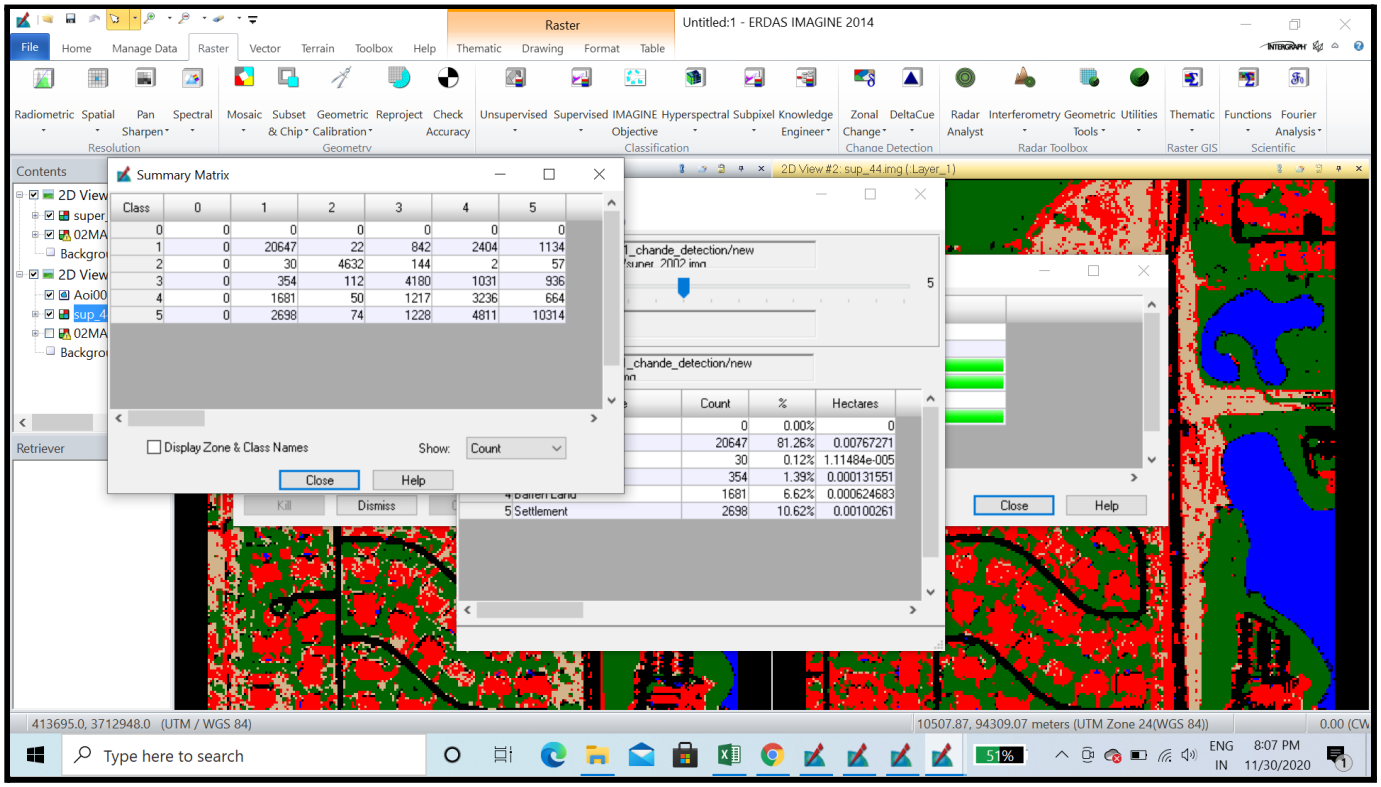
Step-1 Go to **Raster > Thematic > Two Layer Union Matrix > Summary Report Matrix**



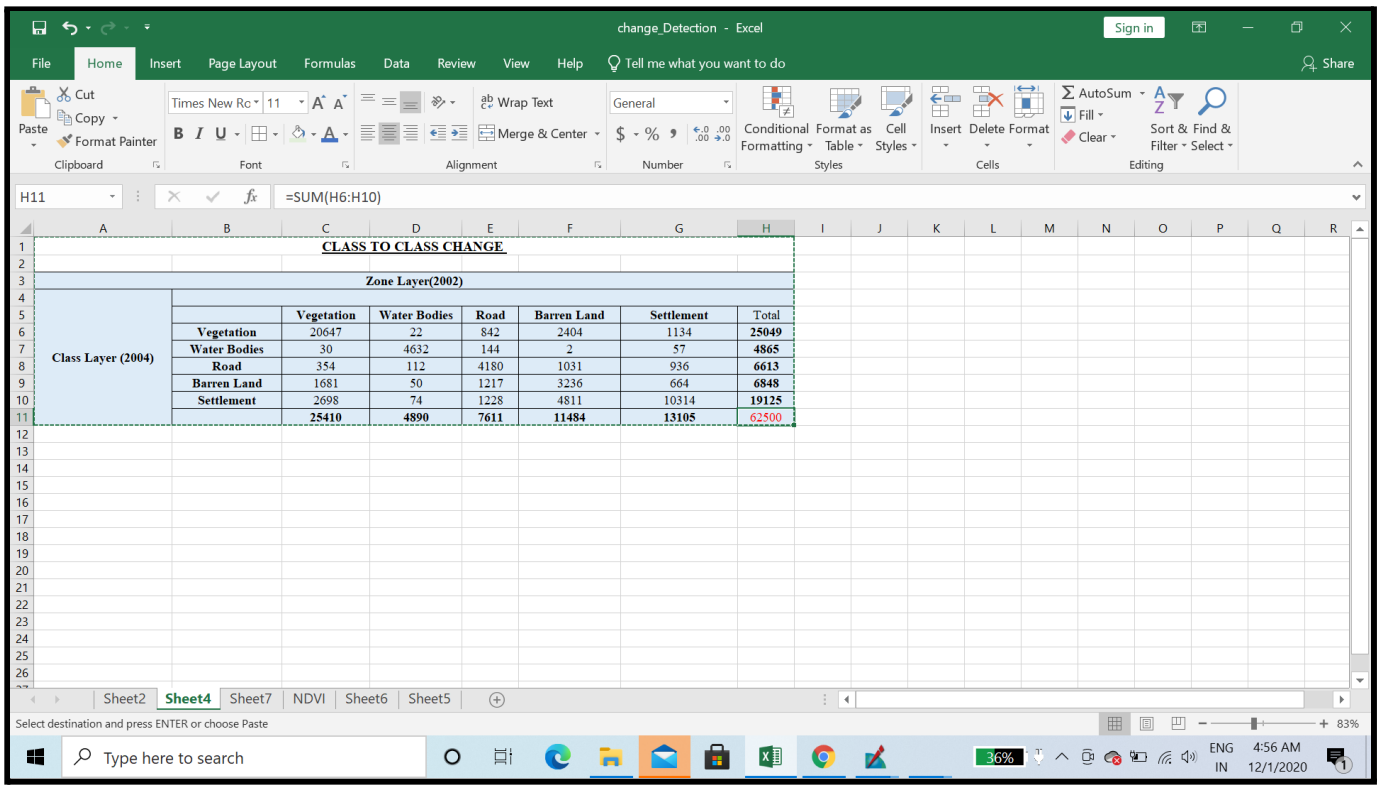
Step-4 Input classified map 1 in first input box and second classified map in second input box. Output Options: **Interactive (CellArray).** And click ok. The Summary by Zone tab will appear.



Step-5 Go to **View > Summary Matrix.** The summary matrix will appear. Note the pixel values.

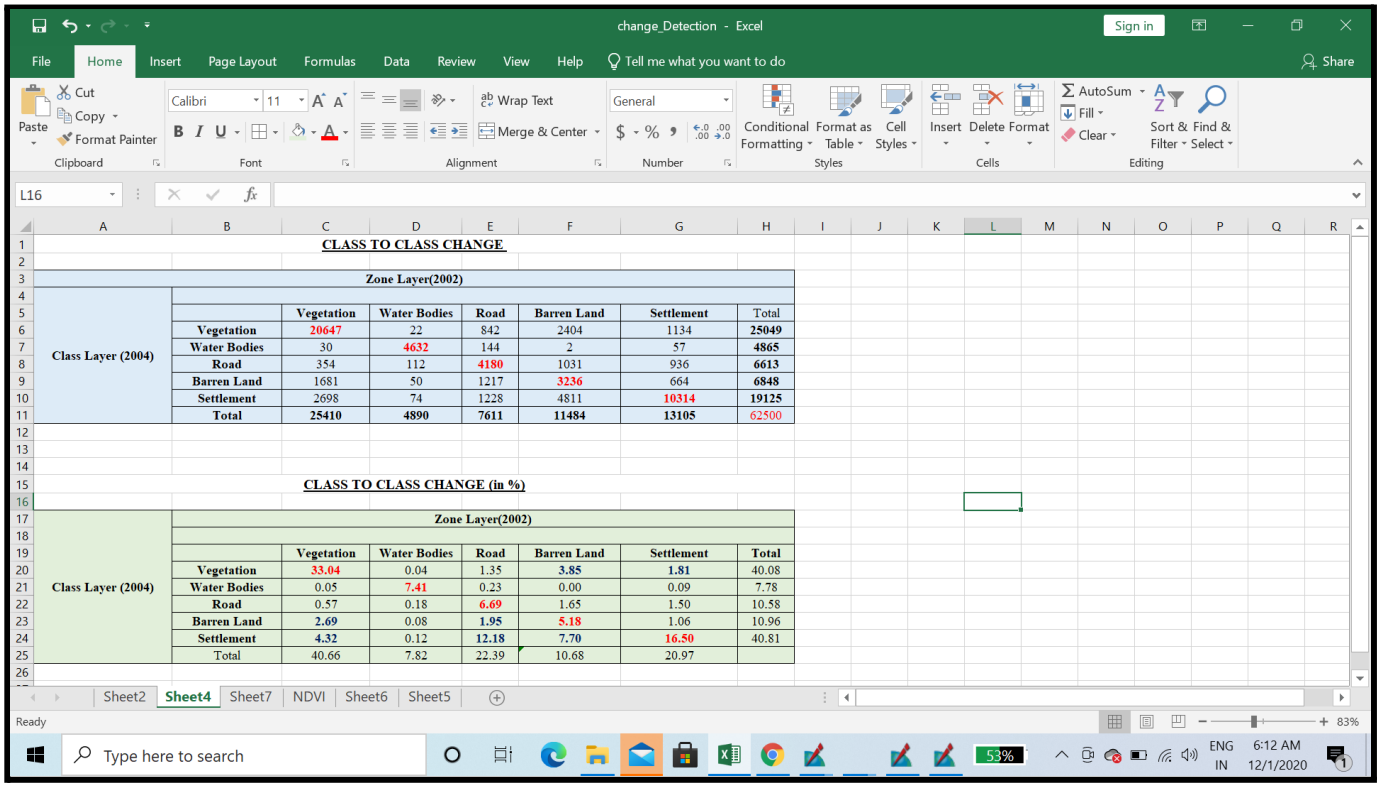


Step-6 Note the values and paste in the excel sheet.



Using Summary to Report Matrix, **individual values** i.e. **class to class changes** can be determined, not just overall changes. Here, **vegetation** to the water body, 30 pixels changed. Around 354 pixels converted to road from vegetation, 1681 pixels of vegetation converted to barren land and 2698 to settlement. This indicates that a **significant part of vegetation has been converted to barren land and settlement during the last two years.** Similar interpretations about other features can be made.

Class to class Changes (in %)



CLASS TO CLASS CHANGE

	Zone Layer(2002)					
Class Layer (2004)	Vegetation	Water Bodies	Road	Barren Land	Settlement	Total
Vegetation	20647	22	842	2404	1134	25049
Water Bodies	30	4632	144	2	57	4865
Road	354	112	4180	1031	936	6613
Barren Land	1681	50	1217	3236	664	6848
Settlement	2698	74	1228	4811	10314	19125
Total	25410	4890	7611	11484	13105	62500

CLASS TO CLASS CHANGE (in %)

	Zone Layer(2002)					
Class Layer (2004)	Vegetation	Water Bodies	Road	Barren Land	Settlement	Total
Vegetation	33.04	0.04	1.35	3.85	1.81	40.08
Water Bodies	0.05	7.41	0.23	0.00	0.09	7.78
Road	0.57	0.18	6.69	1.65	1.50	10.58
Barren Land	2.69	0.08	1.95	5.18	1.06	10.96
Settlement	4.32	0.12	12.18	7.70	16.50	40.81
Total	40.66	7.82	22.39	10.68	20.97	

Similarly, the **percentage of individual class change** can be calculated. Here, around **2.7%** of vegetation has changed to barren land and approximately **4.3%** to settlement. These together makes **7% of degradation** caused to vegetation. The w**ater bodies have remained more or less the same** over the 2 years. Around **8%** of barren land has been converted to settlement and **4%** to vegetation. Thus, barren land is being converted either to settlement or vegetation restoration is carried out.

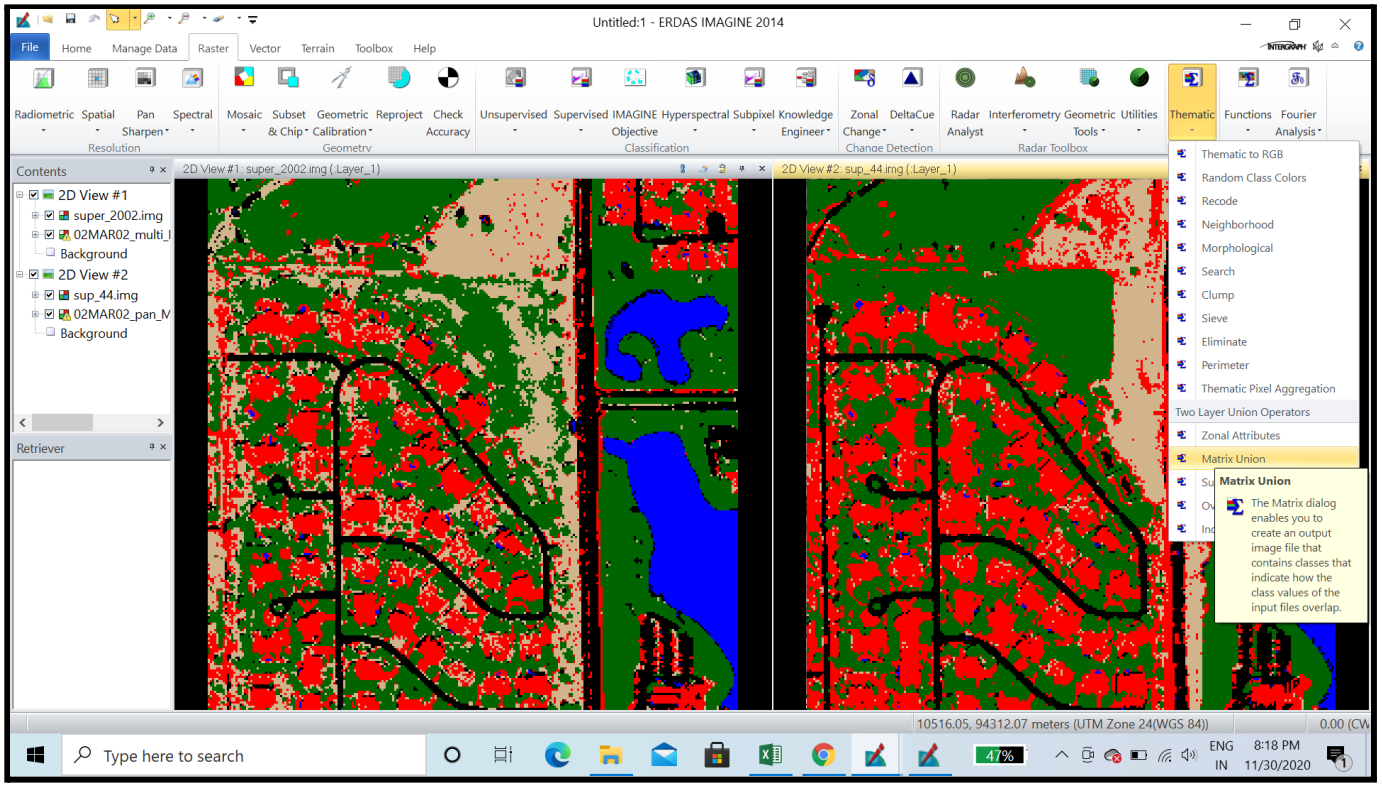
Around **24%** of other features have been converted to settlement. This indicates a massive **scale of urbanization** going in the area. The **diagonal elements** represented by red color indicate the percentage of features which **remained unchanged** during the last 2 years.

Therefore, report summary matrix is an **efficient tool** to determine the i**ndividual values i.e. class to class changes** occuring in an area. However, it **does not give a visual idea** (spatial distribution) about the changes happening.

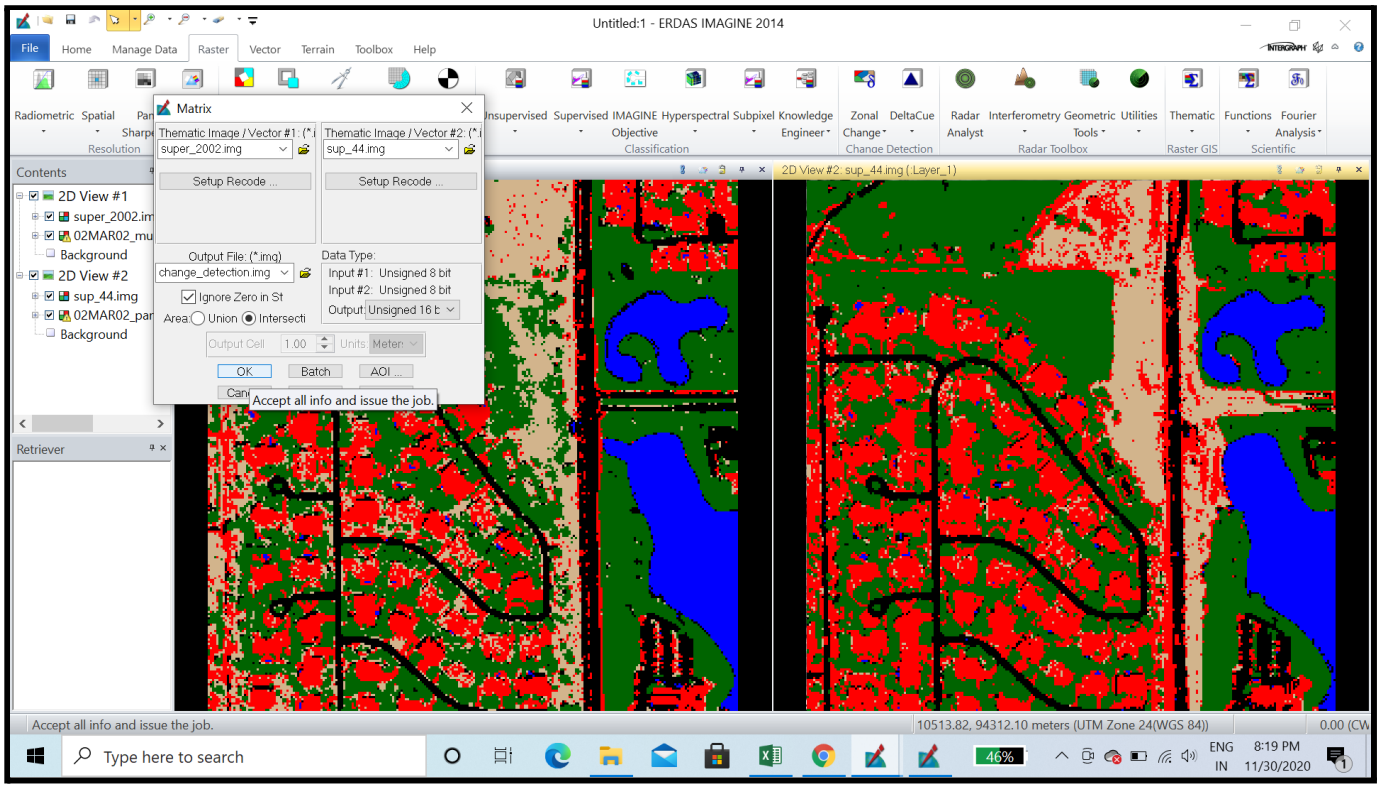
Part-2C

MATRIX UNION

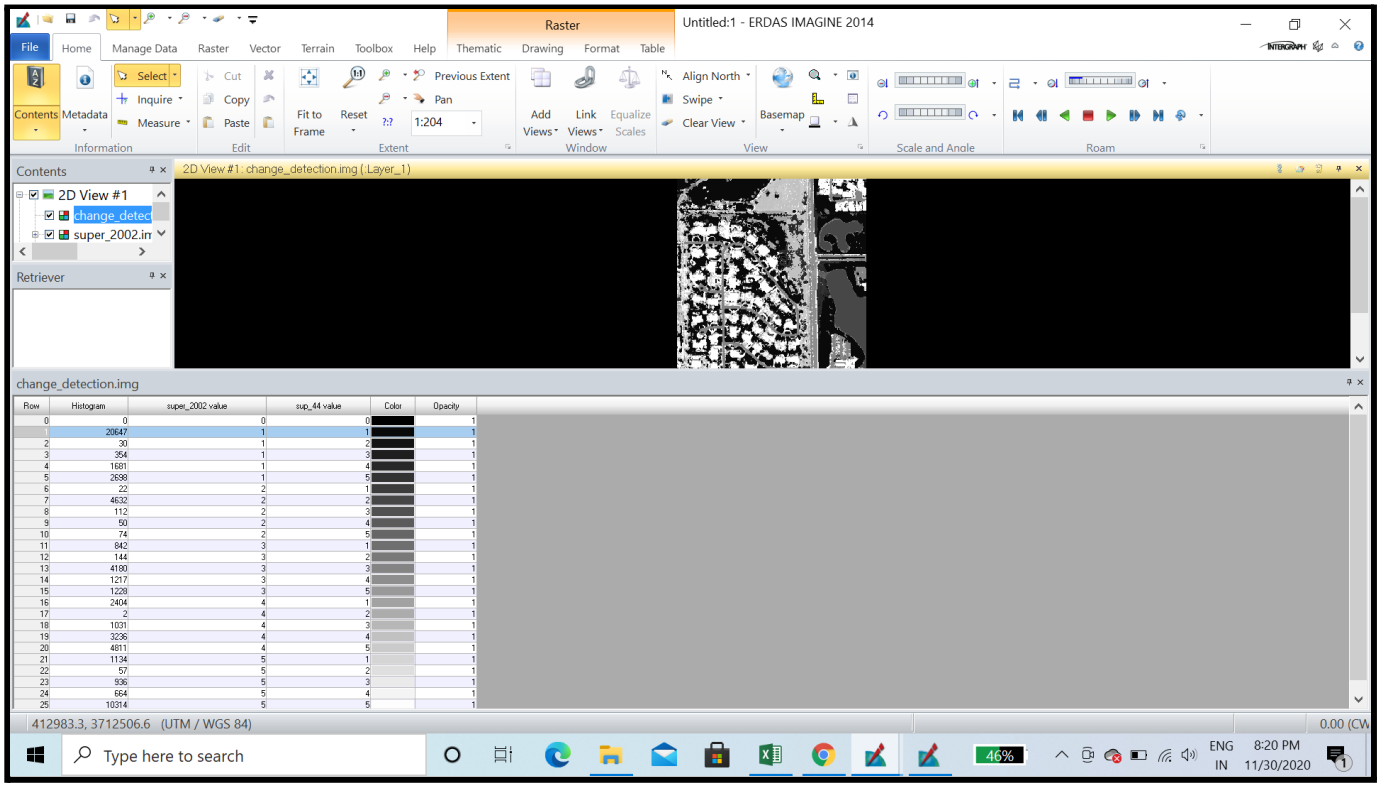
Step-1 Go to **Raster > Thematic > Two Layer Union Matrix > Matrix Union**



Step-2 Input both the thematic maps, give the output file name. Enable Ignore 0 statistics. And click OK.

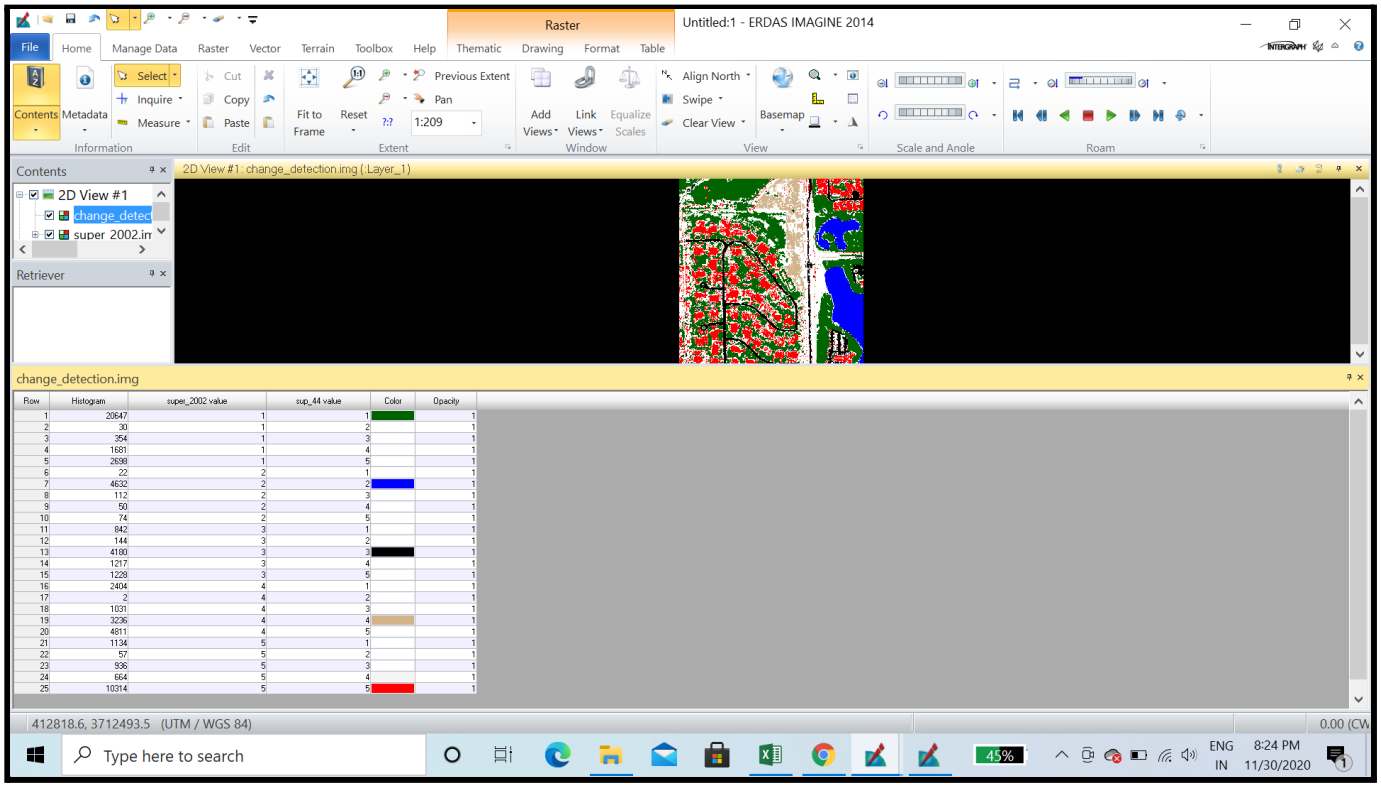


Step-3 Open the image created and display the attribute table.



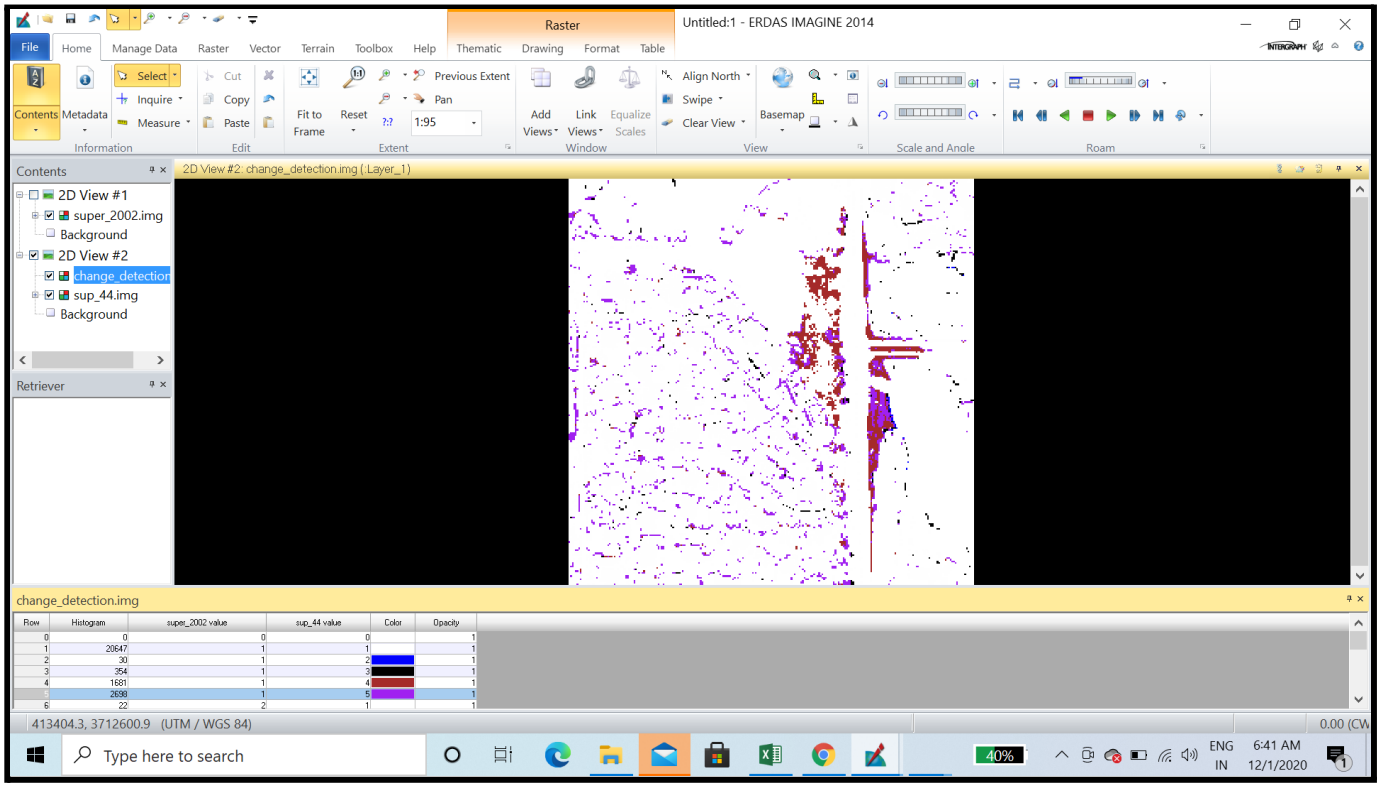
(**Note-** Change the colour coding to your needs. Also, one can note the pixel values from the attribute table and computate the changes occurring.)

No change in features over 2 years.



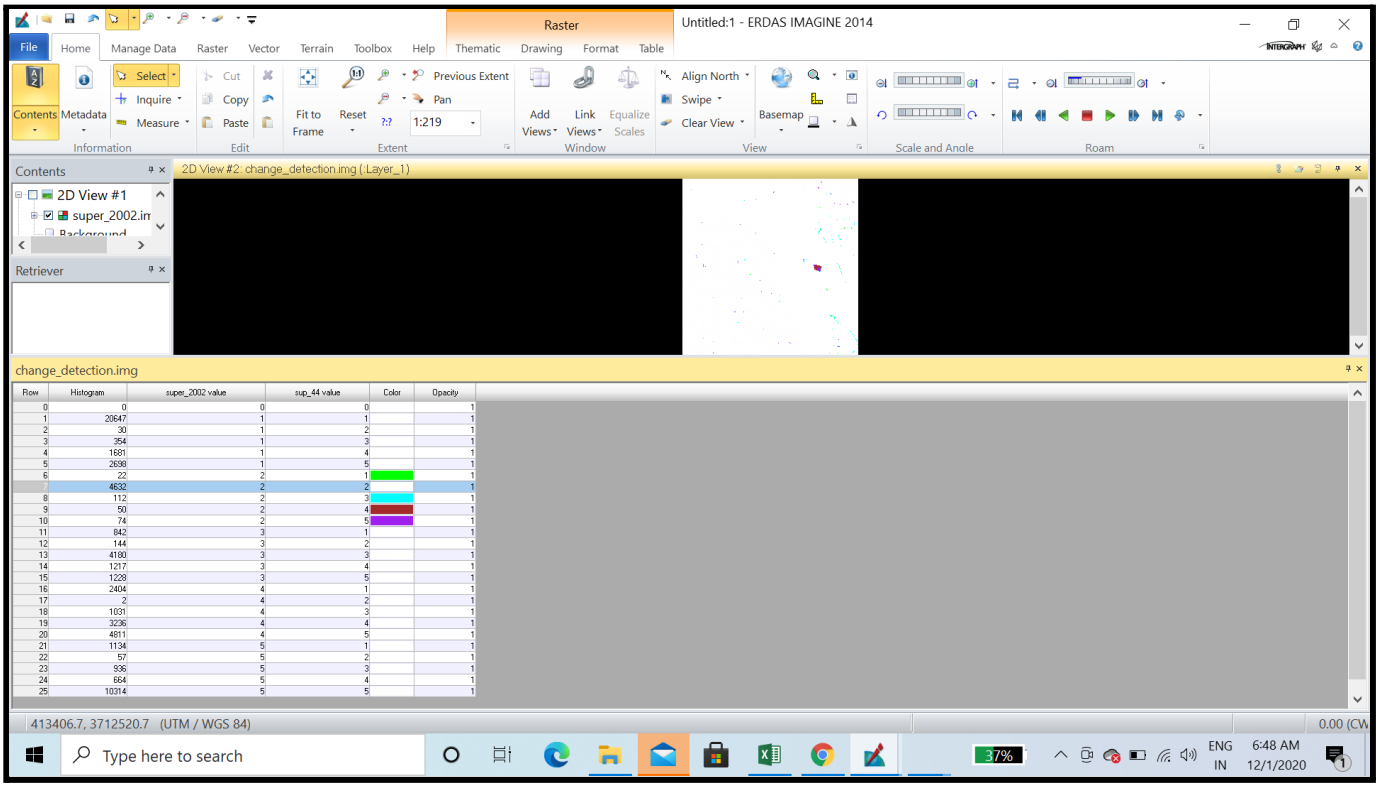
The map above shows the area of those features that remained unchanged from 2002-2004. The **white color** represents the areas that have undergone change during 2 years.

Change Detection in Vegetation Cover



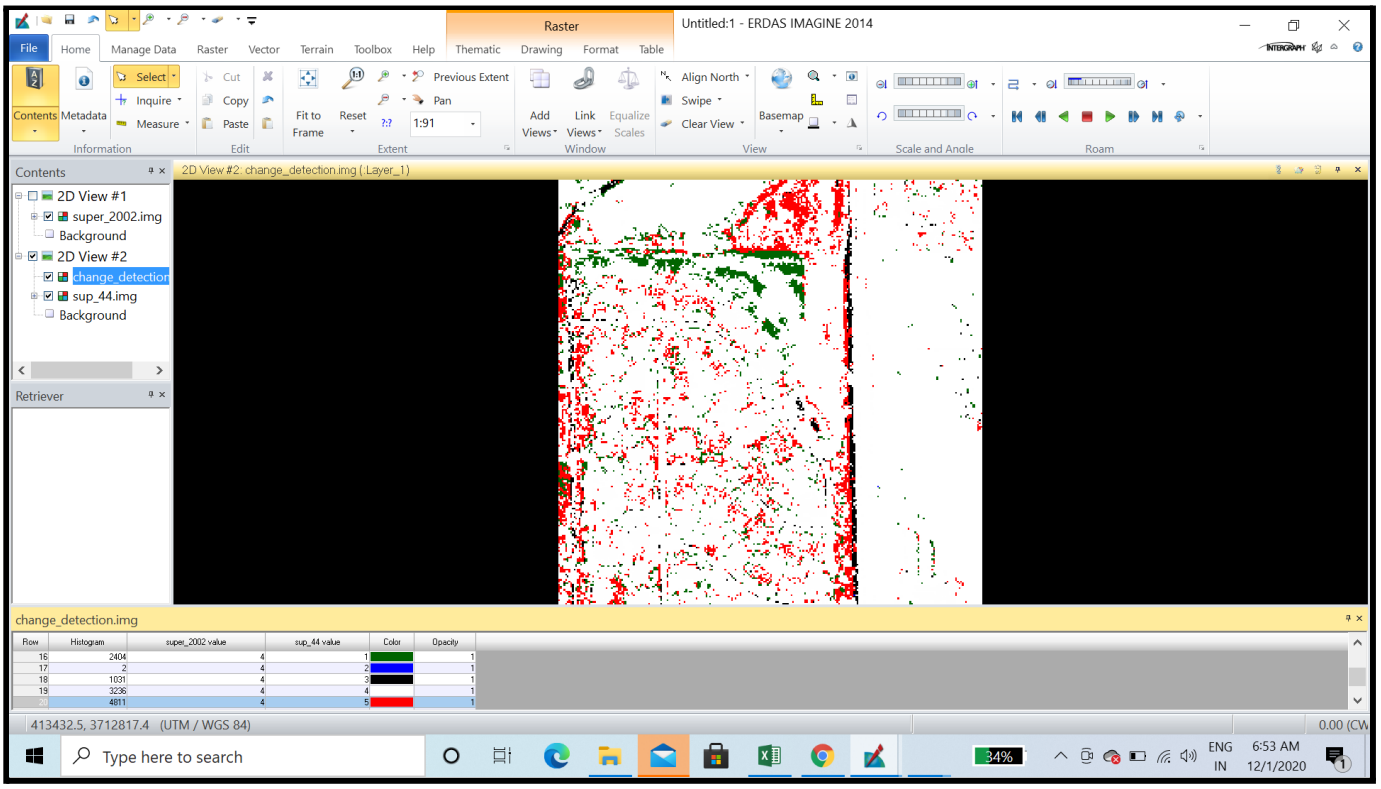
From the image above, it is **visually clear that most of the vegetation has converted to settlement (purple) followed by barren land (brown).**

Change Detection in Water Body



It is clear that the water body has **remained more or less the same** during the last two years except for a small patch where it has converted to settlement and barren land.

Change Detection in Barren land



Maximum of barren land has been converted to settlement forest by vegetation.

Thus, this method is **very good** as it gives both the **visual representation** of the changes occurring along with the **computation part.** Can detect **changes from one class to another** i.e. it is quantifiable (how much calculated by no. of pixels in particular category) and **where the changes are occurring** (by locating on map). Thus, even without visiting the field such estimations can be made using this tool.