Remote Sensing and GIS for Rural Development
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Lecture 42
Different types of LULC classifications

Hello everyone, welcome to the NPTEL course on Remote Sensing and GIS for Rural Development. This is week 9, lecture 2. In this week, we have been looking at the different classification types of LULC, how to classify and bring data together for effective mapping. In today's lecture, we will be using the skills that we have looked upon in the past lectures especially, we will download the data and do a quick like LULC classification, a very basic classification will be done in a semi-supervised fashion, where data clustering will happen, and some clusters will be labeled by us.

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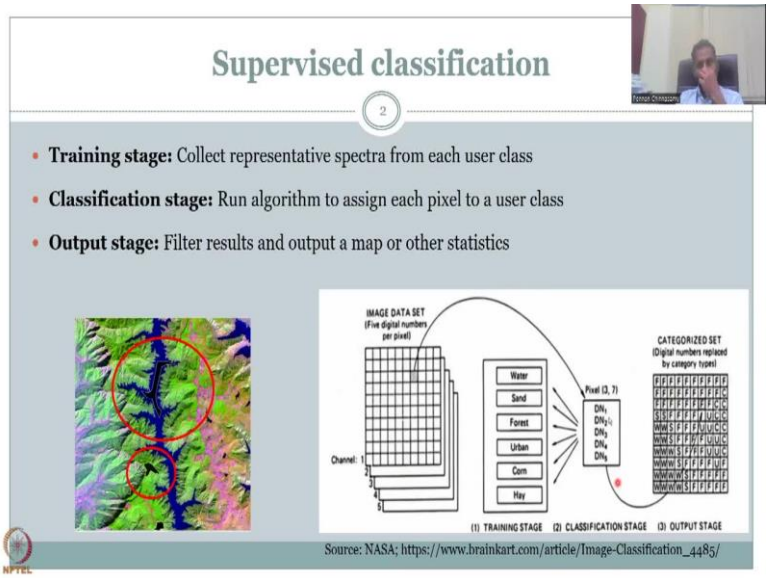

So, let us go ahead with today's lecture. First, let me introduce the supervised classification stage. In the supervised classification, you will need to provide a training stage in which correct representatives spectra from each user class from the image will be done. So, for example, in the image in the bottom you could see, I have taken some spectral signatures for water and the system or the GIS platform will use all the water signatures that I determined as water for clustering. So, that is the training stage where I have to collect data and provide it a class name.

In the second stage, we see that you have a classification stage. So, I have created the spectral signatures, I have created a signature file and the signature file will be now input to the

system and the GIS software runs and classify. So, there is a run algorithm part, to assign each pixel to use a class and the last of course, is output stage where the outputs are filtered. And a map a set of 6 is derived.

So, at the bottom there is an example given the other 3 stages, the first stage, you have the training data all taken together. So, this is the data from your remote sensing platforms NASA, ISRO, Bhuvan you download it. Once you download it, you have each pixel has a number; unique identification number. And in the second case, you have a class that you have determine waters, sand, forest, urban, corn, hay.

So, each unique identification number so for example, this pixel is 3 7. So, third row and seventh column is the unique identification code for that pixel. And that pixel takes one of these classes based on the classification I give. So, the first stage you take the training stage, you give classes, you take spectral signatures for each class, and then you run the algorithm and the output comes. So, in the output you have categorize set digital numbers are replaced by the category types. So, you do not see any 3 7, but that will become f for forest and along the land use classification pattern. So, this is what we will be doing in an exercise in today's lecture.

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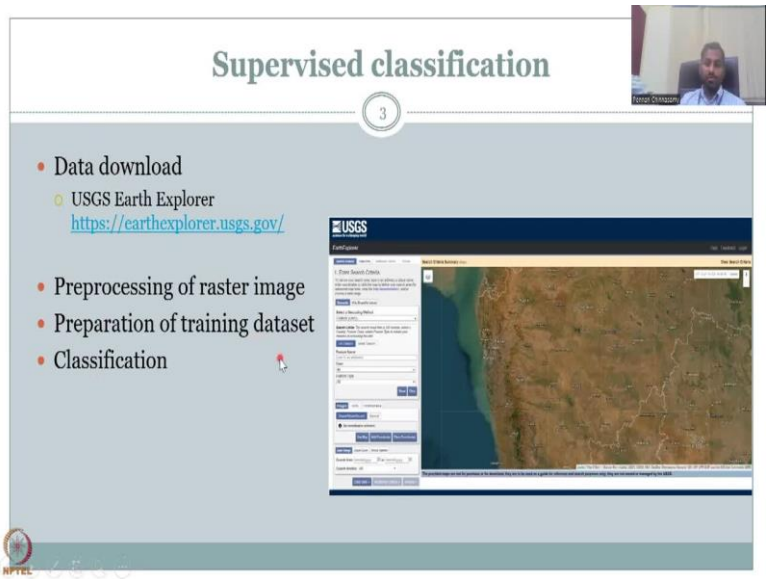

So, for supervised classification, as I said, all the classes have to be given. And in the supervised classification, if you do not have all the labels all the classes it is a semi-supervised. In today's example, within the supervised there is a part of classes, which we will not be labeling, and those are called unclassified. So, let us look at these colors.

So, first step is to download the data. We have already showed that multiple data sets are available. However, the current data set will give you a better LULC because the latest ones we have for the open source systems are 2015-2016. So, let us start processing a data for a current data set for Maharashtra region. So, you have the data download link, I have given, the Explorer, I hope all of you have created an account, it is free, you can download data preprocessing of raster image is done once the data is collected. In the pre-processing stage, you will be only using the part of data that you want, you do not need the entire time, it is too cumbersome, too much memory storage.

So, you can bring it down the cache memory will take long time if you have large datasets. And then you prepare a training data set with classes and the class names the labels you will be given. And then you run the classification. So, these are the steps download data, pre-process the data, create a label of classes and the signature file, and then you do a classification.

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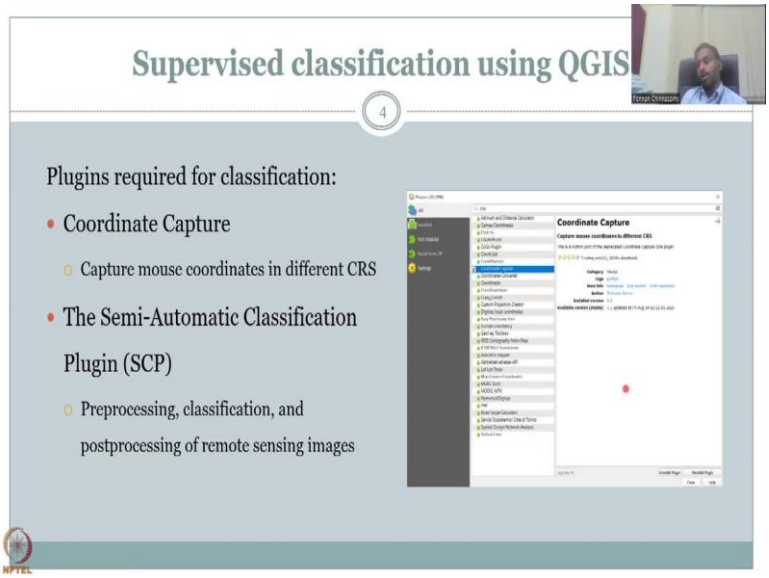

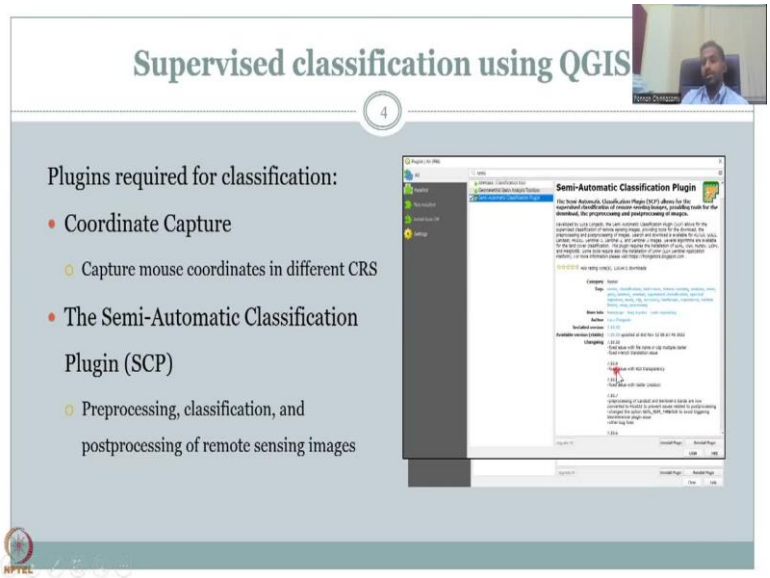

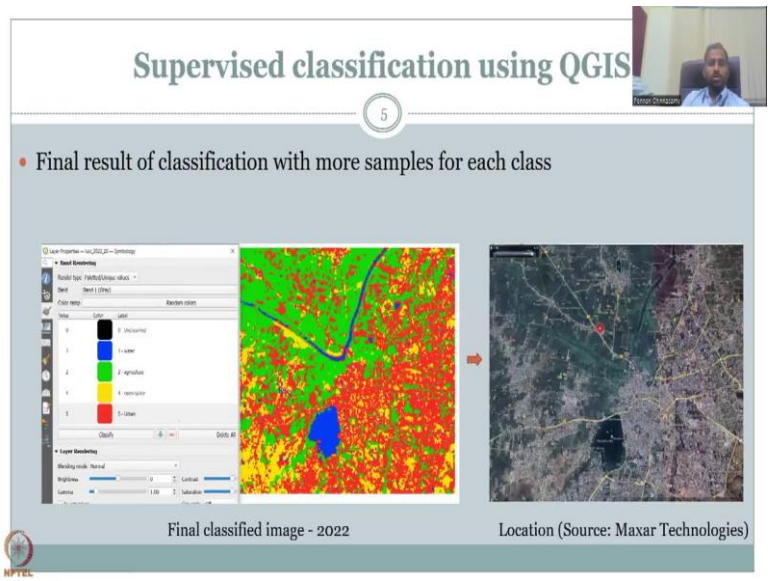

Before that, as I said, there are certain aspects that are needed for QGIS classification. Plugins are very good. And one of the plugins is supervised classification plugin. So, let us take it out from the list of supervised classification plugins available. The ones we will be using is the plugin coordinate capture, we will use the first plugin. So, what it does is it helps us to create a training data set.

So, it basically you can move the mouse to a particular location and click a pixel and the lat long the coordinate of that pixel will come out. This you will have seen already in Google Earth where we Google Earth Pro where we move the mouse and then the lat long was changing on the bottom. So, here in QGIS, we want to have it typed already and taken out instead of you typing it, you click it, it comes out as a clipboard, it copies to pay yourself and then you can use it in different coordinate reference systems.

Then we will use a semi-automatic classification plugin. As I said, semi-automatic is not fully automatic, it is not unsupervised, where you let it classify by itself, you give it some weightages, some labels, and then the classification starts. So, there is a preprocessing stage in a classification stage and post processing stage. The coordinate capture plugin is just for you to help you to extract the lat longs for creating the training set, which is part of the preprocessing stage.

So, let us go ahead. The first one is the coordinates capture it those who do not have it already, please go to the plugins all plugins will come my 98. I have showed you how to access the plugins on the QGIS top toolbar, go to the toolbar and then type coordinate capture, you will find it this installed as a plugin. So, most of the steps I am going to fast forward, because in a 30 minute, I want to capture most of the classification part.

The second plugin is a semi-automatic classification plugin, please look at the icon. This is what icon will come when you type semi, and then the third one semi-automatic will pop up, just click it install the plugin and I have installed it I have kept it ready for the class so that if any error comes we will not waste time while recording. So, the final results will come once we show it, I have made a slide but before that let us start the data download process. So, what we will do is we will start with the USGS explorer and then we will look into the data download part.

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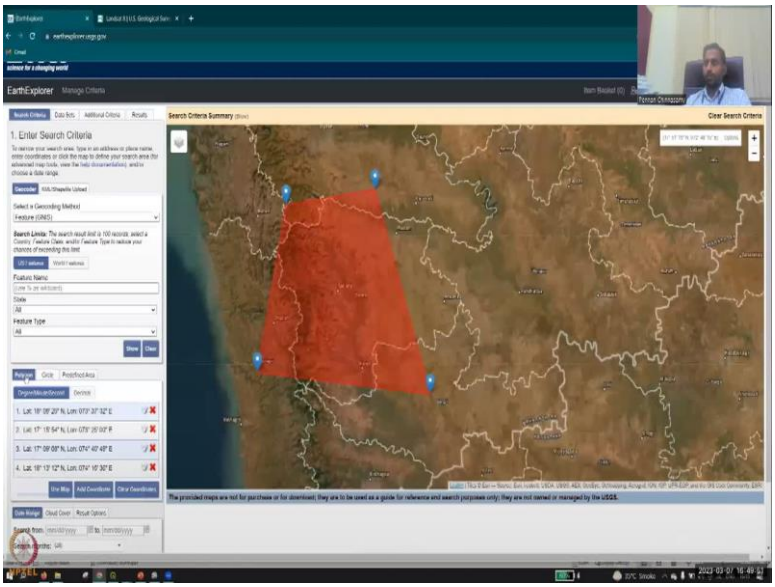

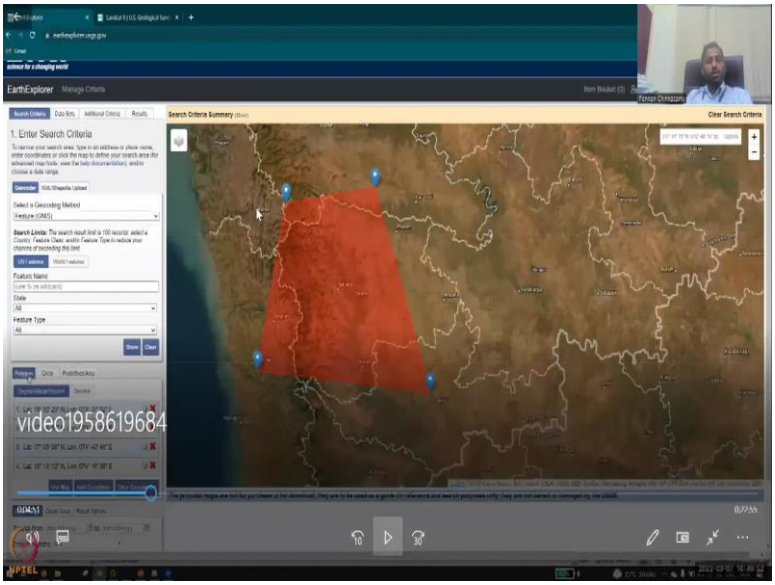
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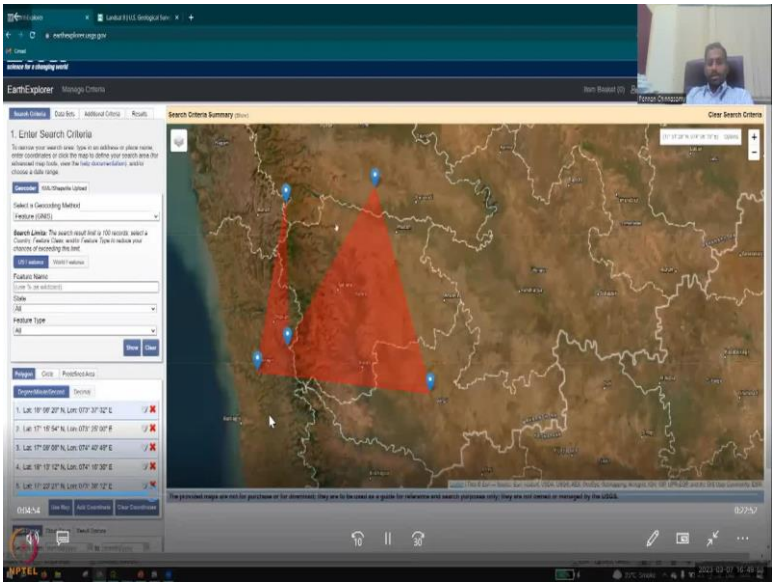
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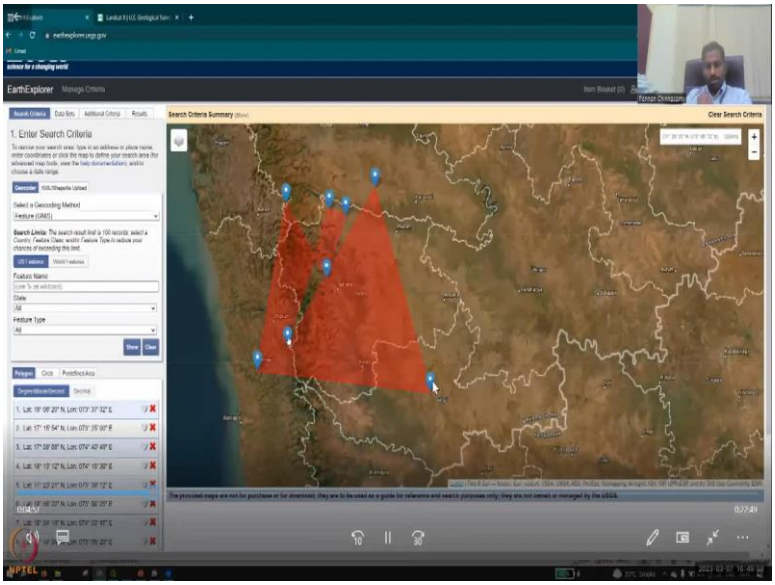
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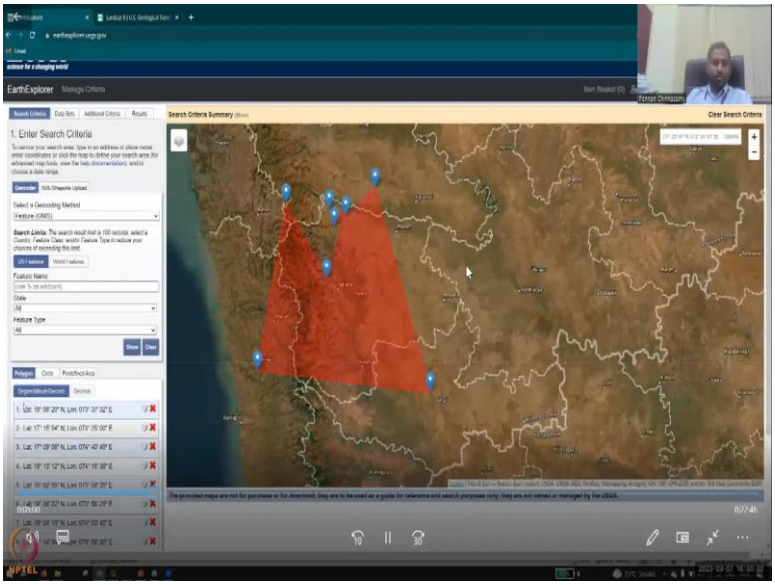

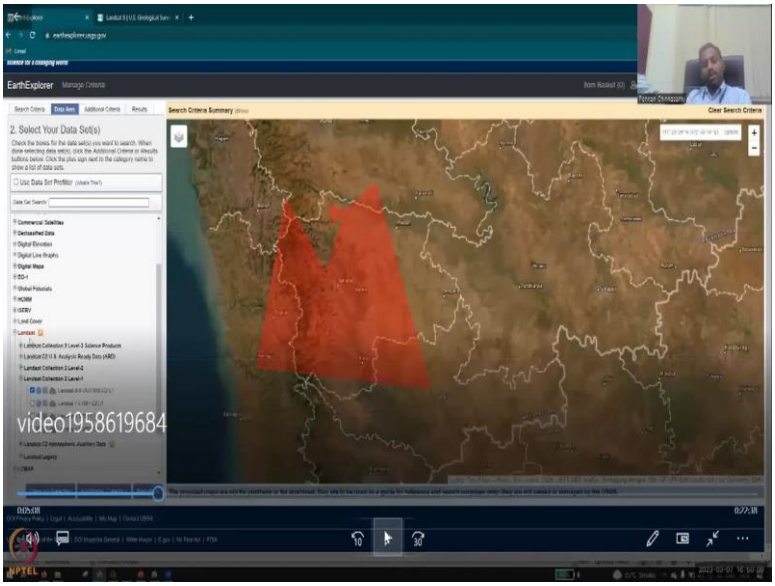

So, here you will see that there is a Earth Explorer that we are going to use. We will start with the supervised classification data. So, as I said, let us go to USGS Explorer, and then we will create these points of interest and then I will show you how to download the data. So, what we will do is select the study area random study area and then I am just pulling the points and moving so that we can select the study area part. And then when you click the data sets in the bottom, you will see that there are multiple data sets that are available.

But we will take the Landsat data. In the Landsat, we have multiple Landsat classifications and collections, we will use the recent ones 8 9 because we want the 2022. So, we will click it. And for that particular coordinate systems that we have given it is searching for data and all the data for that particular location area of interest is coming.

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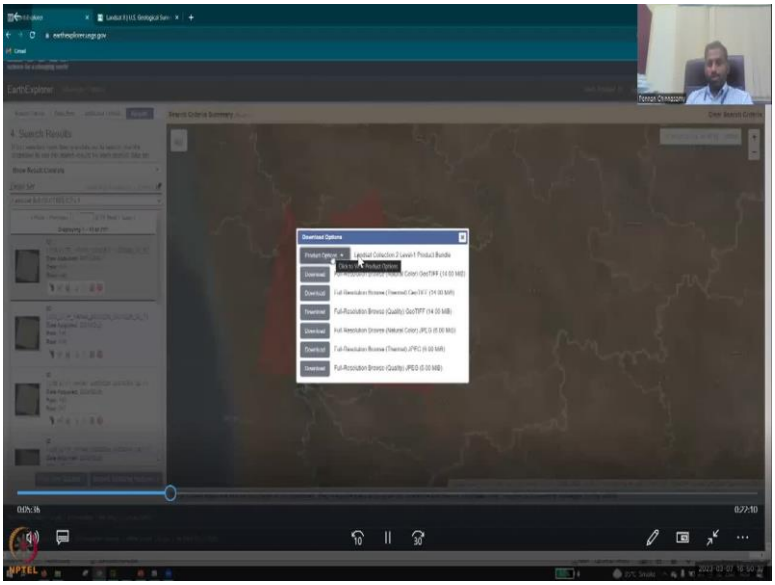
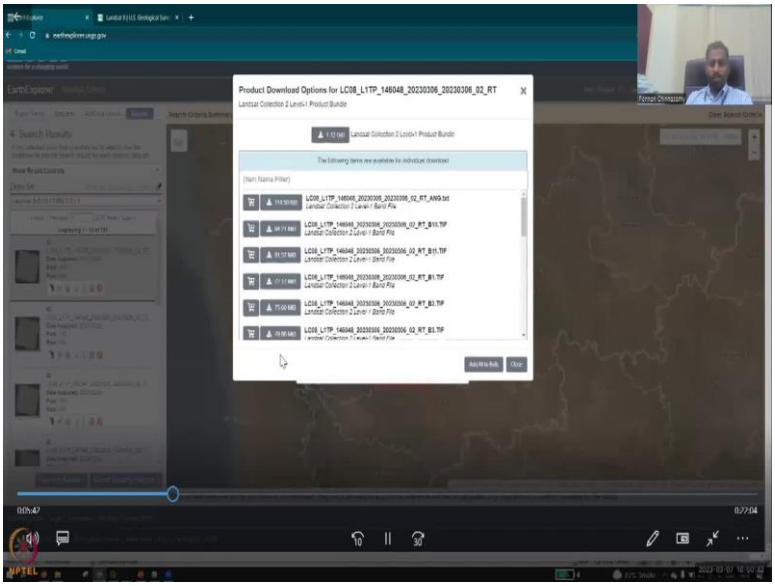
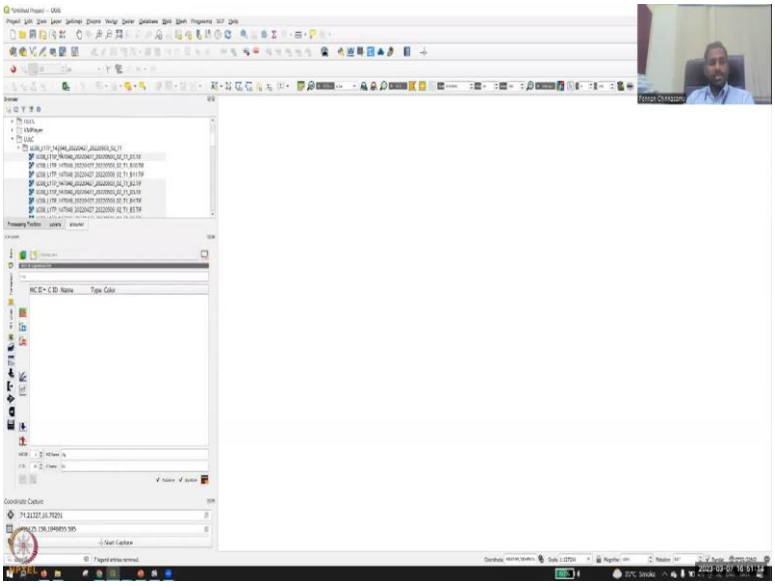
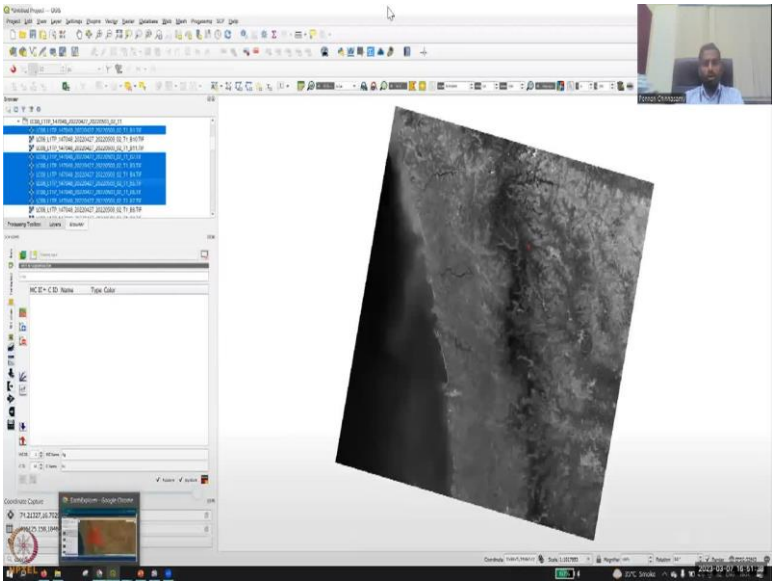
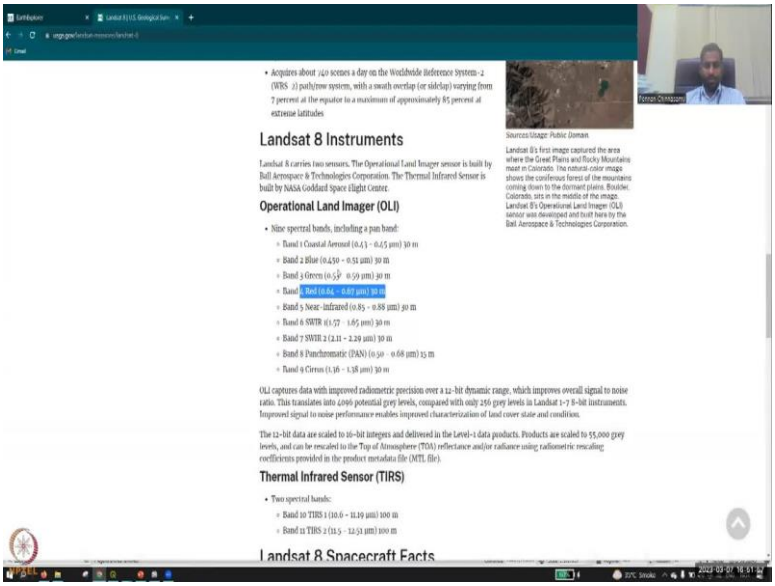



Product Download Options for LC08_L1TP_146048_20230306_20230306_02_RT







- Acquires about 740 scenes a day on the Worldwide Reference System-2 (WRS -2) path/row system, with a swath overlap (or sidelap) varying from 7 percent at the equator to a maximum of approximately 85 percent at extreme latitudes

Landsat 8 Instruments

Landsat 8 carries two sensors. The Operational Land Imager sensor is built by Ball Aerospace & Technologies Corporation. The Thermal Infrared Sensor is built by NASA Goddard Space Flight Center.

Operational Land Imager (OLI)

- Nine spectral bands, including a pan band:
  - Band 1 Coastal Aerosol (0.43 - 0.45 µm) 30 m
  - Band 2 Blue (0.450 - 0.51 µm) 30 m
  - Band 3 Green (0.53 - 0.59 µm) 30 m
  - Band 4 Red (0.64 - 0.67 µm) 30 m
  - Band 5 Near-infrared (0.85 - 0.88 µm) 30 m
  - Band 6 SWIR (1.57 - 1.65 µm) 30 m
  - Band 7 SWIR 2 (2.11 - 2.29 µm) 30 m
  - Band 8 Panchromatic (PAN) (0.50 - 0.68 µm) 15 m
  - Band 9 Cirrus (1.36 - 1.38 µm) 30 m

OLI captures data with improved radiometric precision over a 12-bit dynamic range, which improves overall signal to noise ratio. This translates into 4096 potential grey levels, compared with only 256 grey levels in Landsat 1-7 8-bit instruments. Improved signal to noise performance enables improved characterization of land cover state and condition.

The 12-bit data are scaled to 16-bit integers and delivered in the Level-1 data products. Products are scaled to 55,000 grey levels, and can be rescaled to the Top of Atmosphere (TOA) reflectance and/or radiance using radiometric rescaling coefficients provided in the product metadata file (MTL file).

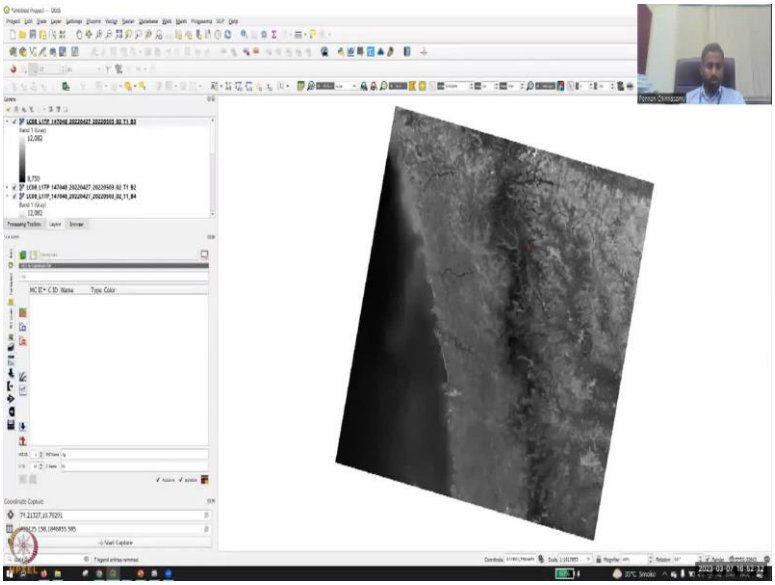
Thermal Infrared Sensor (TIRS)

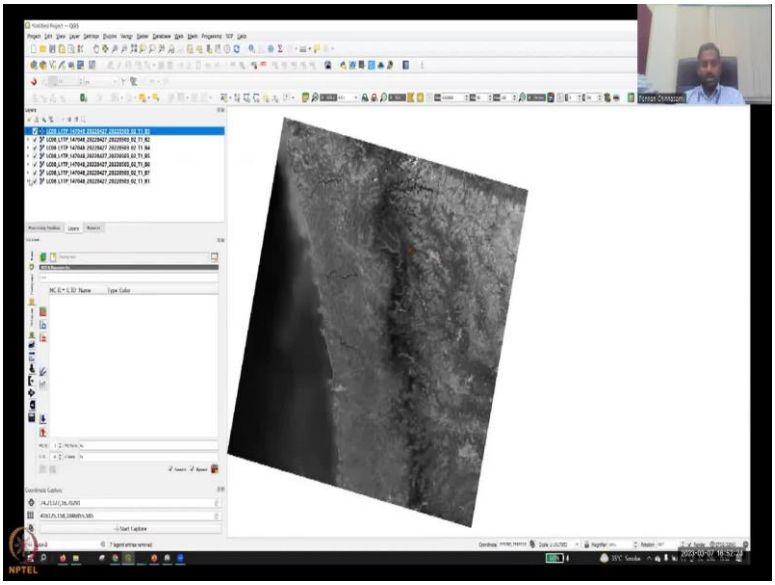
- Two spectral bands:
  - Band 10 TIRS 1 (10.6 - 11.19 µm) 100 m
  - Band 11 TIRS 2 (11.5 - 12.51 µm) 100 m

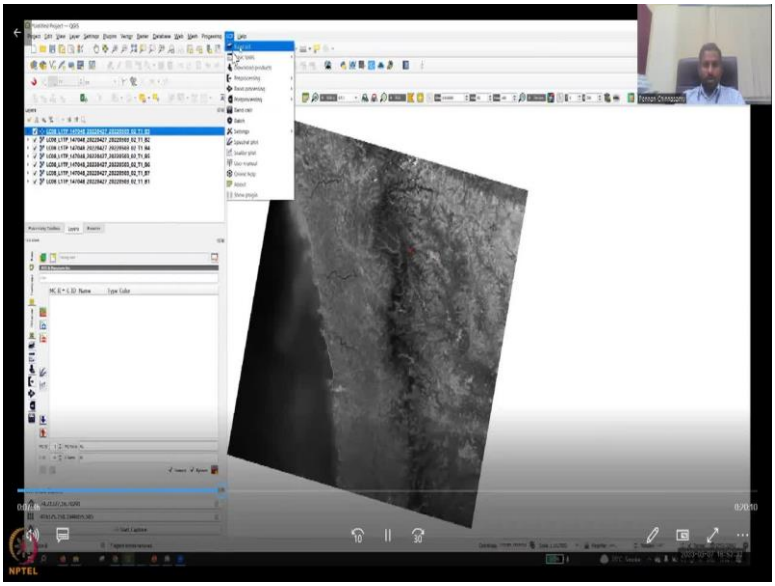
Landsat 8 Spacecraft Facts

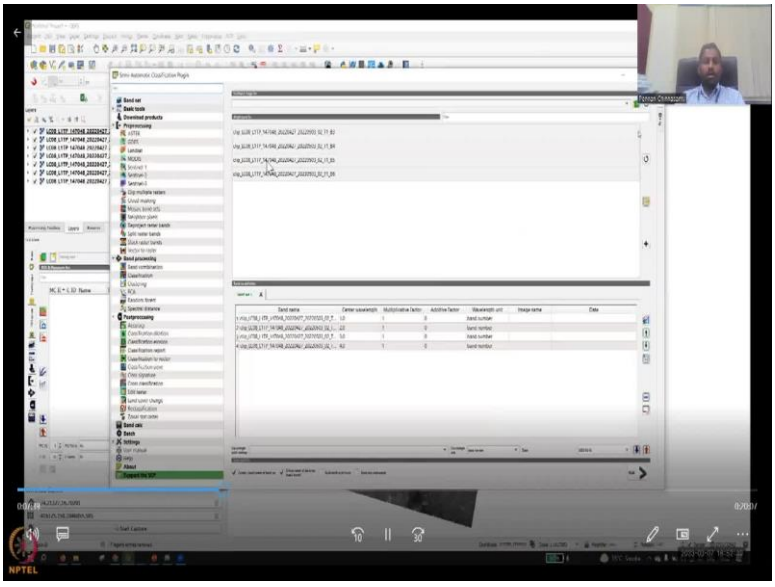
Sources/Usage: Public Domain.

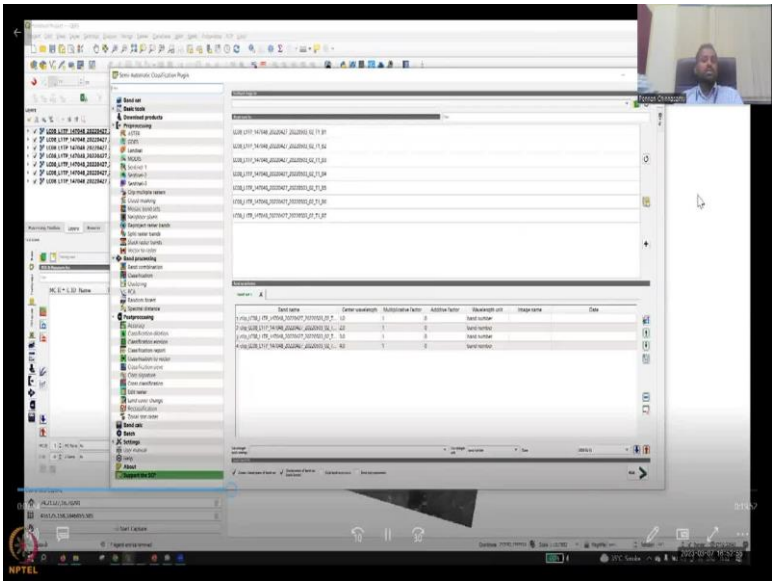
Landsat 8's first image captured the area where the Great Plains and Rocky Mountains meet in Colorado. The natural-color image shows the coniferous forest of the mountains coming down to the dormant plains. Boulder, Colorado, sits in the middle of the image. Landsat 8's Operational Land Imager (OLI) sensor was developed and built here by the Ball Aerospace & Technologies Corporation.

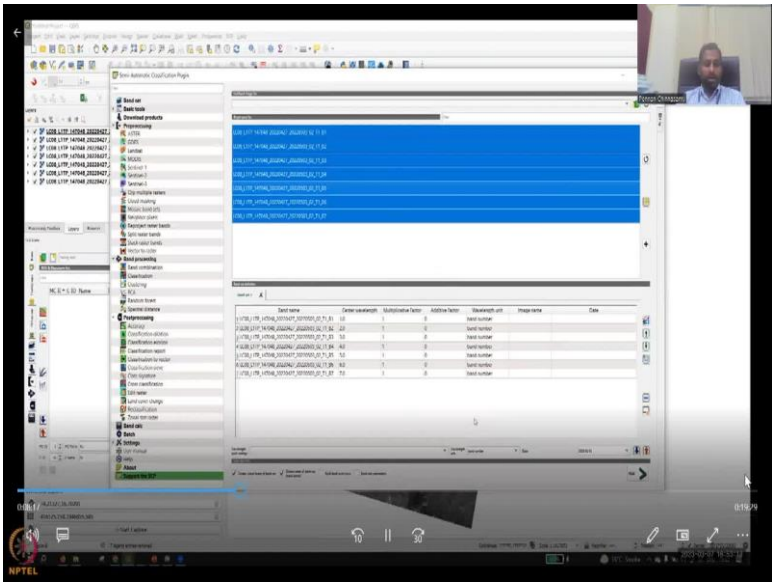


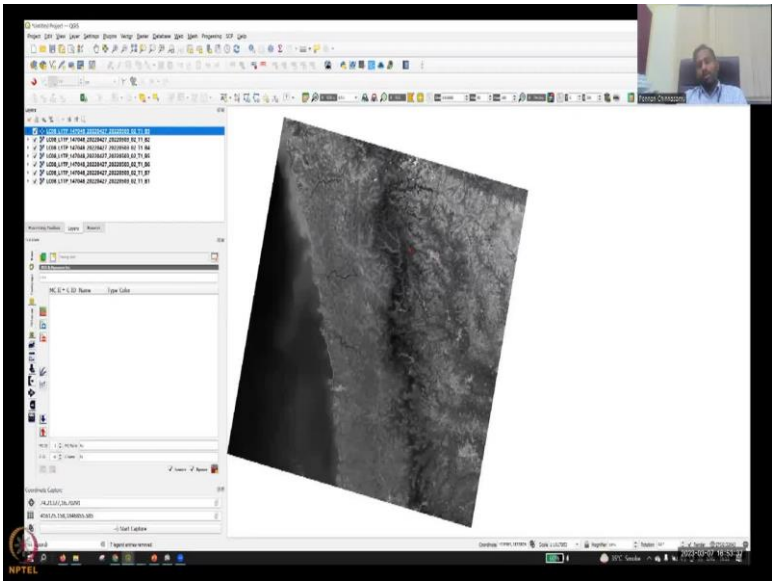


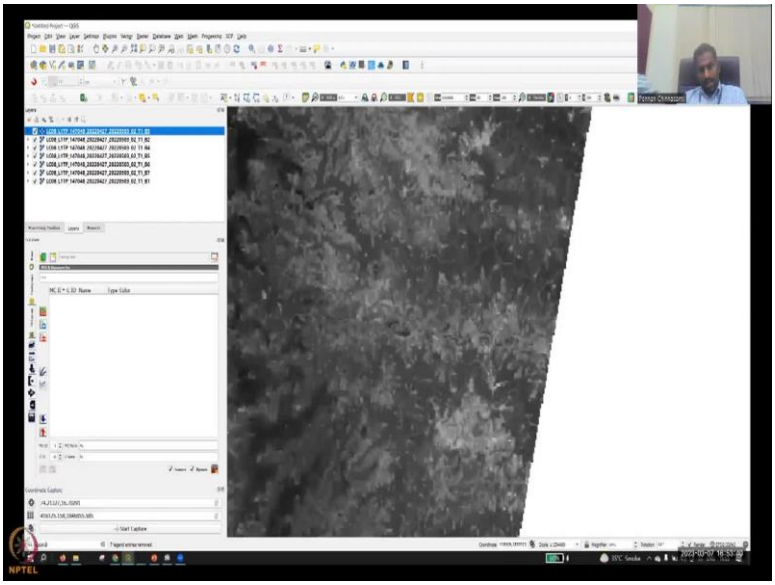


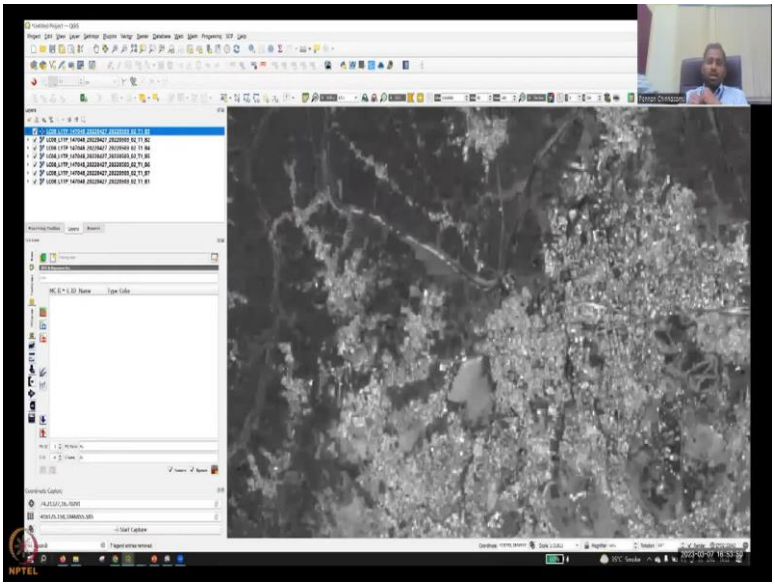


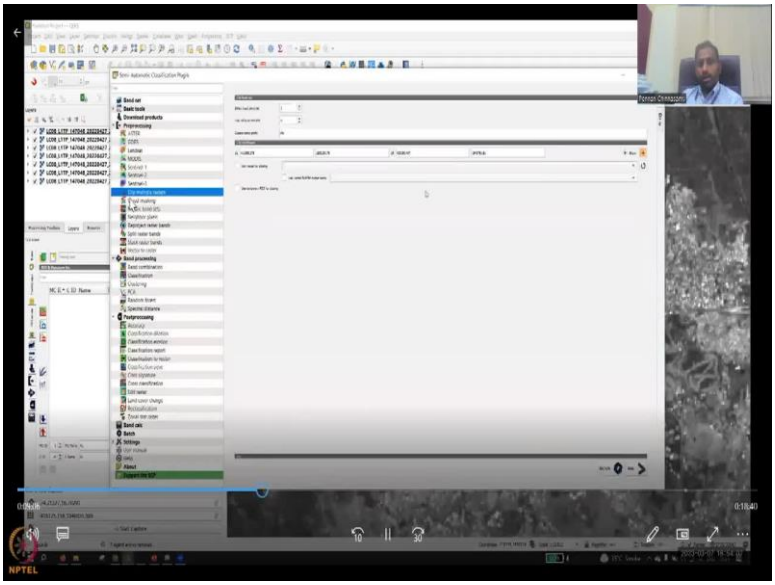


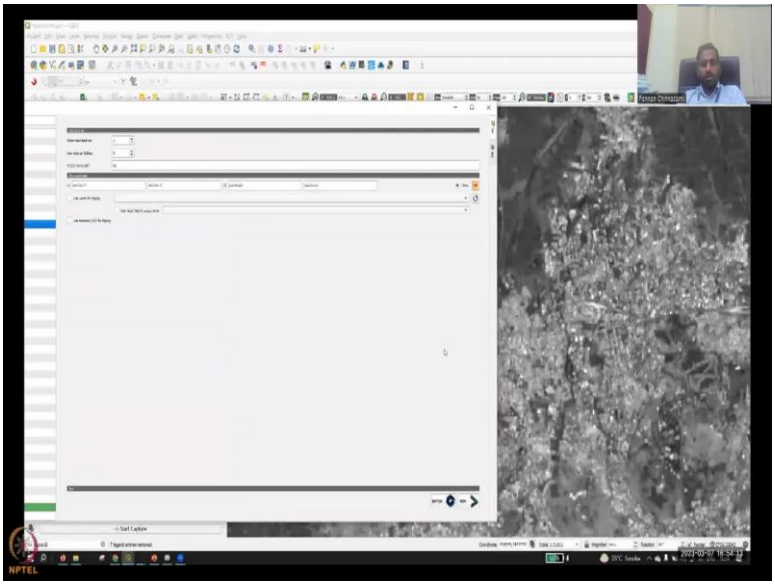


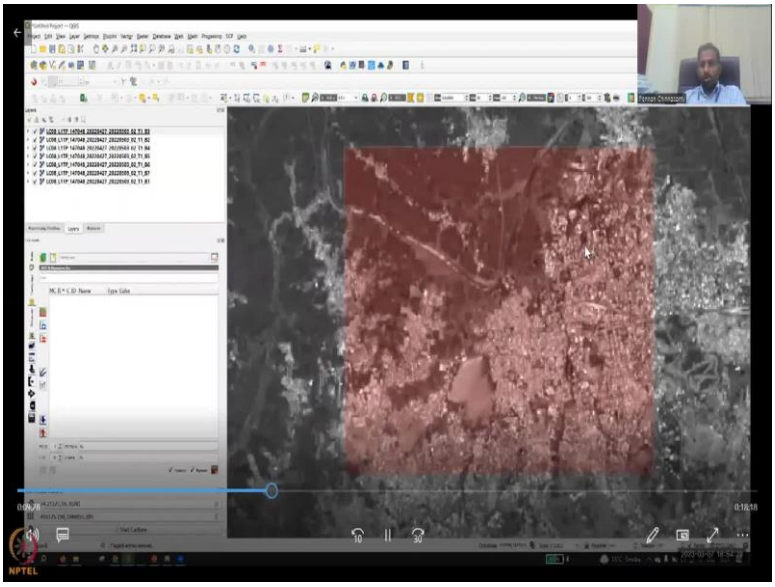


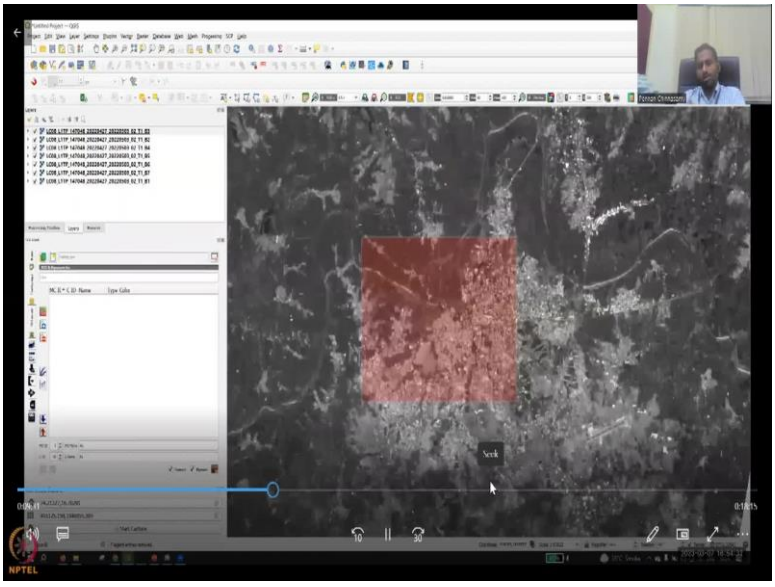


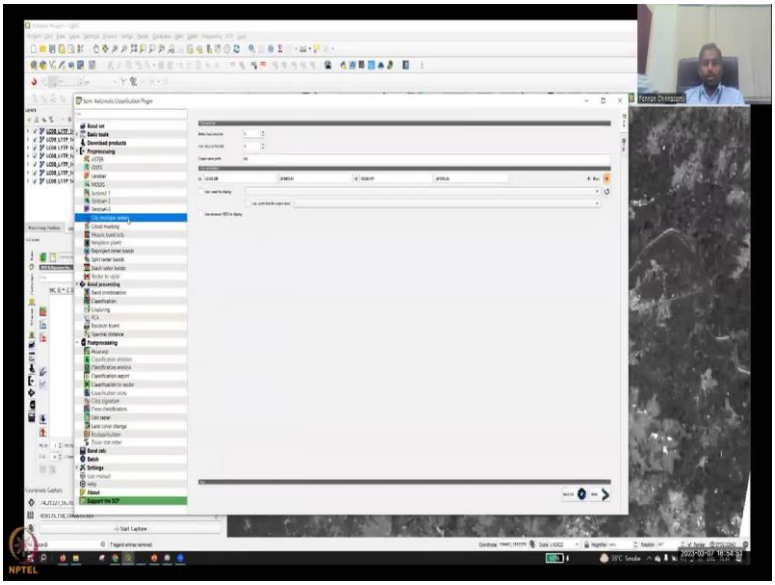












So, now we are going to download the data and then all the download we want. So, product options are there, what type of products how you want to download it, we want all the downloads, so all the bundle will be downloaded. Just you can select all 1 or 2 of the bands. Right now, we have not discussed the band so let us download it. So, now I have downloaded and kept it ready for QGIS now I have opened my QGIS so that you could look into it and see where the plugin has happened. So, you can see that Sep plugin has come up, which is the Semi Automatic plugin.

And then in the browser where all the tiles are there. I am going to open my browser and download a data all the lands sat files have come, so LC 08 2022, Landsat 8 have been downloaded for that particular area of interest, we are dragging it to the layer panel, so that the map has been created. So, but we need to understand what are the bands. So, in the QGIS, you saw band 1 to band 7. So, to go back, we can go back to the Earth Explorer, and see in the Earth Explorer profile, what is each band.

So, for example, band number 5 is near infrared, band number 4 is red, and then we have band 3 is green, etcetera. So, these are the wavelengths that are given and the resolutions that are given at the end so within the bracket, it is the wavelength range. So, we have Landsat 8, which is what you wanted the recent land use land cover map you want to do. So, now we are ready each image is on top of one another. So, you will see that you have a data set. And each data set is on top of each other. So, it is like a composite we are going to see. So, right now we just see one on top of the other, so it is covering each layer.

So, now let us define each of the 7 bands as a band set. We can select it from your layers or the tools SCP tool. Let us go to the SCP tool on the top, because you have installed it, it will

come now we want to create one band, one band which is a composite. So, since I have the previous bands are going to come here. So, when we refresh the band or the refresh tool on the side, what will happen is all the bands are coming and populating all the bands that are available on my QGIS are now calculated.

The previous existing let us remove it, so I am just going to click the Remove button and remove it. So, because we work on this a lot, I have a lot of other bands represented. So, now all the bands are being pulled in and called as bands set 1 because I have imported them into the band by putting the arrow marks and imported into it addition. So, now we can also move it up and down.

If the band needs to be moved up and down, we go back. Now this minimizes go back to your QGIS layer. So, only one location we need to do so what we have to do is before we make a band, I am going to come back to the band stuff again. But we do not as I said we do not need the entire time, we just want to do a part of the land. Because too much it will become slower and you are not going to do the entire band for now. So, let us do a clip.

The Mask tool has already been discussed in this class. Let us zoom in and select an area I can extract using a shape file or I can give an area of interest. So, this is the built up area where we would like to look at it and extract, what we need to do is go back to SCP. In a normal scenario, you will use the raster processing tools, and then you do a mask. But since SCP has a tool that can take all the rosters together, I am going to go into that. So, go to SCP tool again and then clip multiple rosters clip you are going to cut. As I said, the first option is you can give a shape file.

And then load the shape file and clip it, but we do not have it. So, we are going to do a defining area. So, we will define a plus sign and then you go to draw a box a small box you can draw which is the area of interest. So, now I selected the area, now, we run this clip tool, it will only take the data.

So, going back to the SCP tool in the clip multiple rosters we have selected the extent which bands do you want to take off. Right now, band one we have repaired. So, the band set is basically creating all of them together. So, we had initially 7 bands, we have clubbed it into one band as a band set. So, one band one is band set of 7 bands. And that is what I am giving here. And I am going to click okay and run the tool.

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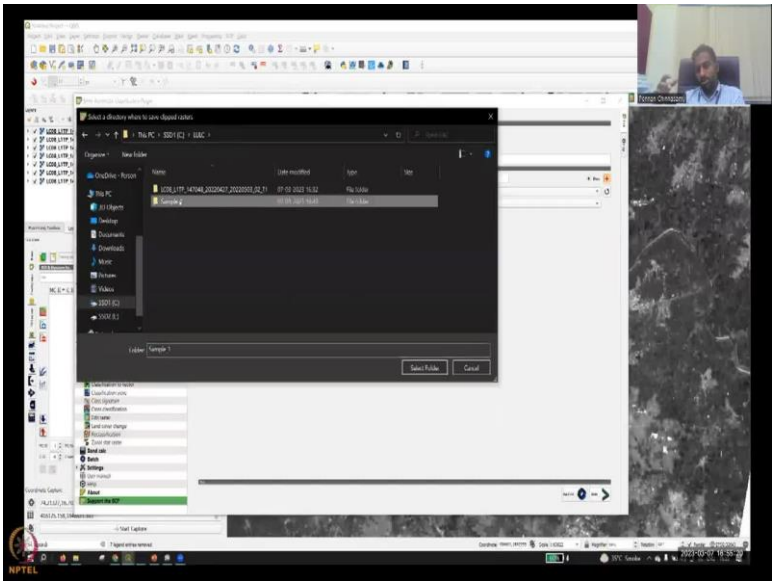

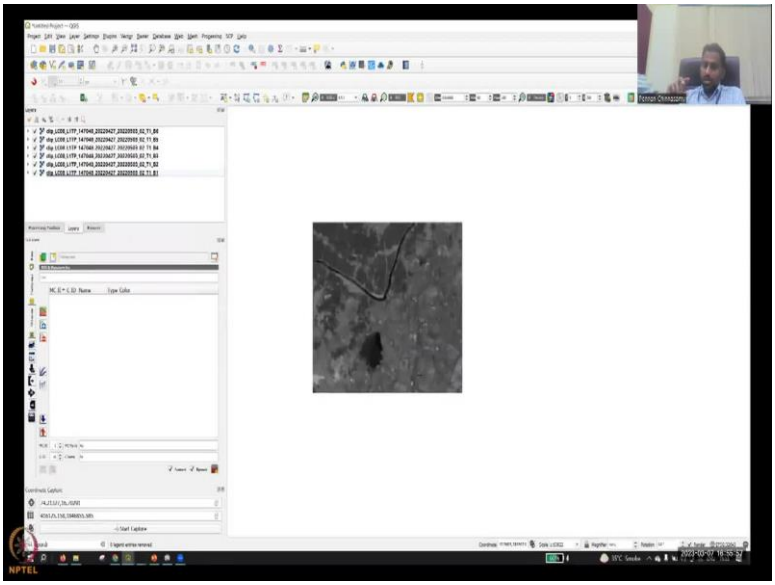

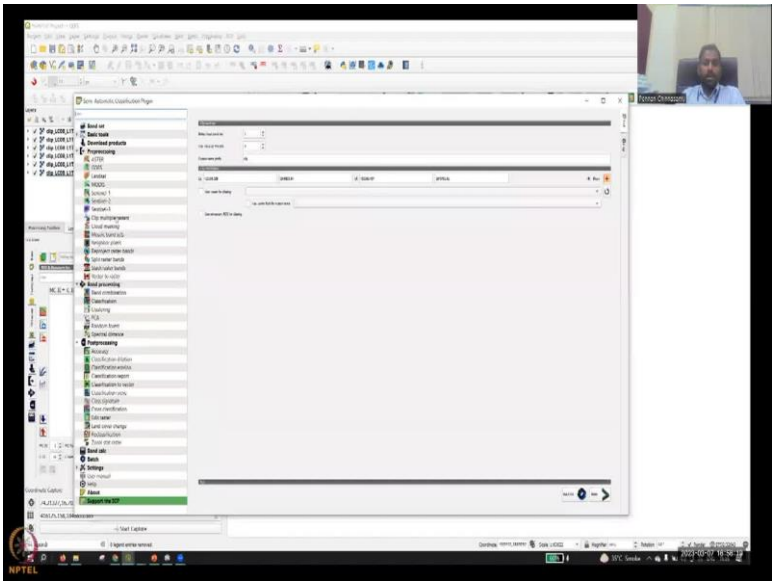

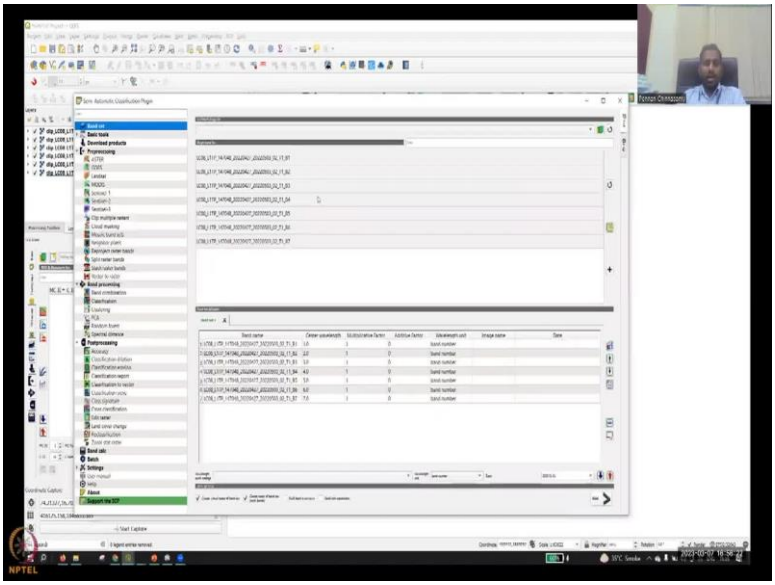

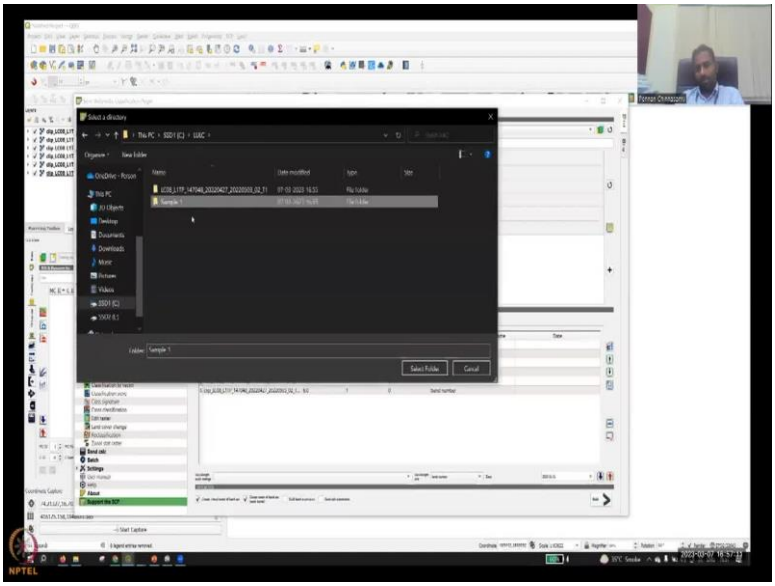

So, instead of doing each one separately, where you want to save is asking so I am going to save it in our selected folder. So, all the bands are going to be clipped, just wait for a couple of seconds it is clipping on the left hand side you will see the processing going on. Once it finish, you can see that on the screen you have another image overlapping and that is the clipped image.

So, now we can remove all the original bands which are the whole of Maharashtra times, we can remove them. So, now we have a clip bands. So, 7 bands have been clipped using one shape that we determined. Now for doing classification. Now we need to again do the banding. So, now we will go back to the SCP tool.

So, stacking is basically you bringing all the bands together go back to band set and the previous bands would come, so just refresh it and the new clip bands are coming the same on

the bottom you see the older bands we can remove them, so click the negative button on the bottom it will go off. So, once you select all you can select one by one or select all and then add the plus sign all the data bands will come in.

So, now all of them again we can create it as band set 1, so the previous band is gone, the band set 1 is gone, we have created a new band, make sure you select the bottom 2 options and then run. Now we have 6 bands, we have run it and then we have taken it we put it in US folder called sample.

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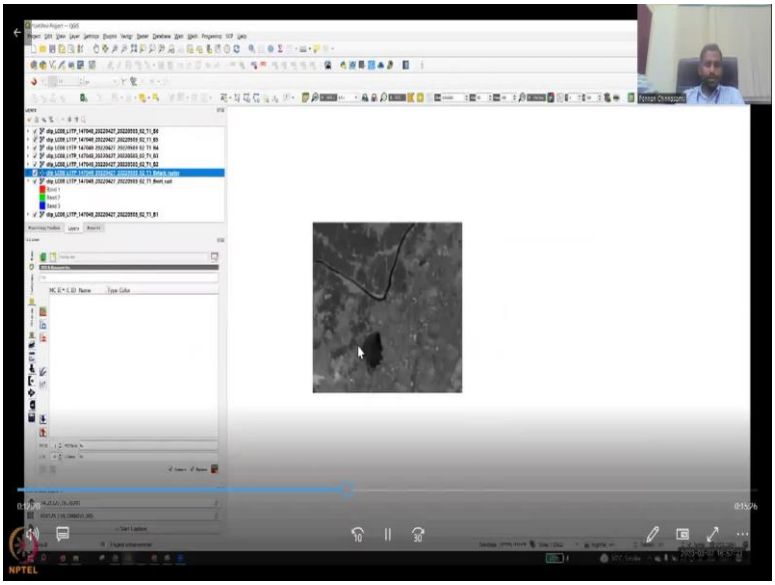

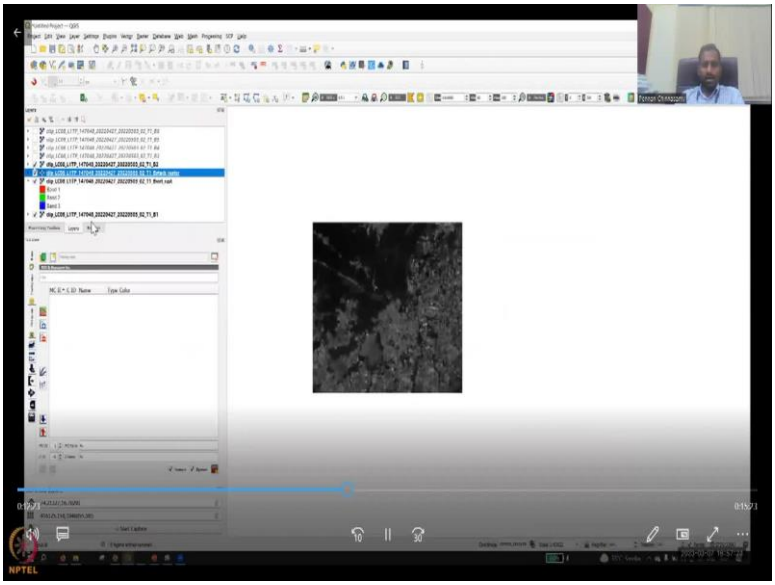

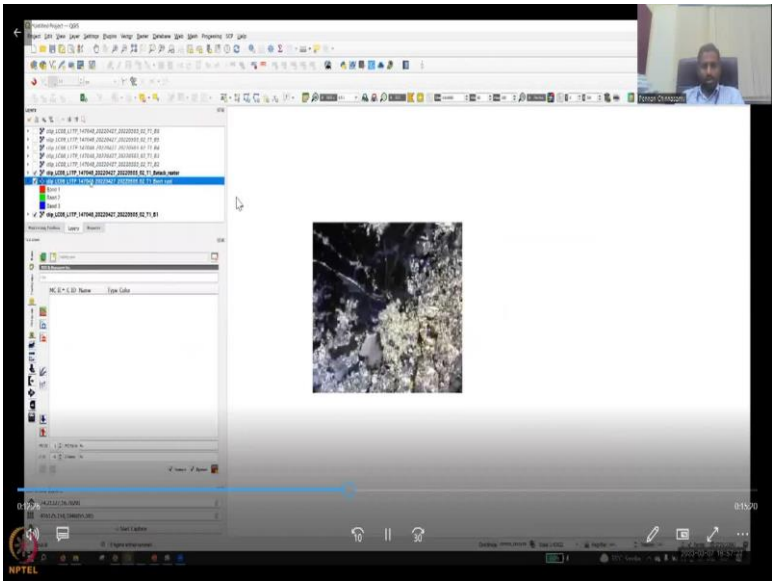

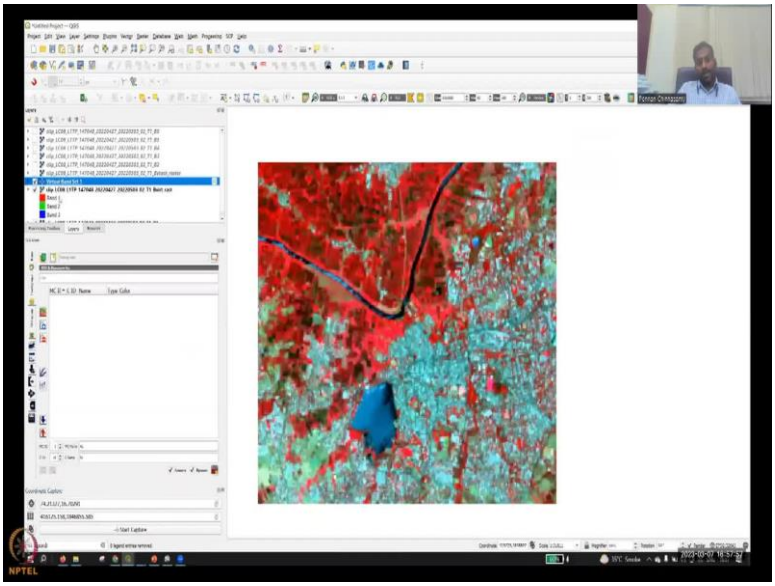

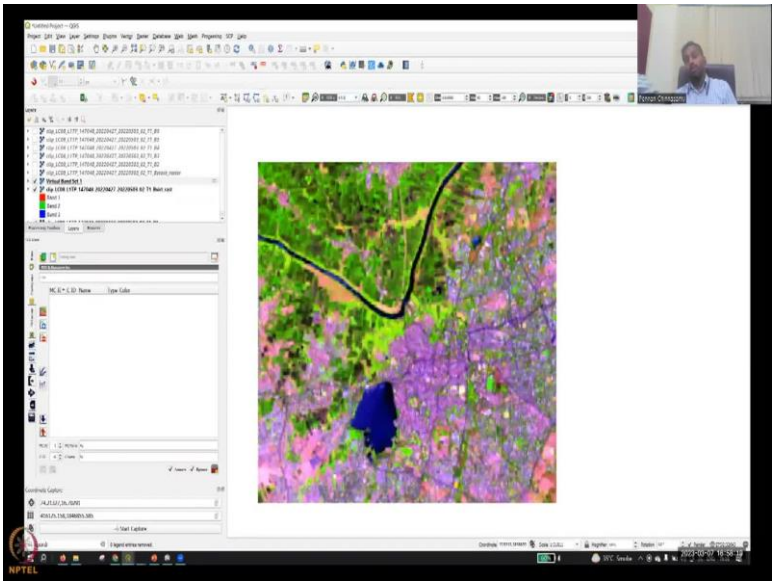

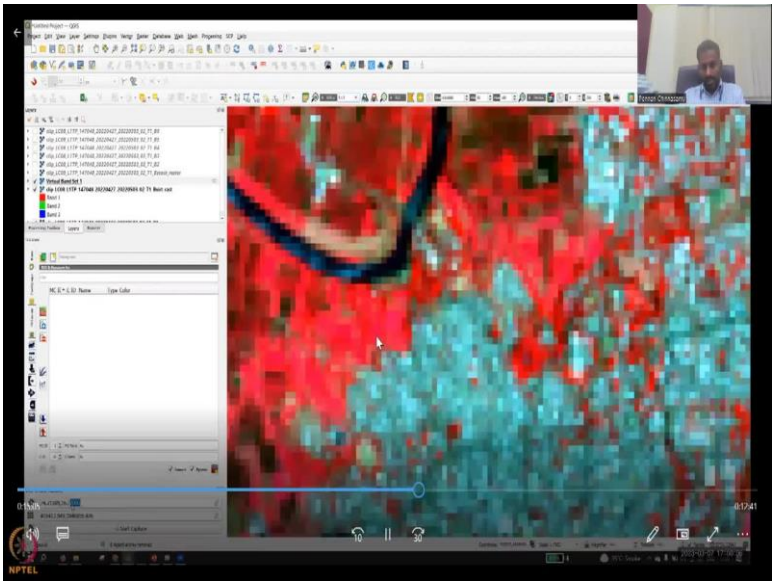

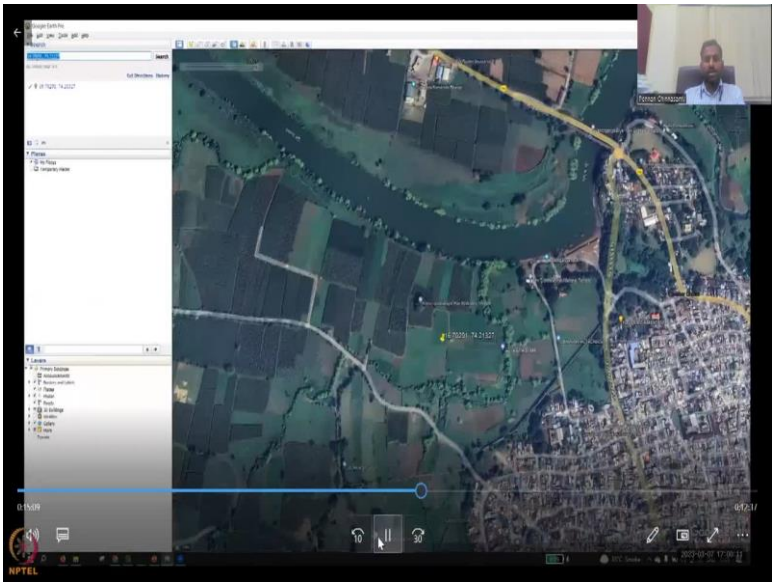

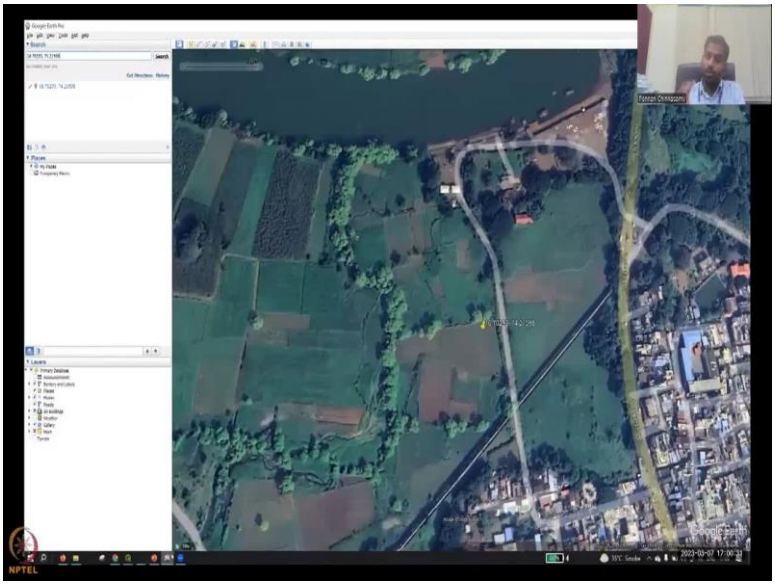

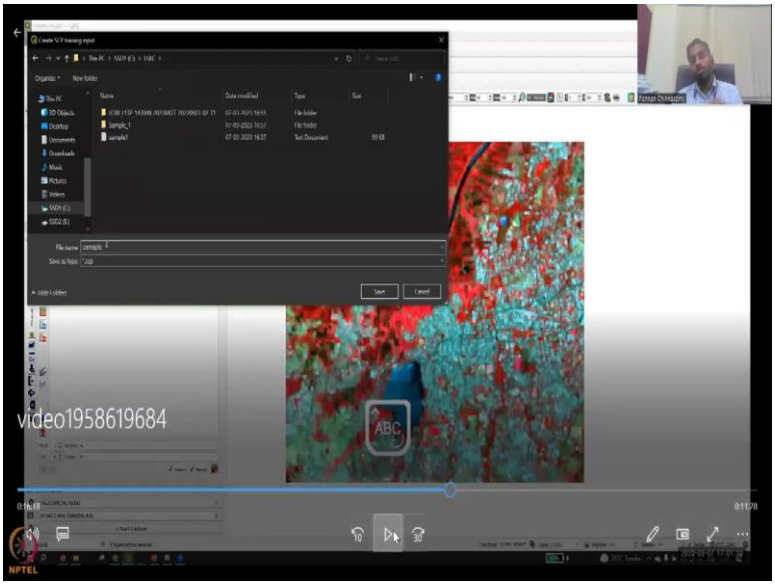

So, now the band has been created. You can see that all of them are stacked together as a band set. So, I am going to remove all the clips soon. But you can see that the ban set has been there, I am opening it. And also, we can open the RGB to change the coloring. So, raster can be symbolized or color using different coloring schemes. What we are going to do here is we are going to RGB and 543.

Let us give a scheme which bands we want to take. So, 5 is near infrared 3 is green, 4 is red. So, when we say 543 those bands are going to be colored higher. So, you could see that the infrared is captured by or represents more than vegetated area. So, all the vegetated area will show up very well if we use 543. Let us try to use another college same 654. You can see that 654 is better for the water body. So, you can try play with all these attribute at the top which is part of the classification tool.

The SCP tool, which ones you want to check for visualization, you can select, see right now we are going to visualize it better, so that we are going to extract training cells. Let us do the 543. Again, because the vegetation area, the infrared is captured well. So, all the red areas here are vegetation. So, now the combination is ready, let us go into the creating the classes and training samples. And we are not going to do 10 15 classifications like the Bhuvan, as I said that takes a long, long time, just for a small class, we are going to create only 4 to 5 classes.

So, look at this image, you have vegetation, you have water bodies, you have a built up area, you have other areas that are of interest. So, let us go through this areas. But again, if you do not know about this area, how are you going to do it, and that is where some tools that I have initially recommended as plugins will be helpful. So, first, let us visualize this image. And

then make sure that we differentiate the coloring scheme here, what is represented as blue what is represented as red, etcetera. So, now, if you could zoom into the full area, and keep on zooming, you will see the image getting pixelated, pixelated means it is no longer smooth, every pixel you can see.

Now you can place your coordinate capture tool, which is on the left hand bottom, you can see here on the bottom of the video, there is a tool which says the gardener capture thing. So, please enable the Start Capture. And then go ahead and see which ones you want to capture. First, when you click it, you will see that the coordinate is being captured in the coordinate box. As I said, you can also look at it as a start capture, go back. And then I am clicking a point on the on the on the vertex, copy the coordinate system on it and go to Google Earth.

So, now we are going to juggle between the image and the Google Earth Pro. Make sure that when you click on any copy it on Google Earth Pro the orientation of the lat long is different. So, in the coordinate system a comma b, in Google Earth you have to do B, A so just change it. So, copy paste it, take the first part out and then put it at the back cut it and put it at the back and then click search you can see that it zooms into that particular area. So, here now your visual proof, which is going to clarify what is that location.

So, in this image, you can see that that location is showing a vegetated area and agricultural field. So, this is what we call as supervised classification where you go to the field collect data and then come back and then classify the image sometimes there is no time there is no money to go up and down in the field. So, these kind of satellite images can be used for classifying satellite images.

So, again, as I said, Now, we can see it, it is an agriculture field. So, now go back to QGIS. Now, we will go back to QGIS. And then address that this particular pixel that is a vegetated area. So, now we know how to take each pixel going back and forth and then check it in Google Earth. So, that is for us to confirm.

So, now we are going to go to the SCP tool and create a training set. So, in the left hand side, and if your SCP tool comes out as the left hand panel, sometimes it will float on the PGA screen. You can also dock it on the left that as I have done, you can see a button the second button called Create a new training input. Click that and then we are going to extract points or shapes that are going to give you where you want to give classes and also you will have to store this classification because the G QGIS will go and access this sample naming scheme and then apply it to the all the datasets. So, you can see that let us say sample 2.

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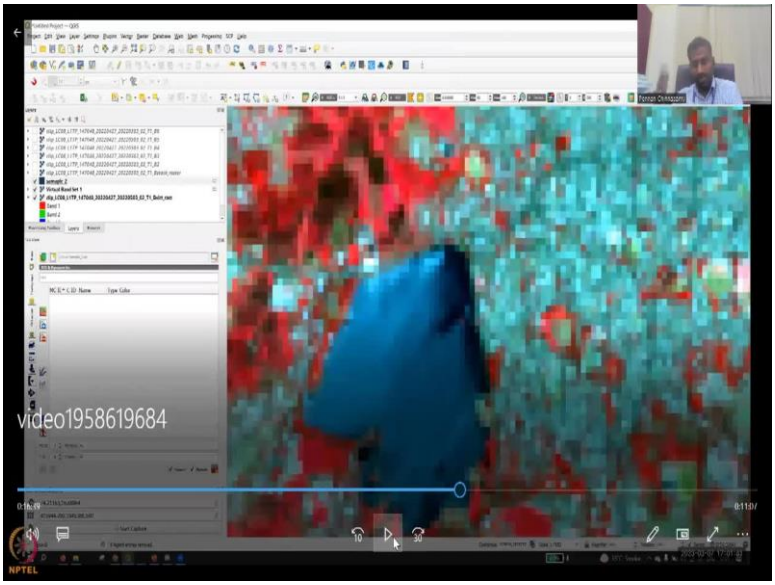

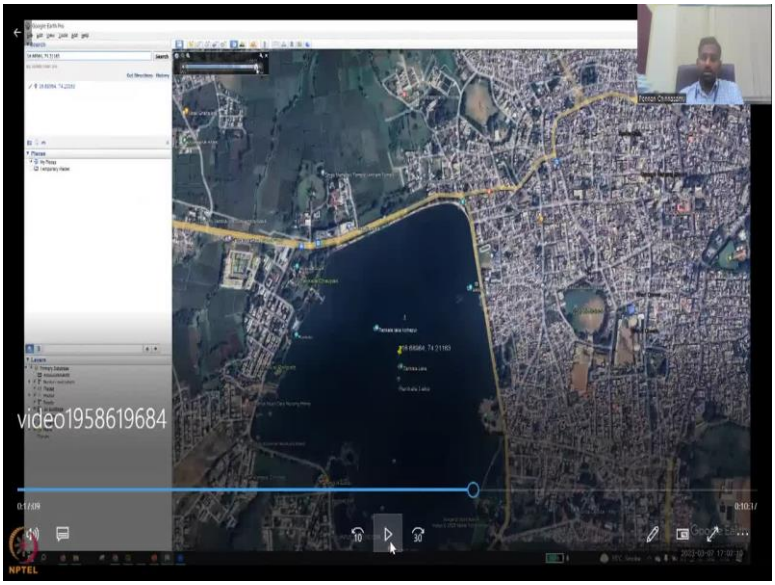

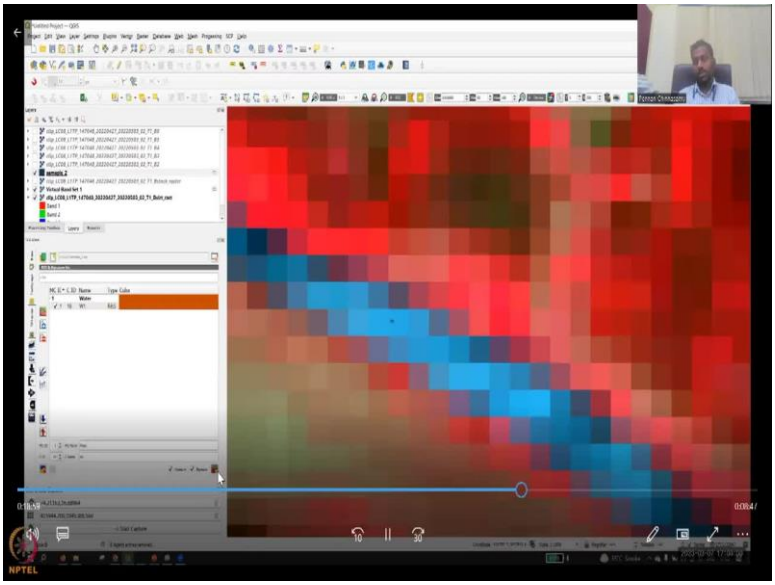

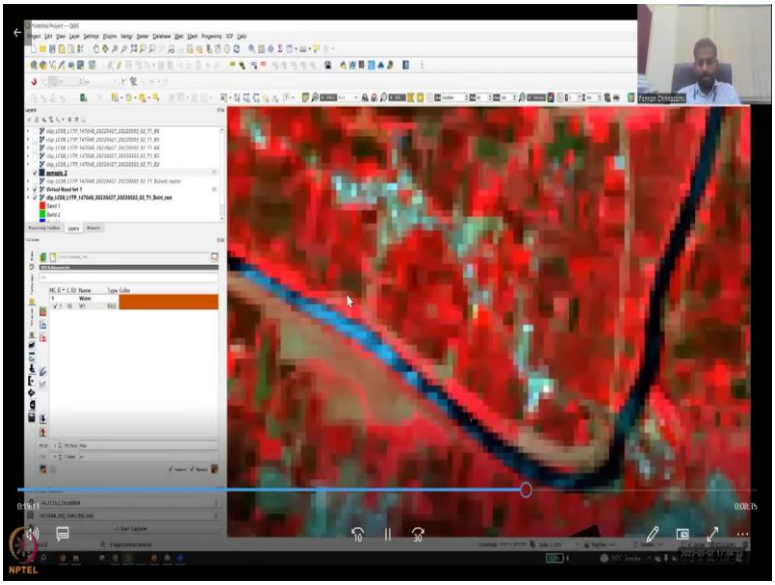

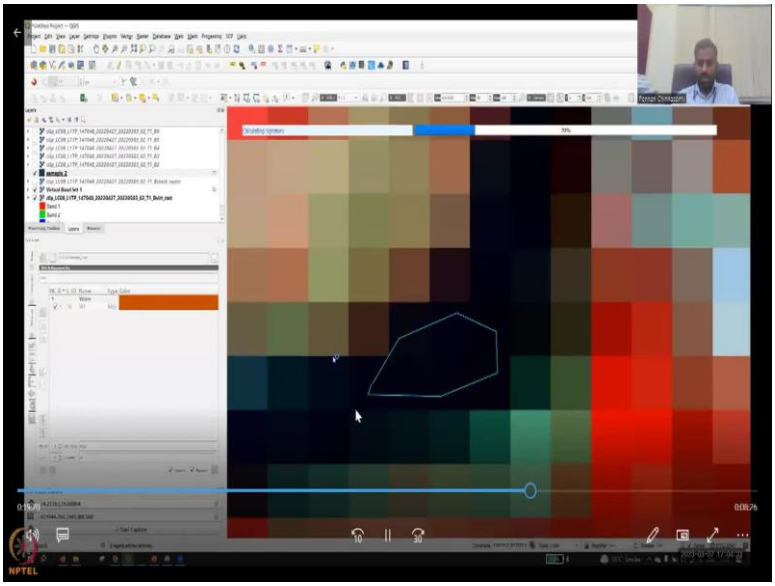

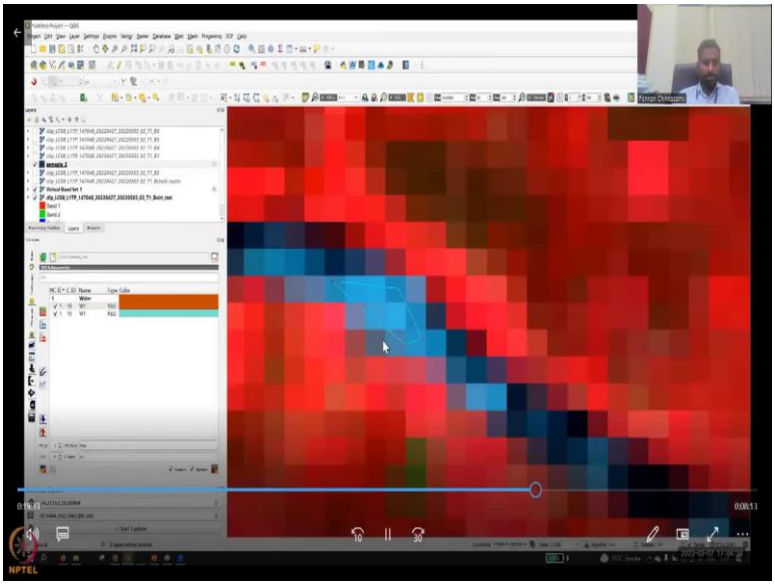

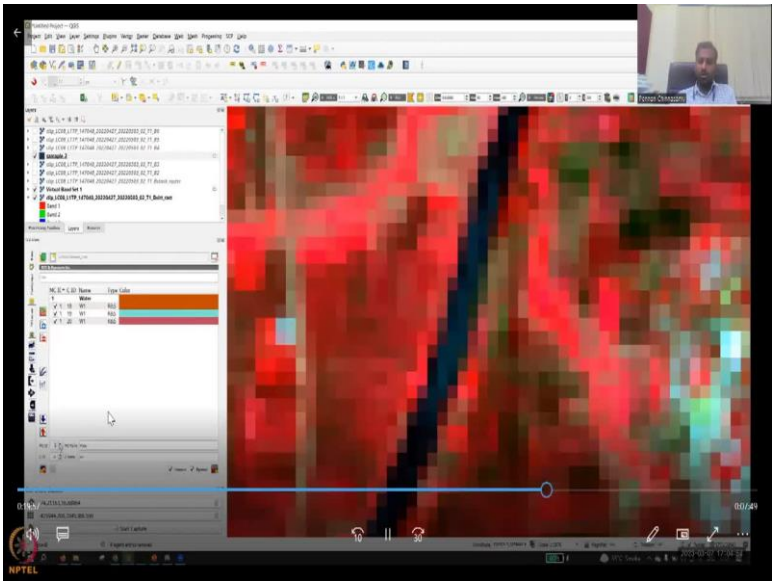

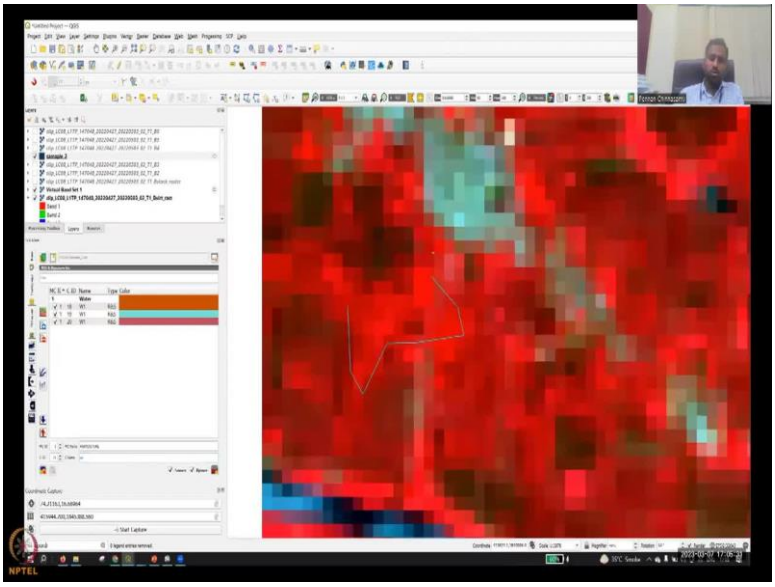

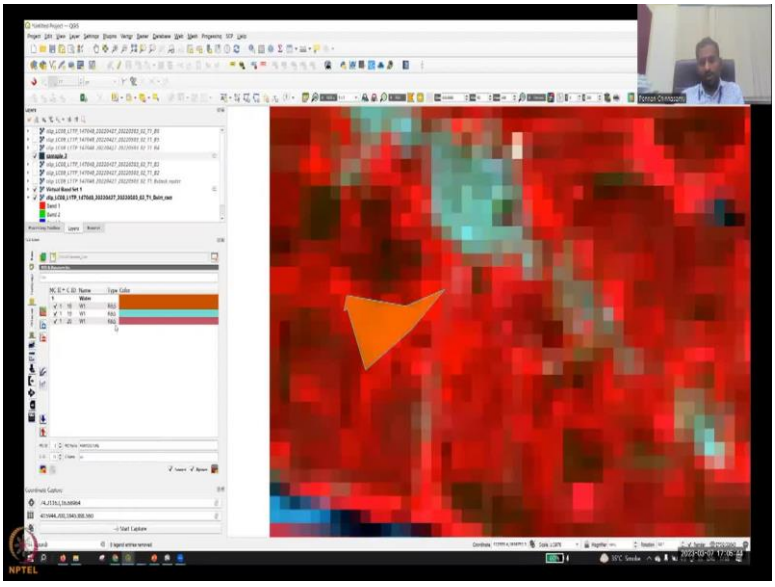

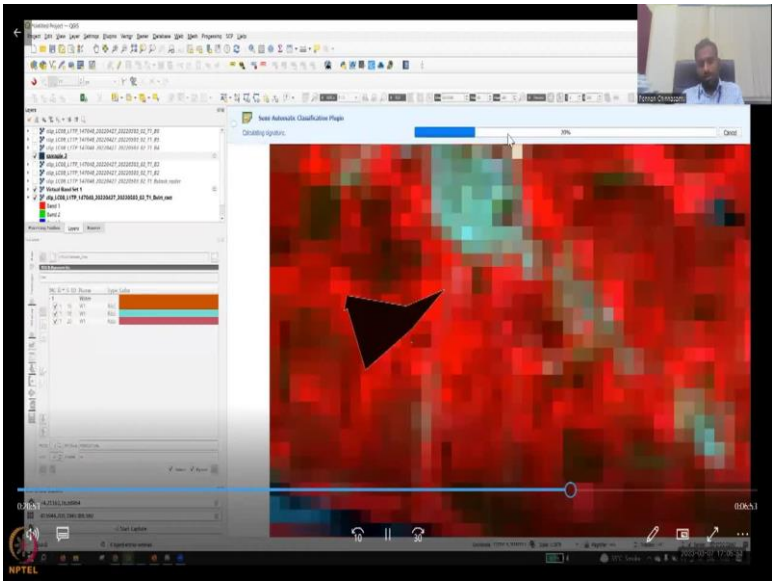

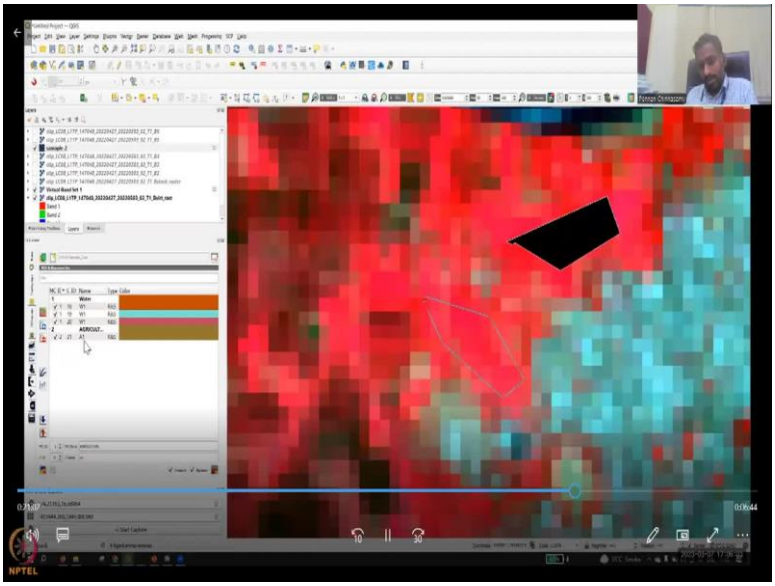

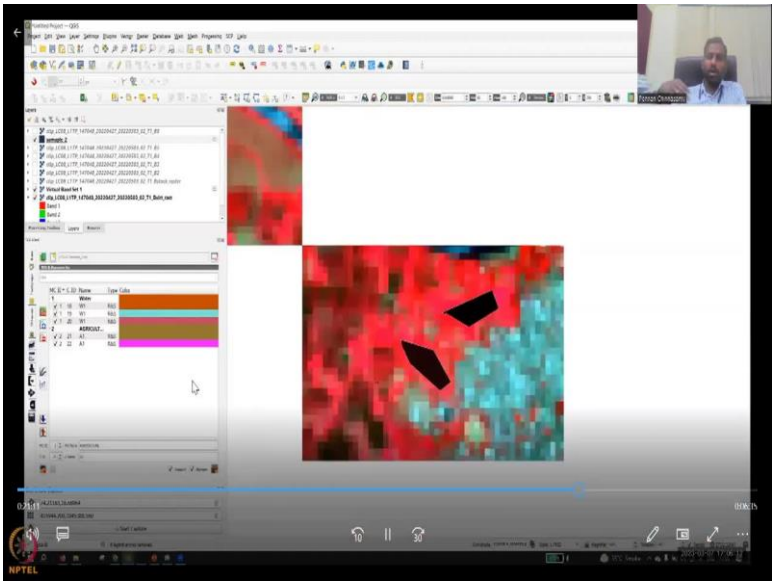

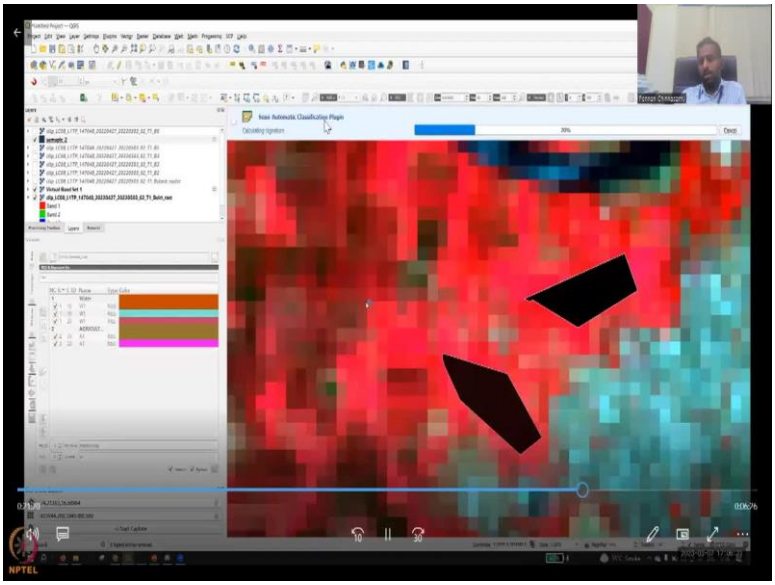

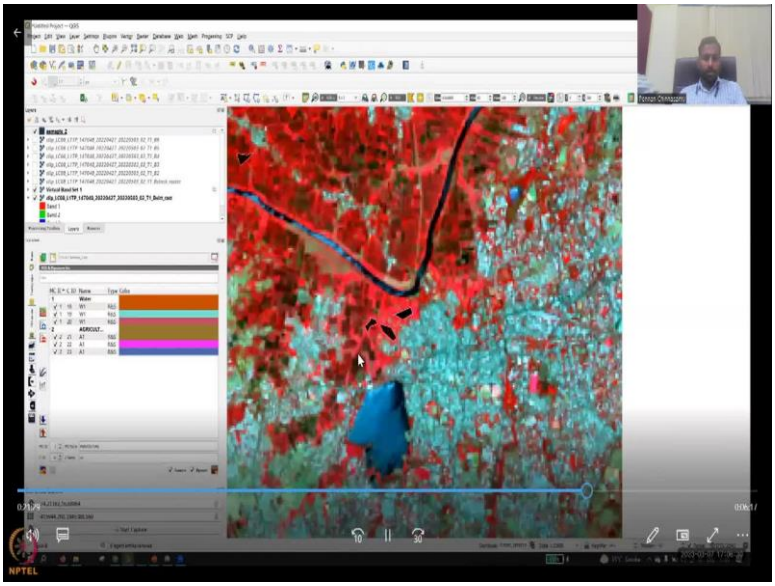

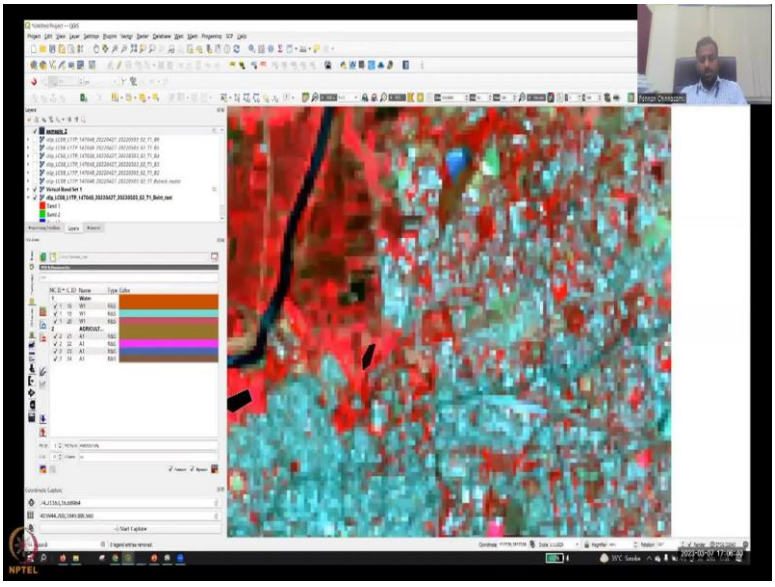

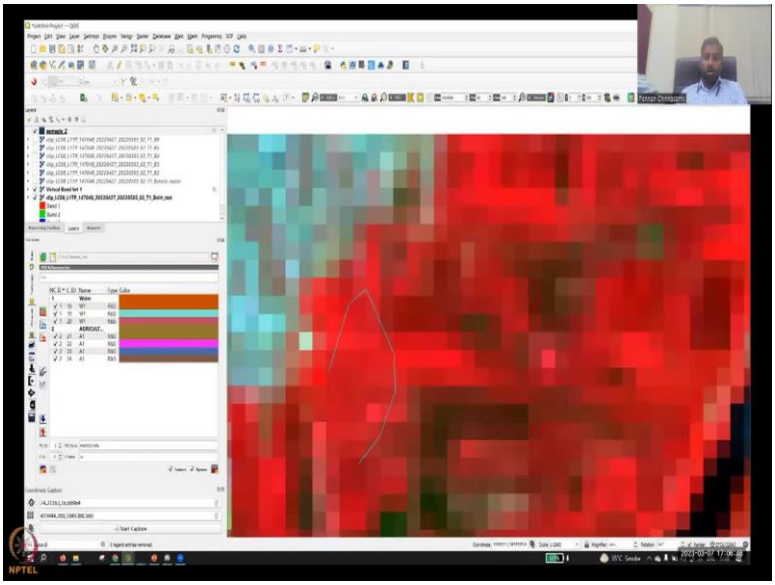

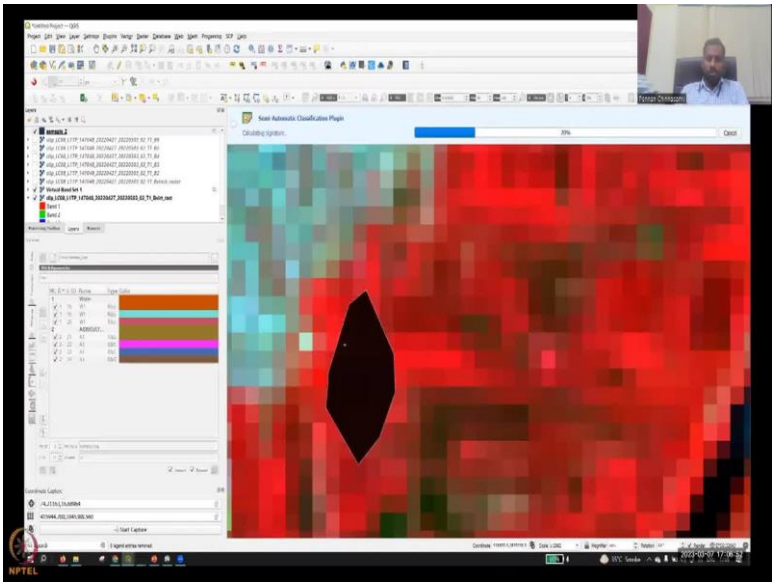

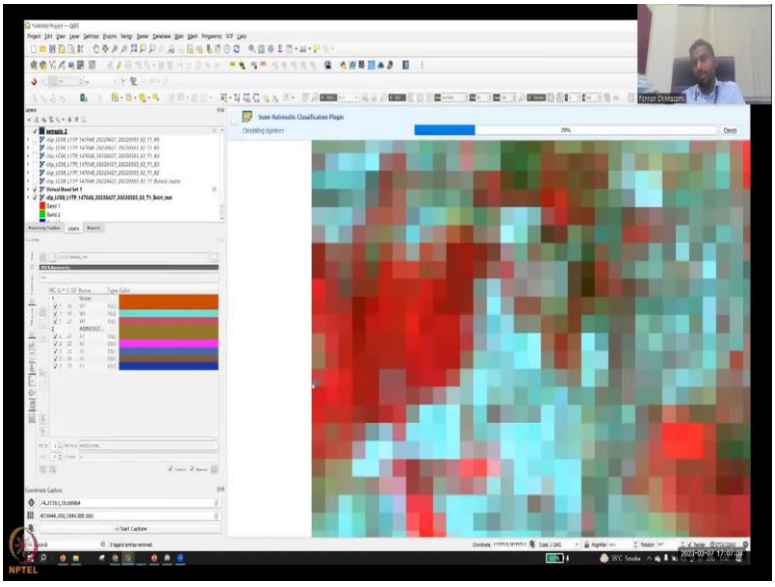

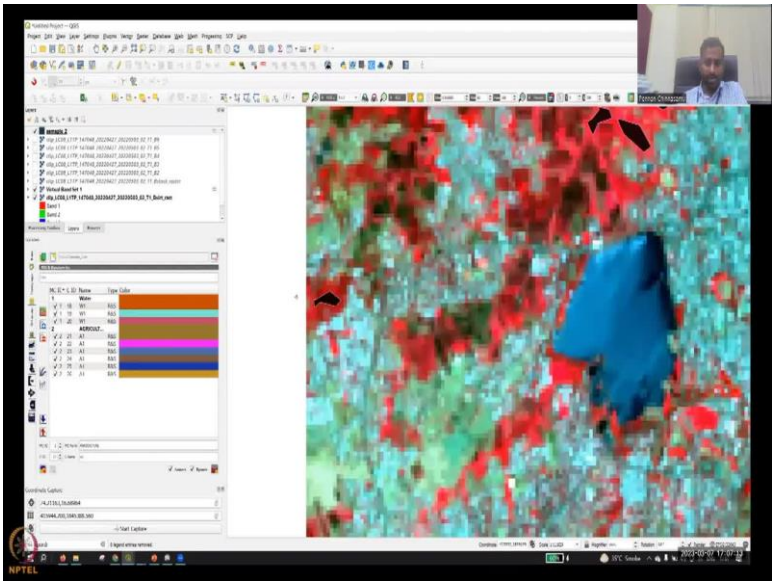

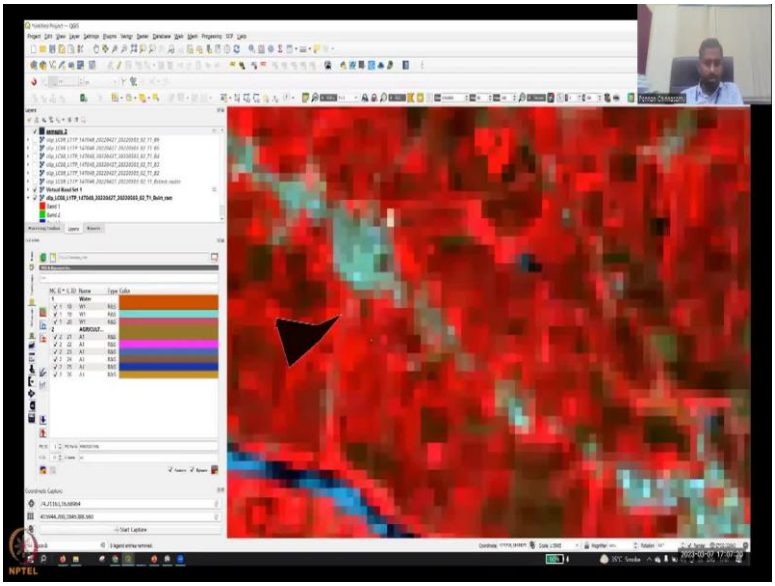

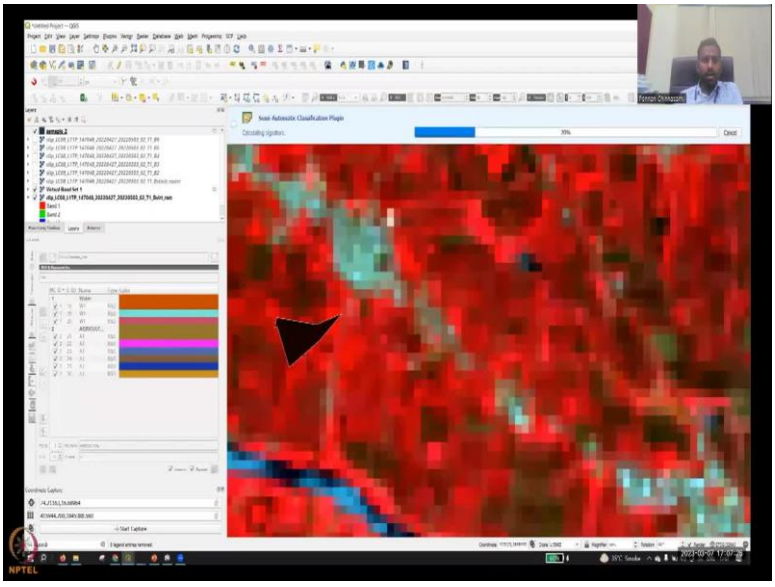

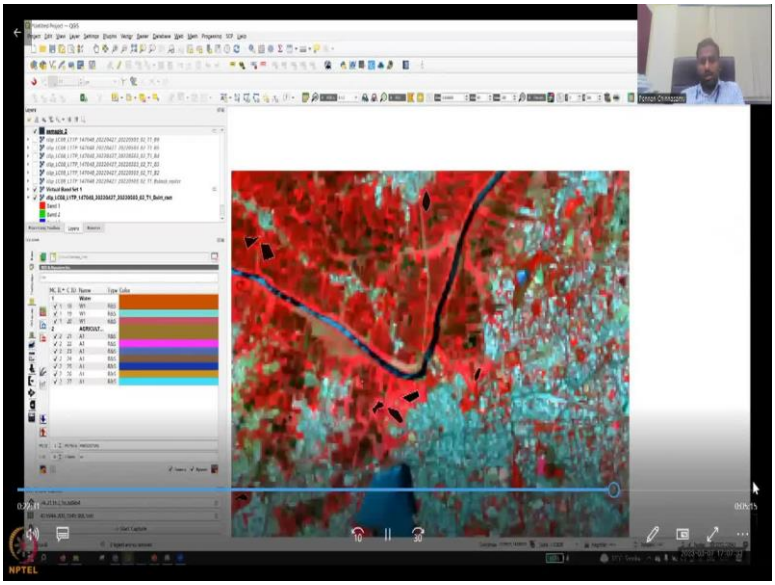

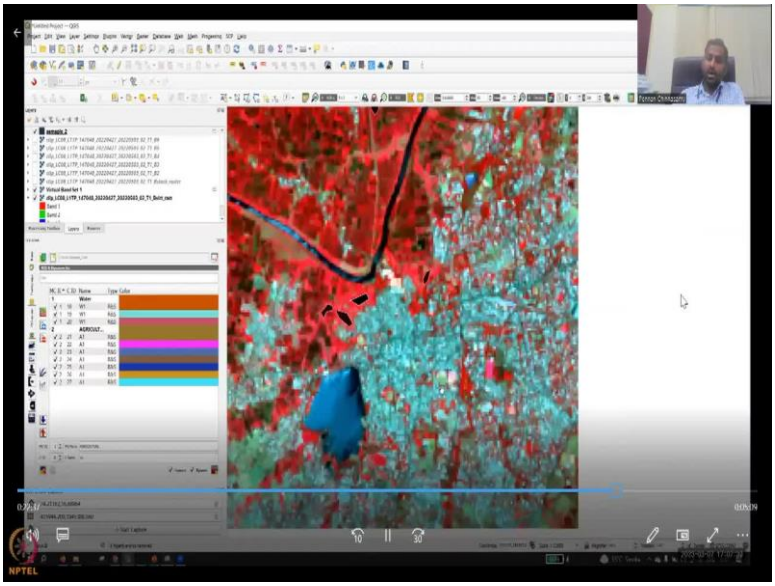

So, now we have defined a training set. That let us now go to zoom into the map, zoom to the data. Let us start with the water. Each feature may be questionable, because the coloring may be different as we have changed the 543, 643, etcetera. If we change the RGB combination, the band combination, you will have different colors. So, just to make sure you can click on the coordinate system, I will do it again, I am just going to click one the coordinate, so you can see the coordinate on the left, I copy it, paste it in Google Earth Pro, put it upside down, switch the coordinates.

And then when I click OK, and search after I input, the Google Earth Pro will go to the location of the coordinate system. Now you could see that it is a water body, I have also taught you that just make sure that it is not a flood. If it is a flood, then we can go back and forth and see if the water is always there. Okay, so the water is always there. It is not a flood,

it is a water body. Also make sure that the same year is chosen. So, here 2022, I have selected on the Google Earth Pro, because my image is 2022 in QGIS.

So, this is a water body, I go back to the QGIS, the shape is almost the same. Now I know that if I extract the pixels from here, it is a good training data for water body. So, I am going to create first training set and the first class. So, the first top is MC name is water that is the main classification name, there is a sub classification name or sub class name. We do not need that because in this example, which is going to do major classification, so m, c is given us W and then C is given us w 1.

Now let us take samples, which is pixels that are representing water. So, this dark blue, light blue all represent water, so I am going to create a polygon. So, carefully select not too much of the boundary, the boundary is a gray line, because some land imagery is also coming, the water image is also coming in the pixels. So, do not take that just take within the water body, and then click okay, say water. I clicked it. And then it is added.

Once you say this button, then it gets added. Make sure that as much as samples you select the accuracy of the image is going to go higher. So, one water body is a lake. So, let us look at a river also. So, just to make sure this is a river or a road, you can go back, take the coordinate, go back and then come to the initial image. So, I am going back and then see that along the lake, it is a river. So, if you could, if you could see that I can take the coordinate system it is moving, we can take one instance, but I am confident so I am taking this as a sample. So, I am taking a sample, I am clicking it, and now it goes in.

So, similarly, let us take some more one more sample along the same river, and I am selecting another one, and then hit the Enter for the third sample. So, slowly, slowly, it gets loaded up up toolbar showing the loading. So, just for water, we have 3 already. Now we want to let us do the agricultural area. Agriculture is different, so because there will be growing crops, mature crops, initial crops, so I am just going to go to one area and then we will look into the pixels I know that along the river bodies it is agriculture.

So, first let me create the class name. So, it is agriculture I have created a clip and then we have a one or so which is the agriculture one. And then zooming in and zooming into the red areas because the infrared is going to show the agriculture any questions any doubts on this land, you can always use the coordinate system content capture, go to Google Earth Pro, check the land and come back.

So, if you miss typing, just click the left click the buttons, your new area can be drawn. So, now you are drawing the new area. And then the class IDs are given I added so now it is slowly going to go into a semi-SEP tool and then you will see on the bottom it is going to show us agriculture. So, agriculture is created A1 is created. Similarly, we are going to create some more A1s. A1 is the sub classification as I said, if you are doing it very, very carefully, you can actually do a growing A1 mature A2 like that.

So, right now we are just going to take some more samples in the agricultural area, click add, add it in. So, a lot of different red colors you can see mature red, and then light red all of them are related to agriculture. So, let us take as much samples as we can. So, here we are taking another red color, parcel of red colors one I have taken around the water but you could see that not on the boundary and taking a bit some pixels away from the from the boundary, because maybe on the boundary there was a water the plants are not growing well to a sub location. So, it let us take some outside.

So, with diverse regions, we have taken samples and then we are adding all the red colors. I have checked the image so I know that the image is all agriculture, but you have to go back up back and forth between Google Earth Pro and then select. So, now we have selected around 4 or 5 data for the crops. Now let us finish the agricultural area. And let us go to the next class soon. So, just finish off some more and then let us go to the agriculture and selected samples.

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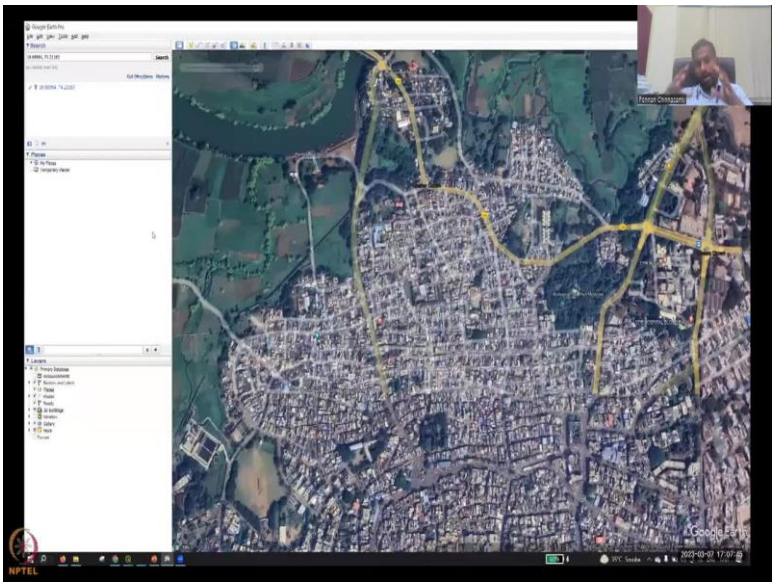

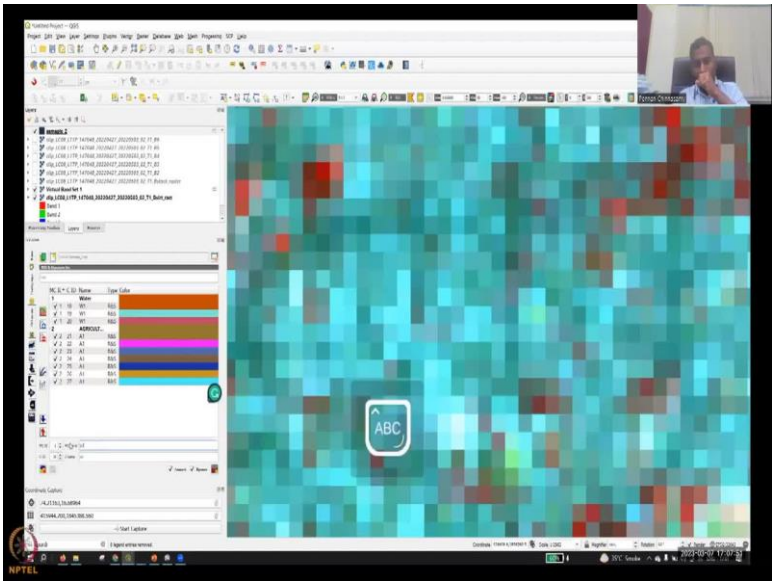
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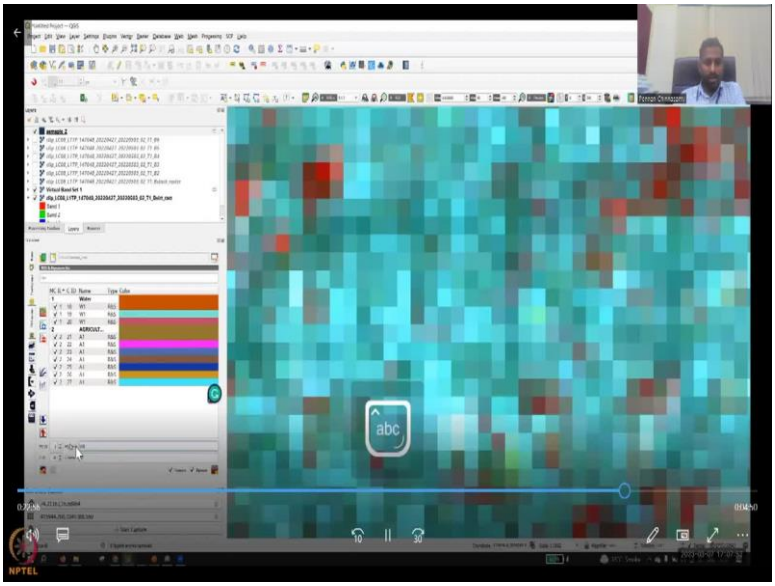
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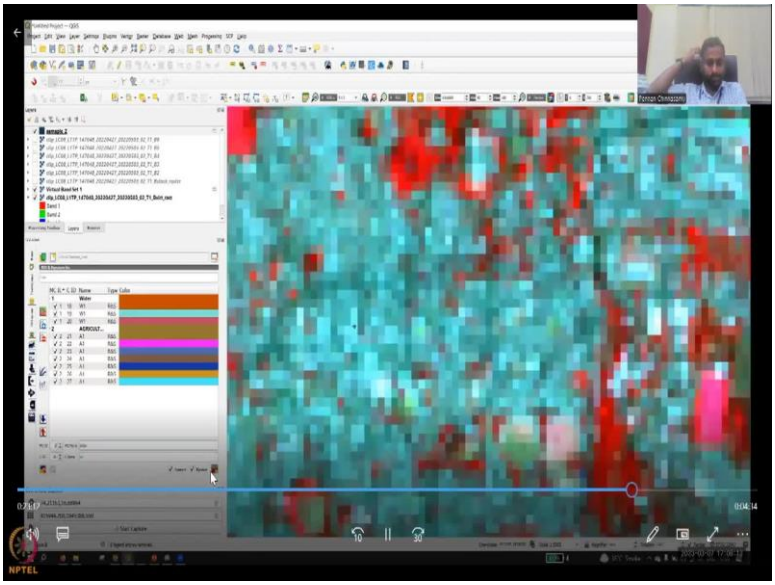
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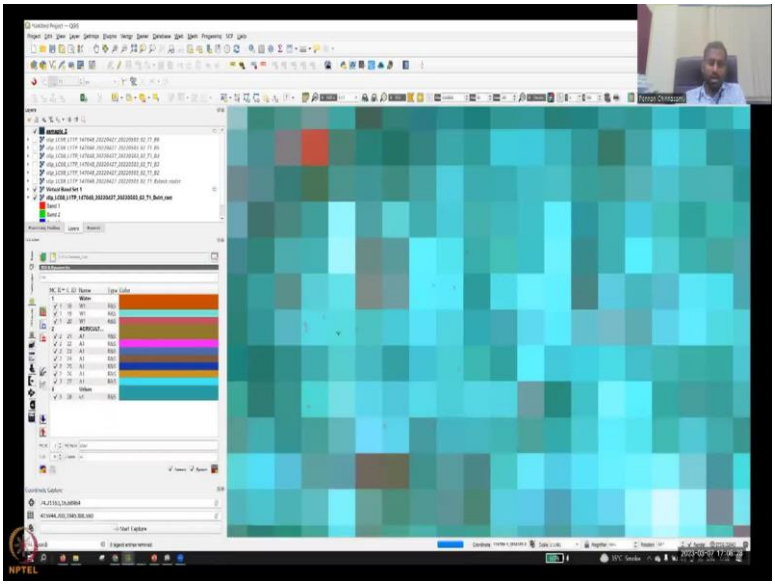

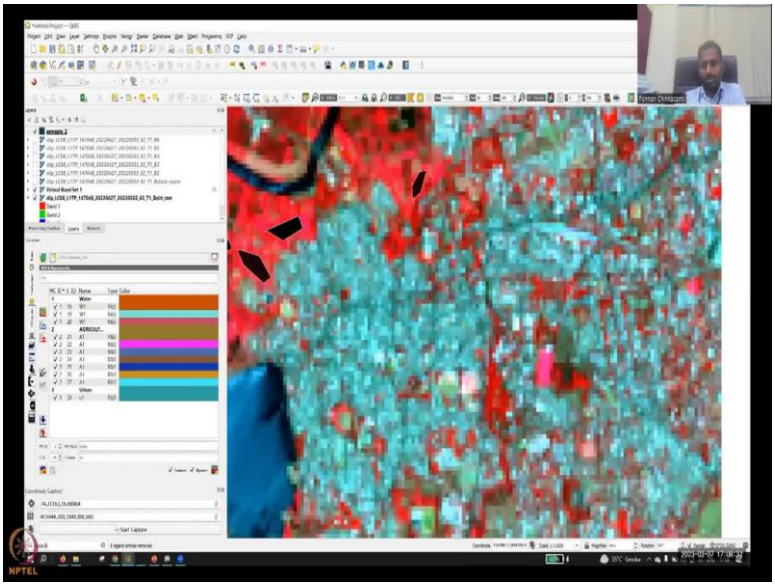

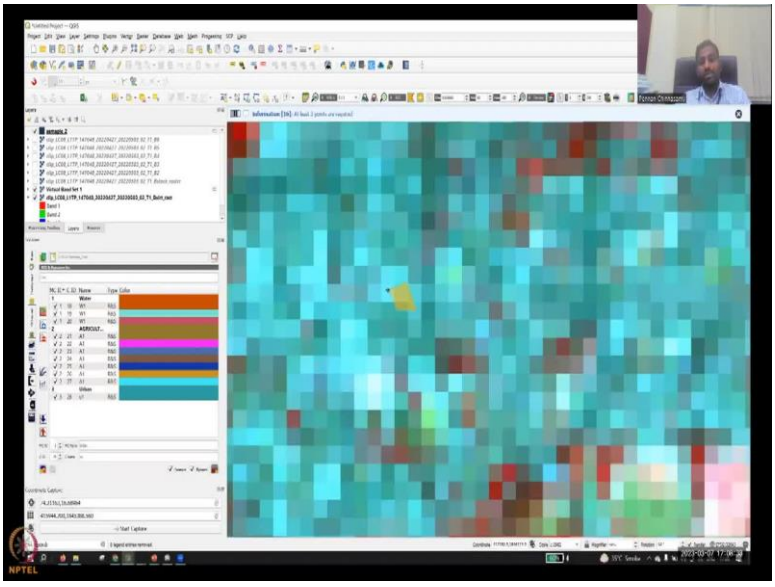

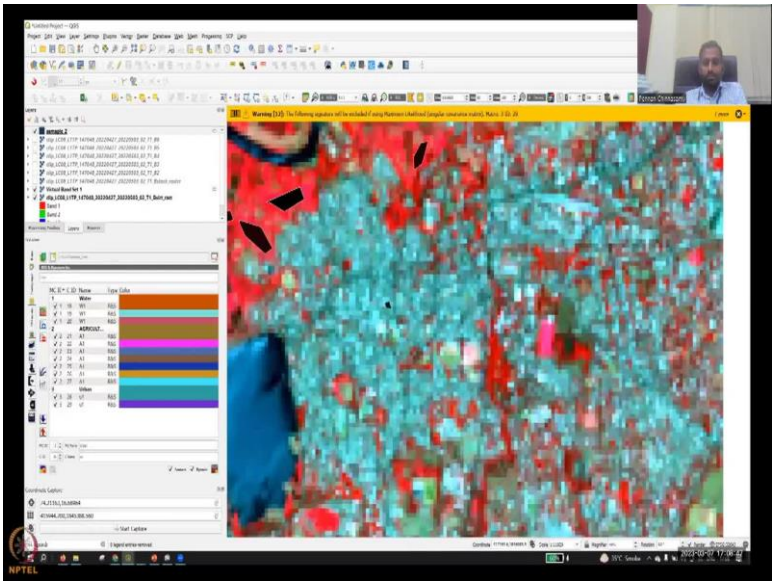

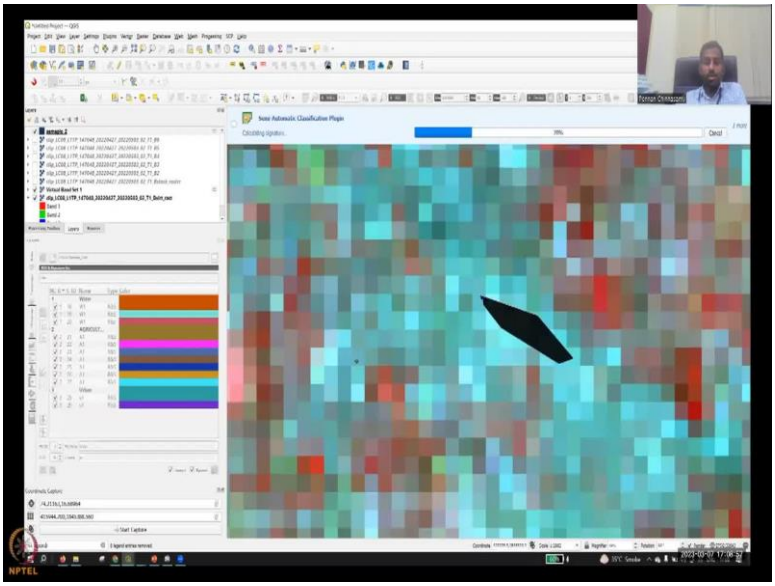

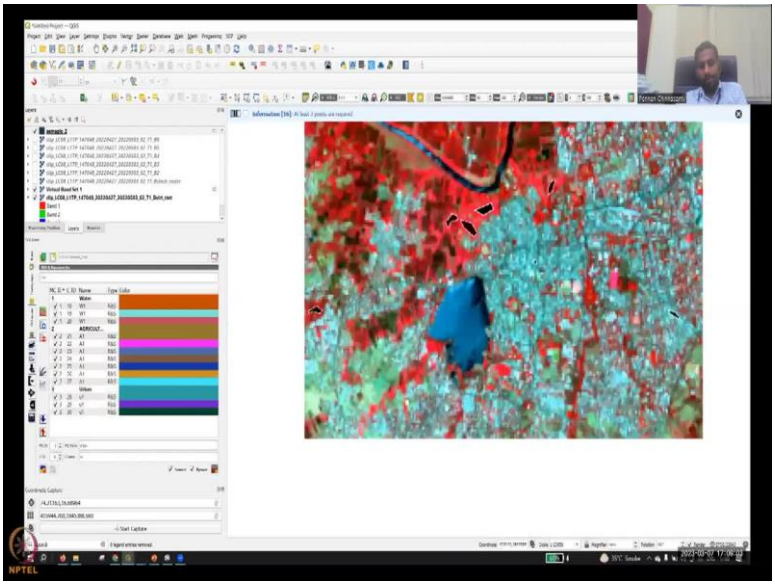

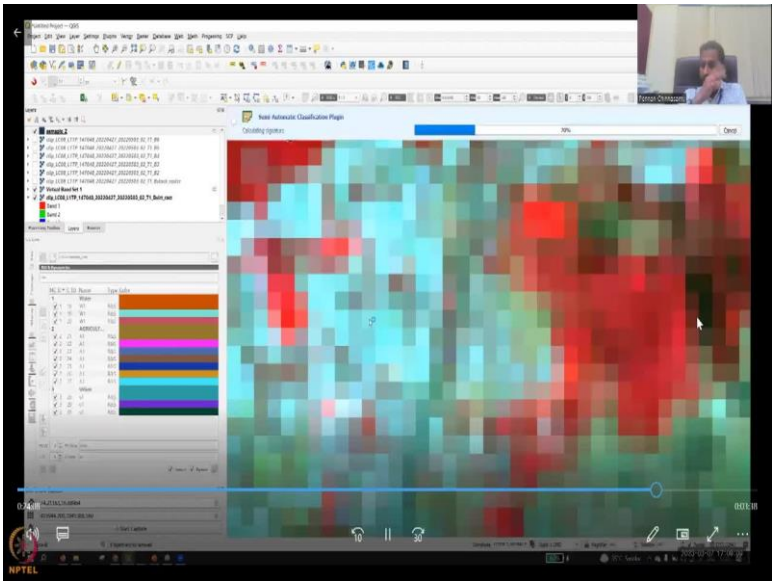

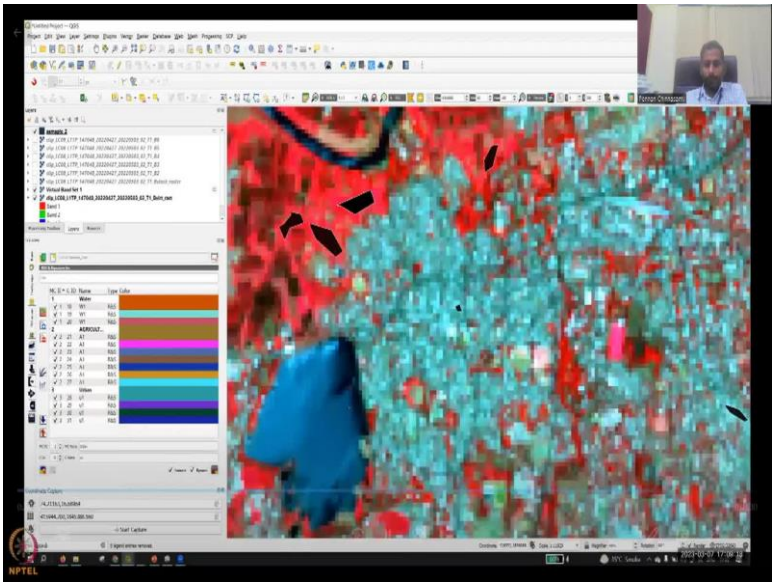

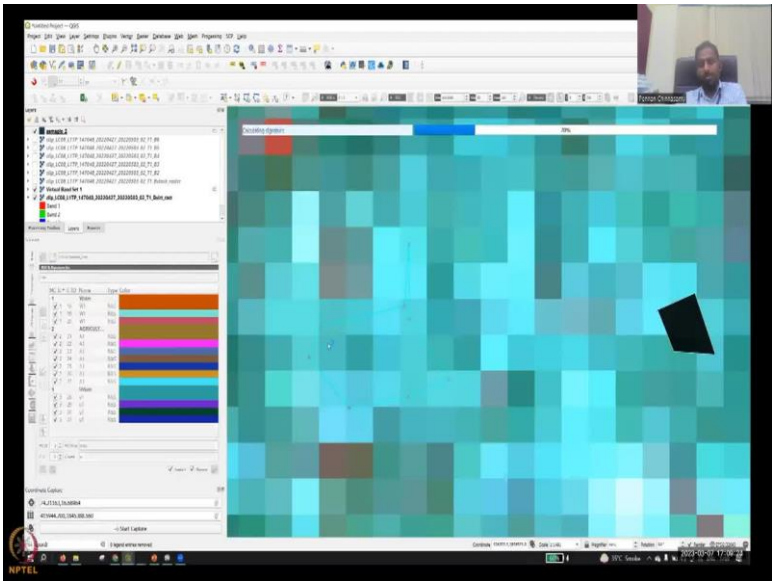

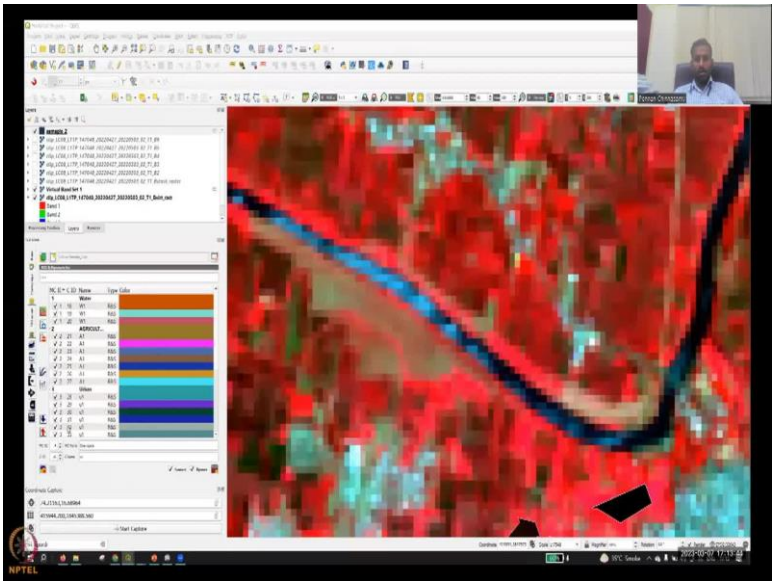

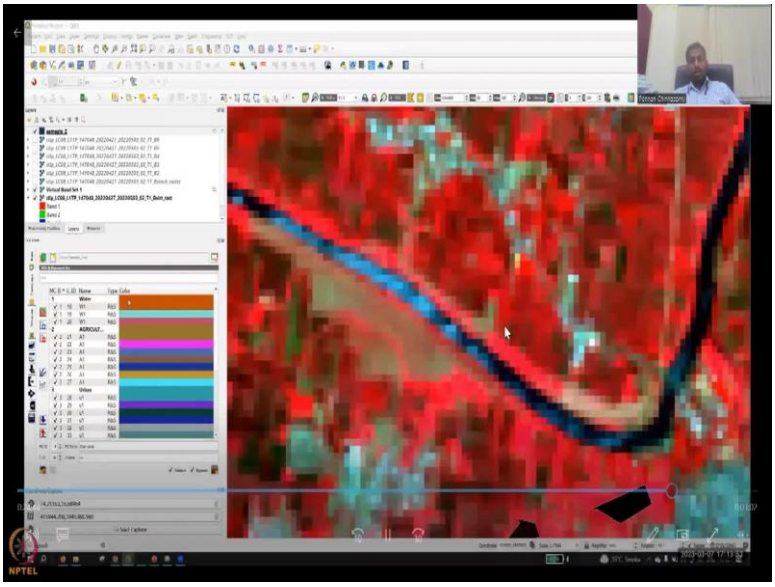

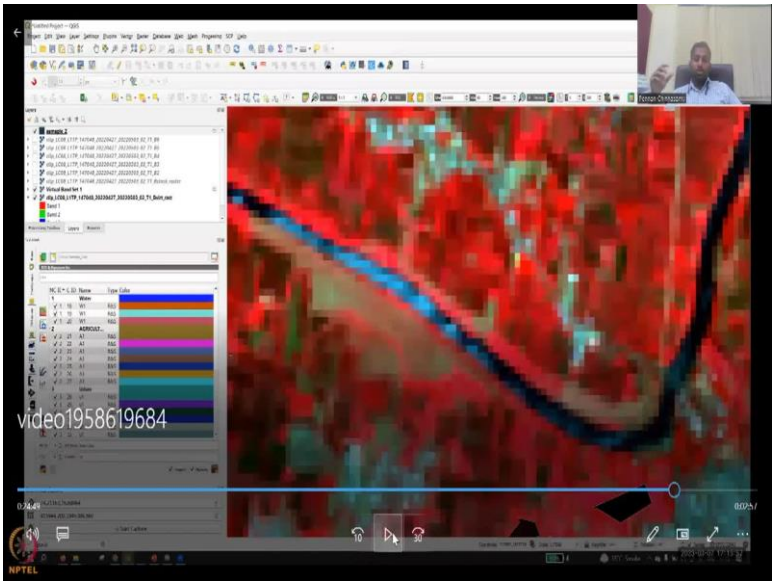
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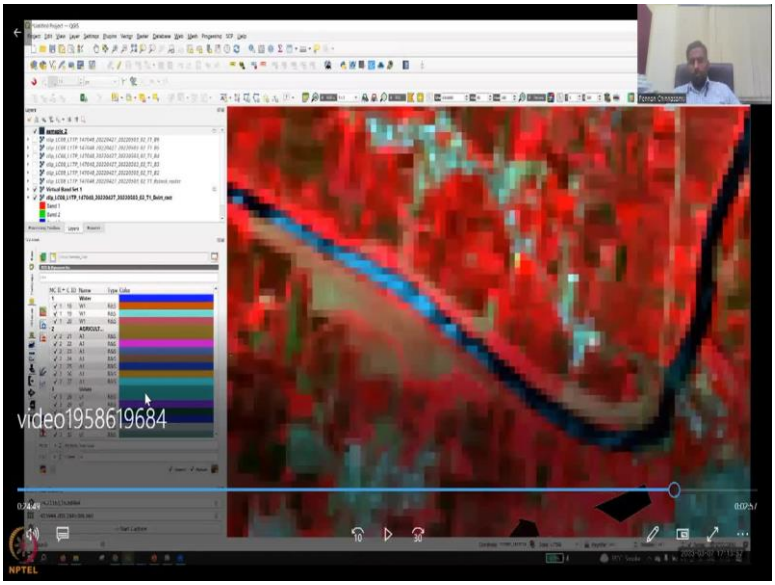
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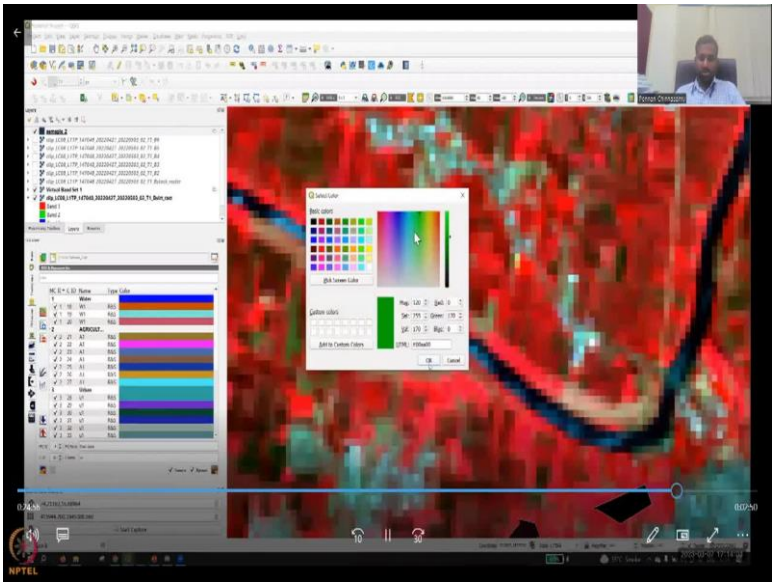

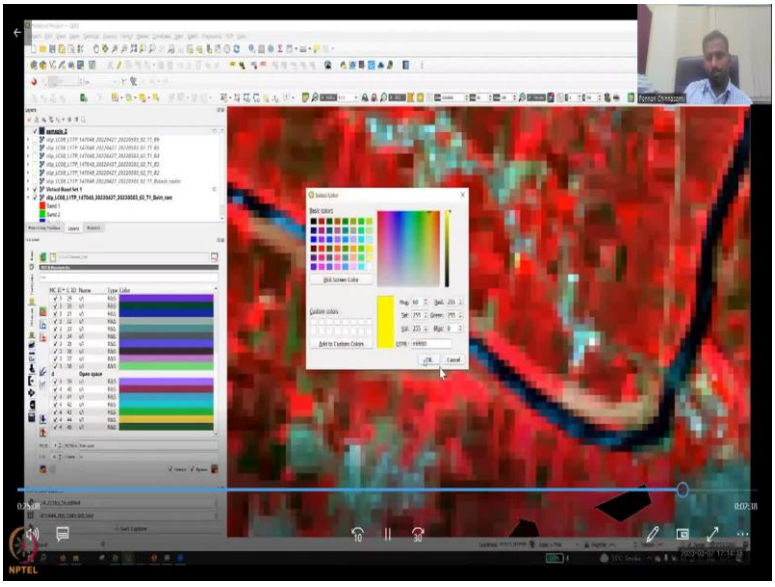

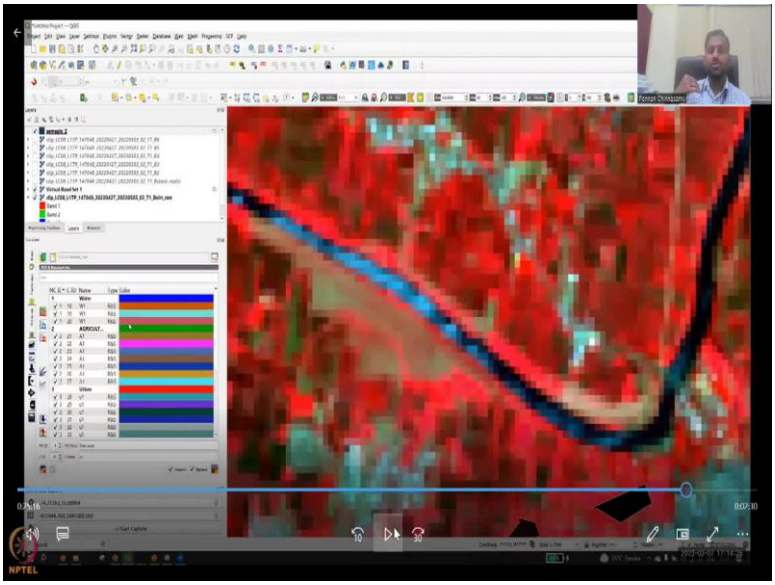

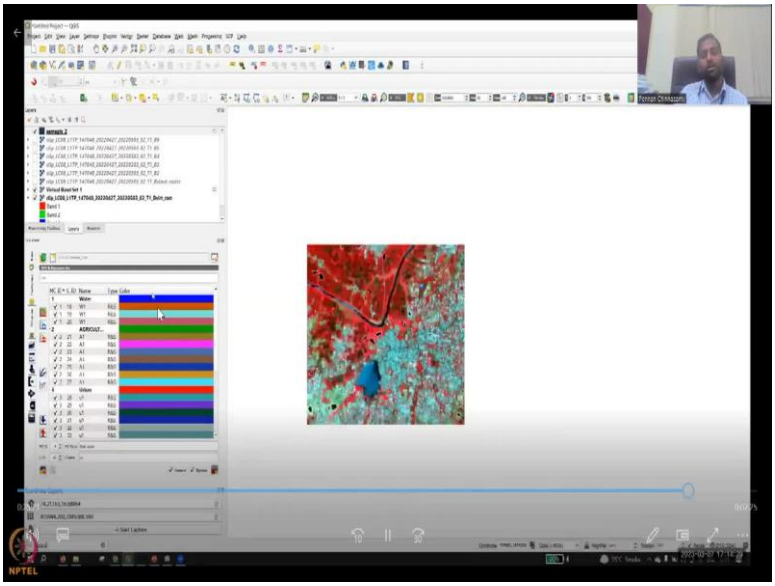

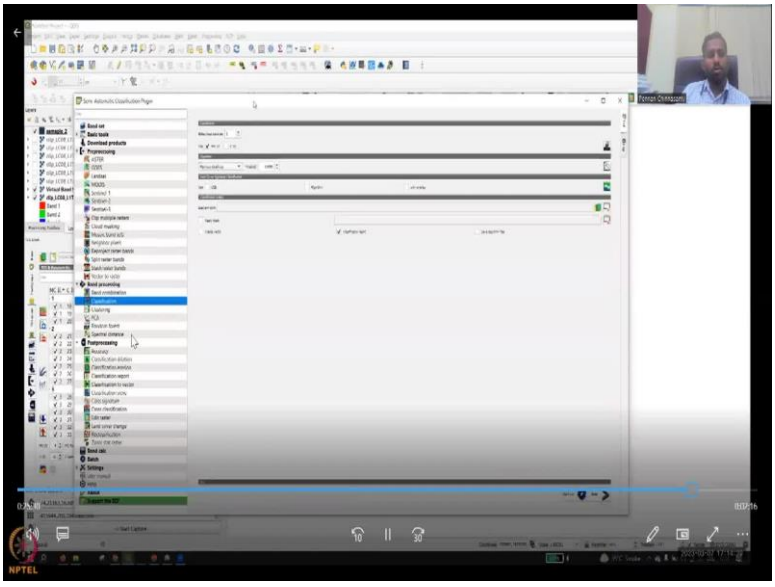

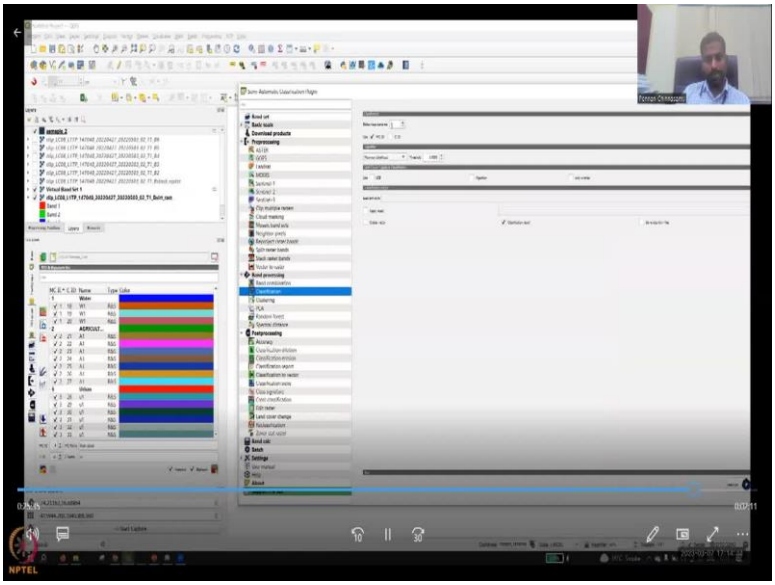

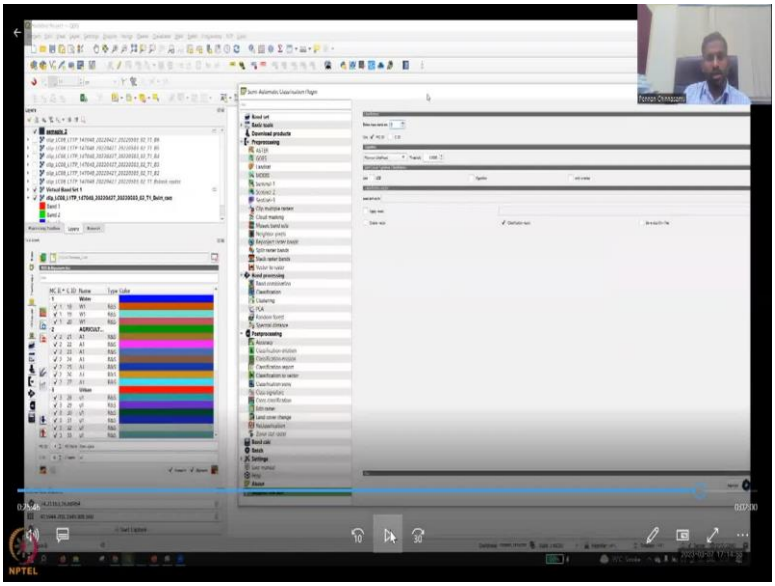

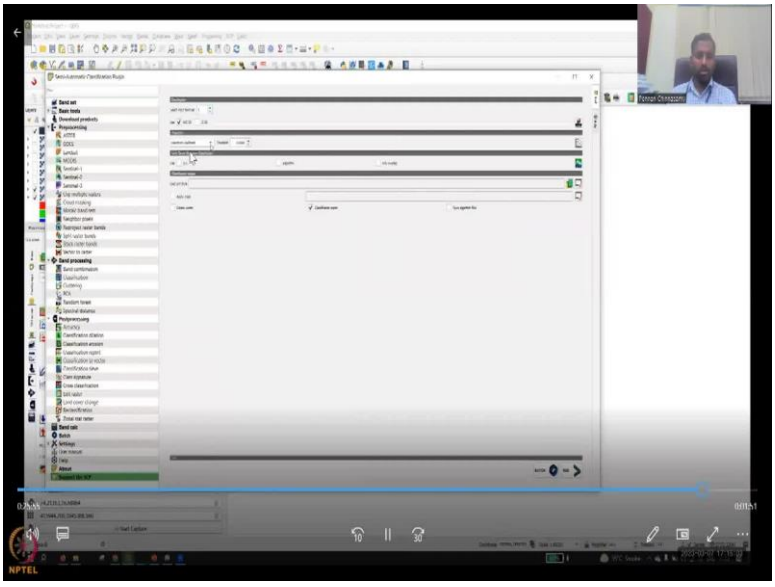

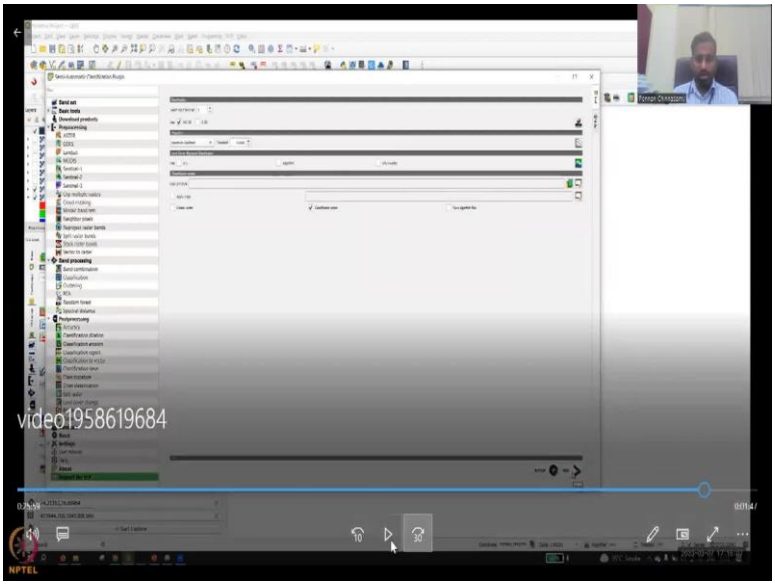
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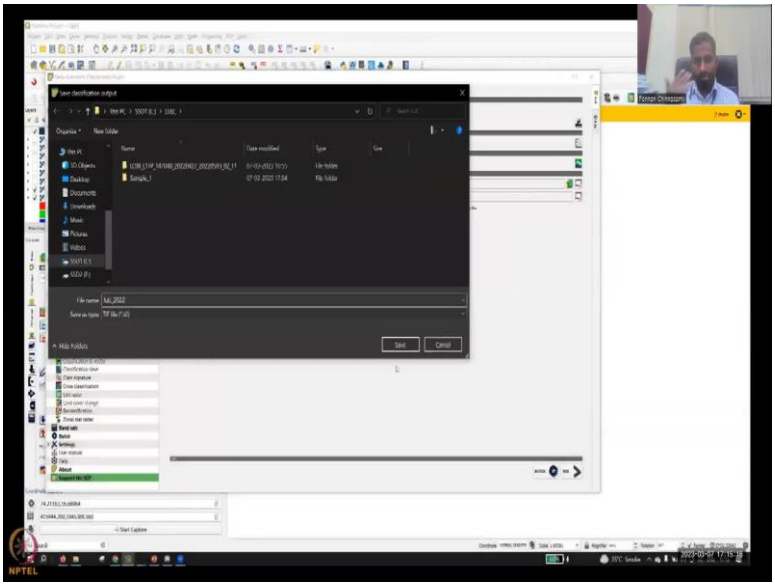

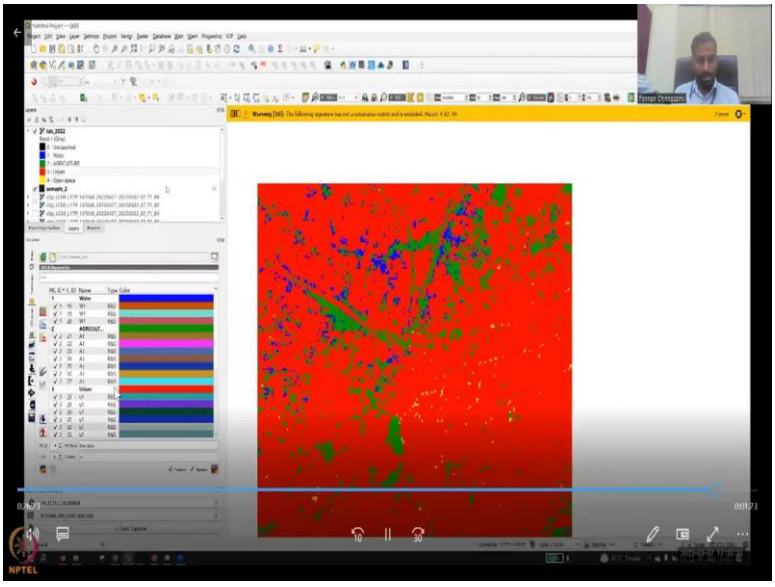

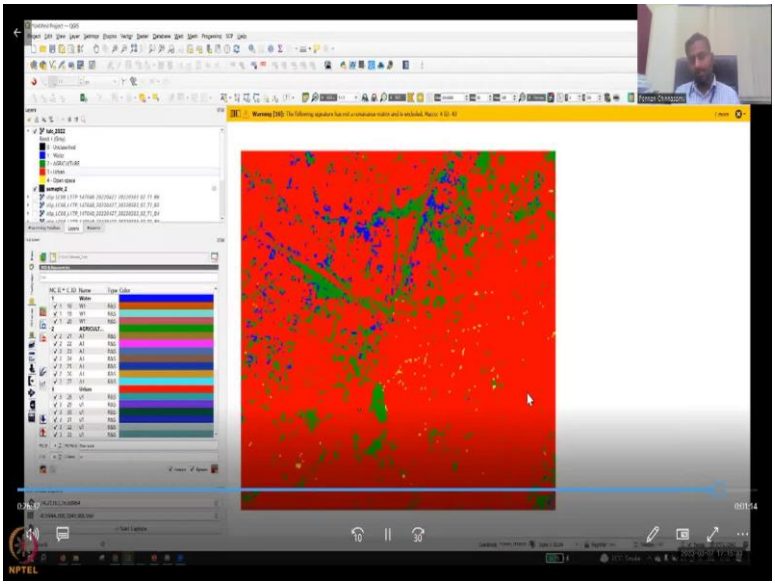

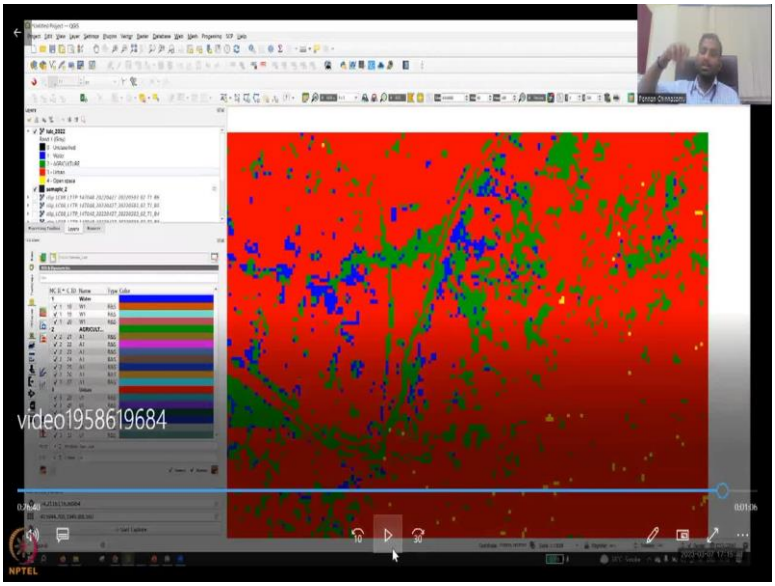
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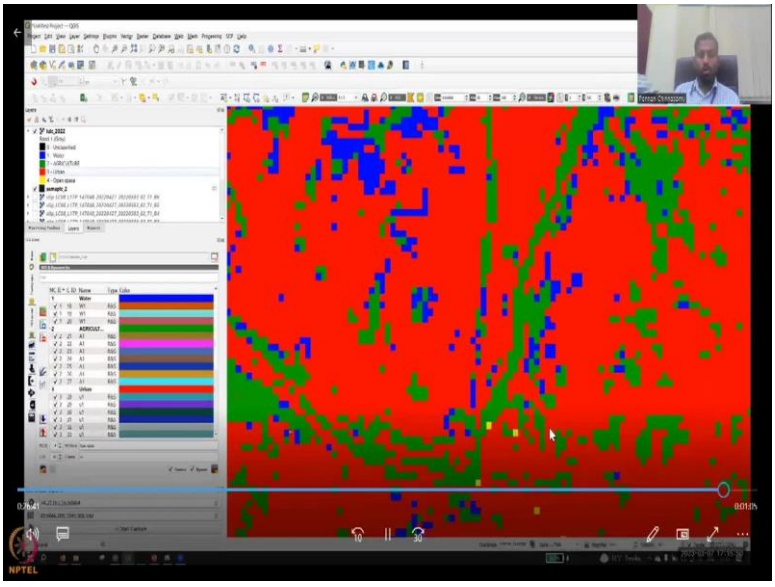
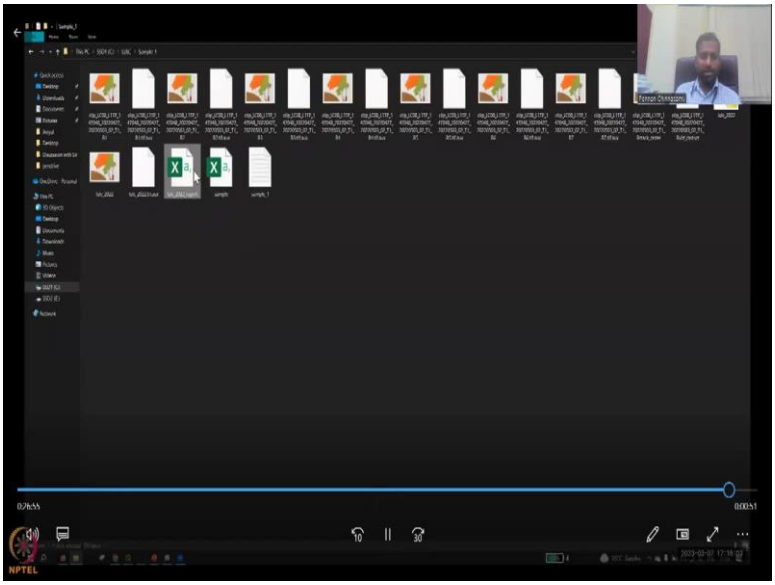
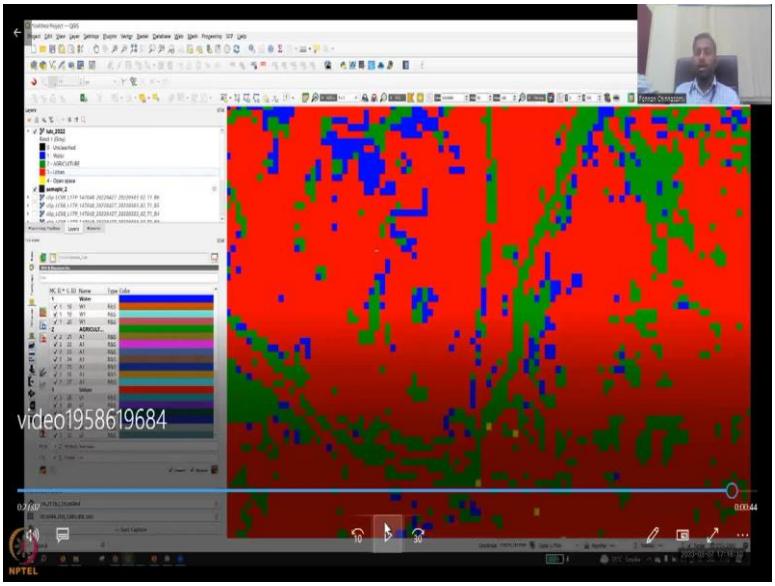






Now let us go to the built up area as I said in the Google Earth Pro, you can see that there is around the lake area there is a lot of built up area and that built up area is coming here so the coordinate system capture we have used so all the blue light blues are built up area. So, let us type a new class, class 3, ID 3 and then 3 you have put and then let us type urban. And then we will type it as U1 and then it is classes 3 and then go and do the add.

So, zoom in as much as possible and then check all the colors you look at it I am selecting mostly the blue colors which are representing the Black could be roads or non-built up areas so let us not take that or barren land, so let us take some more samples for urban area, urban built up area. Make sure you have enough samples so slowly, I am taking different, different shades of blue.

In my image blue represents the classification of built up area. So, we have 3 urban now, let us take some more 4 and add again. You can see that you can also cancel in between if it is not correct. So, you have 3 classes now. You can spend as much as much time and add more colors, more signature files, it will become more accurate. So, we have enough for 3. And then open spaces also I have selected, open areas are areas without any agriculture water or, or built up area. So, we are going to have open areas also.

Now you could see that the water, agriculture and urban have different colors, which are automatic colors, but we know that we want to see something logical, which means blue for water is logical. Brown or red for urban buildup is logical agriculture is green. So, let us change the colors. So, click agriculture, the color scheme will come. But okay for green, just stay green just put a mouse on a green color, same urban, let us take orange color, or red colors, I always use them we will use it open space, we can keep yellow. And then we will say Okay, so we are given a color scheme.

So, what we have done so far is we have taken spectral signatures, not only one sample, we have taken multiple sample for each class. First, we define class we say okay, for the time d, we are going to only have water, agriculture, urban and opens space for classes. And then one more it will add the system will add by itself, which is unclassified. So, some colors, which are not given will be unclassified. So, now you are going to have 5 classes of which 4, we define each class, we gave some examples by taking pixels, and then mapping it to the system. Now we are going to give colors to the classes, so all of them will become blue, and we are going to we are ready to run.

So, now go back to SCP, come back down to the down, it is minimize. So, just go to the SEP tool, and then go to classification to hear it will ask which band you want to classify. Band one because we already made a band set, band set as 1, so keep 1. So, only the main classes we have. So, just say MC, you can click you do not have a C, we did not give the sub classification SC values we did not give, so let us click the MC values. And then classification report is good for error analysis.

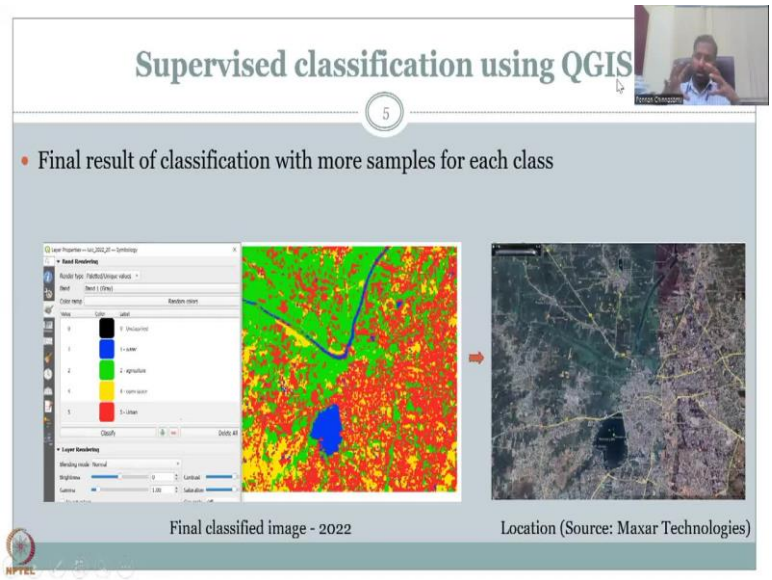
So, you can just click maximum likelihood is one of the best performance. So, just click the maximum likelihood algorithms; there are multiple algorithms available but set the maximum likelihood because it has been used widely across in literature. So, now you click Run. It will run and ask you where you want to save the file as a TIFF file, or you can also change the file type if you want, let us say LULC 2022. running it some for some systems that will take

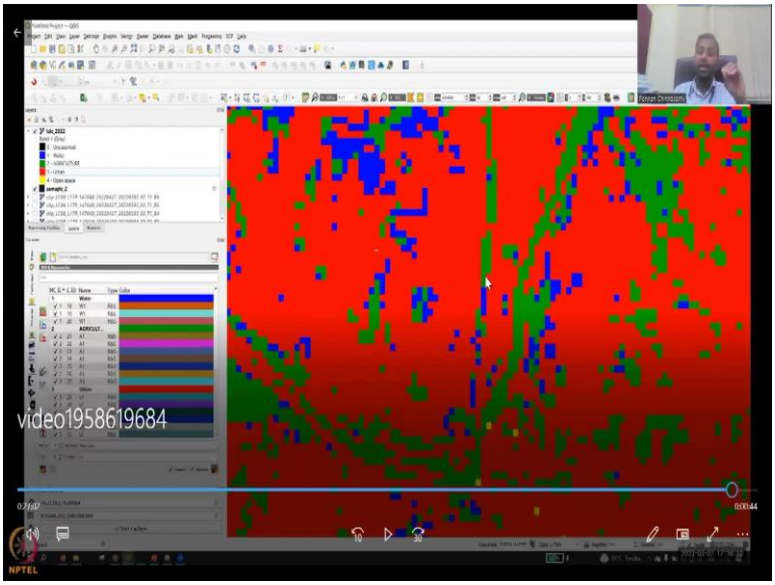
more time. I will cut the because of the time I am going to fast forward that part. And now yes, the system has run it the classification is complete.

Here, you could see that only less number of classes are given because not all our water agriculture urban, so you will see some classes. But more importantly, you could see that the pixels have been extracted based on your preference of what is water, and all those have been clustered. So, there is clustering, the second objective of classification, and the cluster is given a name and a color, which is water, water in blue, say for agriculture is green and, and then for Urban it is red, and then yellow for open space. But, you can see that it is not as accurate as the Google Pro, but let us look at the classification report, it will be generated in your report folder where you have stored it.

So, now, we have completed, just for the class, I have done a very, very small amount of classifications and sizes, and quickly we have done within 20 minutes. But if you are very patient and click accurately the pixels, which I have done already, I will show you the report and the image now.

(Refer Slide Time: 38:00)





Supervised classification using QGIS

6

- LULC classification report of study area (2022)

lulc_2022_2_report

Class	Area in sq. km	Percentage of total area
Water	1.5714	3.7
Agriculture	15.3126	35.7
Open space	6.8985	16.1
Urban/ Builtup area	19.1223	44.6
Total	42.9048	100.0

Supervised classification using QGIS

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lulc_2022_2_report

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So, this is how the image looks like if you take a very, very slow approach, click each pixel and then make sure that you have enough classes here you can see that you have enough classes unclassified black water, agriculture open space in urban, you can see it matches with the Google Earth Pro that we have taken. So, beautifully, these two images are matching, because we have spent more time on each different colors of pixels in the previous image, I will go back and show just for sake of it, you can see that all this was taken as red and we know that urban areas is not that big because we did not take green color from those areas and the brown little bit brown was enough for the system to say it was all urban.

So, what we have done is we have now gone back and forth and did very, very accurate classification, which is here and then that has given better results. Even the report watches the same you can see that the report says that the classification report says the water is this material because opens pace urban area and total area is 42 square kilometers, 42.9 you can estimate the boundary that you drew initially while downloading the data it will be the same so percentage of total area is also coming to the 100 percent.

So, in the error class, if you do not have a particular class and the pixel is not represented then the total 100 percent will not come it will be like 80 percent which means 20 percent of the land, you are not mapping. So, with this is today's lecture went a little bit over time, because we did a hands-on on land use land classification. I will see you in the next class. Thank you.