

**Remote Sensing and GIS for Rural Development**  
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**Centre for Technology Alternatives for Rural Areas (CTARA)**  
**Indian Institute of Technology, Bombay**  
**Week – 7**  
**Lecture – 35**  
**Digital Elevation Models (Hands on Example)**

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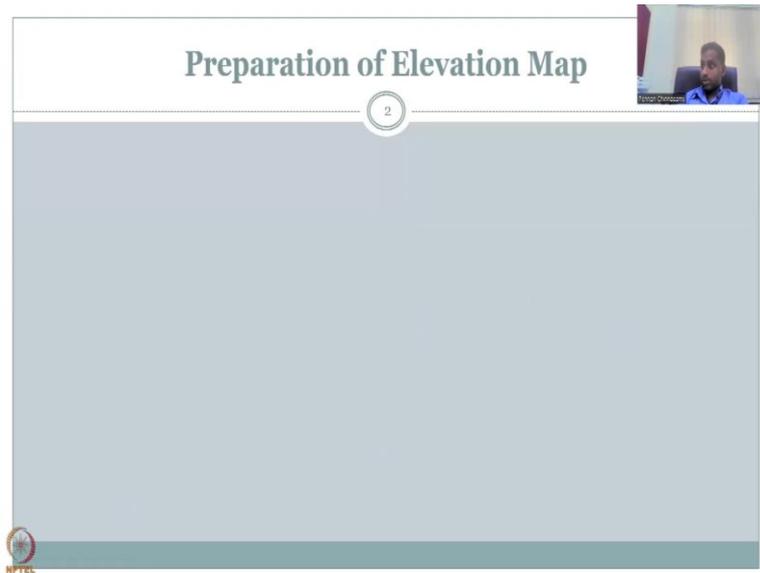
- Remote Sensing and GIS for rural development**
- Week 7: Lecture 5**
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- FACULTY:**
- CENTRE FOR TECHNOLOGY ALTERNATIVES FOR RURAL AREAS (CTARA)**
- INTERDISCIPLINARY PROGRAM ON CLIMATE STUDIES (IDPCS)**
- CENTRE FOR POLICY STUDIES (CPS)**
- CENTRE FOR MACHINE INTELLIGENCE AND DATA SCIENCE (C-MINDS)**
- INDIAN INSTITUTE OF TECHNOLOGY - BOMBAY**
- NPTEL - REMOTE SENSING AND GIS FOR RURAL DEVELOPMENT**
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Hello everyone. Welcome to the NPTEL course on Remote Sensing and GIS for Rural Development. This is Week 7, Lecture 5. In this week, we have been looking at using multiple data sets for rural development, especially, digital elevation models. In the last class, we downloaded one tile from Bhuvan portal and then we had kept it aside to be looked upon in the next class.

So, we will start opening that data set and then look at how the data has been downloaded etcetera. From that, we also would understand that we need multiple data sets for a administrative boundary. Please remember that the rural development and other policies and schemes work on administrative boundaries, not hydrological boundaries, maybe there is a Kaveri basin or planning, ganges basin planning.

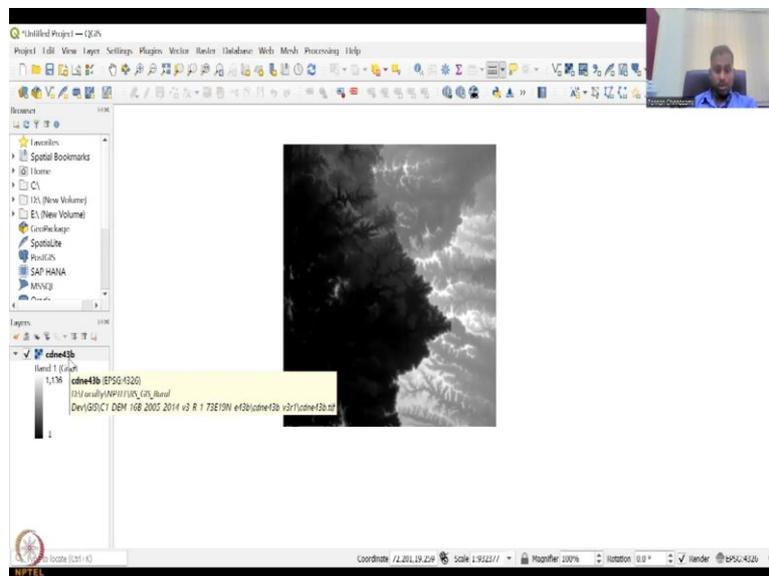
But at the end of the day it comes to the state level, district level and village level panchayats. So, for which today we will download a district from Earth Explorer and show you how to collect one data set for a particular region and then use it in the map composer or QGIS.

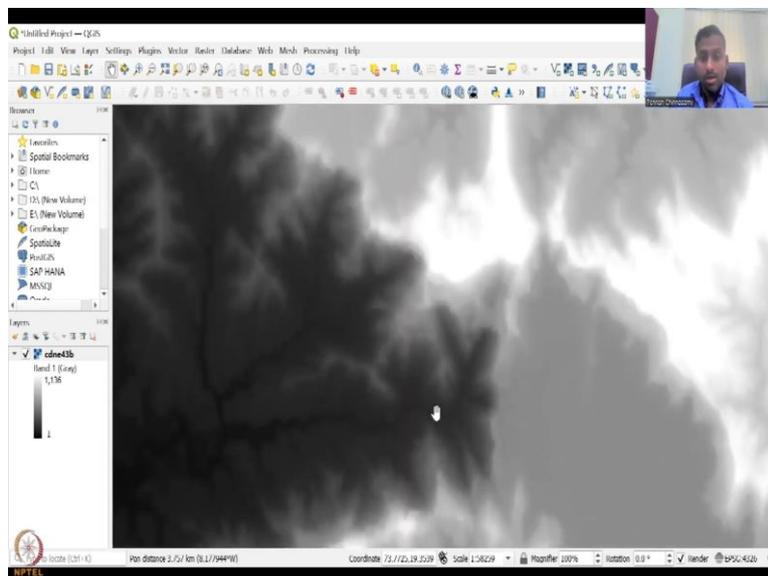
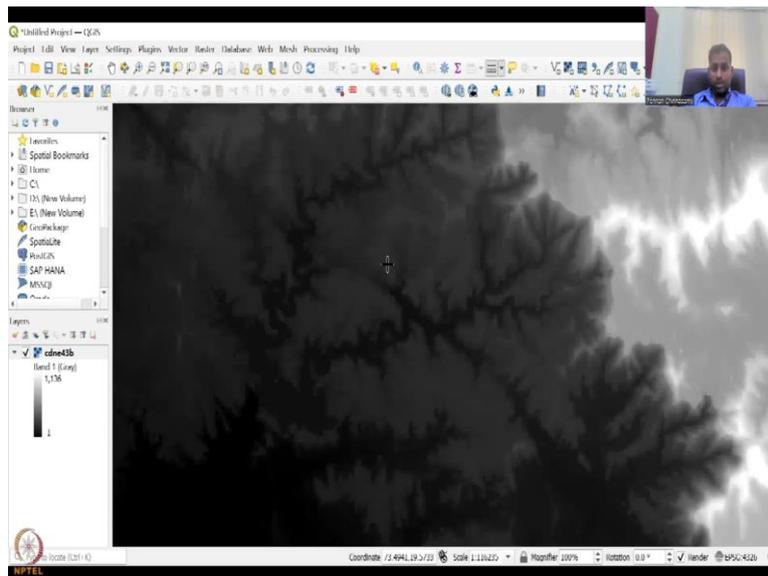
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So, in today's lecture, we will follow through the preparation of elevation of a map for a particular study area. And for before that let me share with you the data set that we included in the last class from QGIS.

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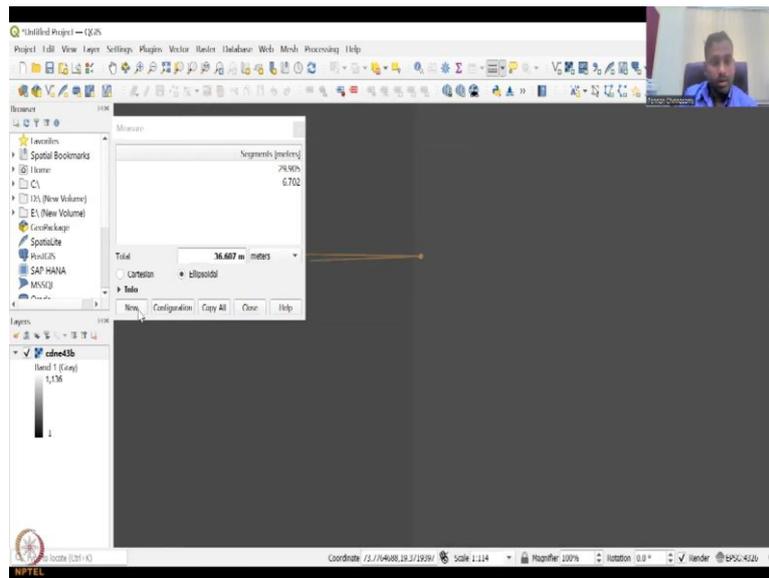




So, this is the data we downloaded, you would have remember cdnea 43b, the tile number that we downloaded. And you if you zoom in and zoom out, you would know this is the third version, version 3 of the Cartos at one and the resolution was 1 Arc second. 1 Arc second is equivalent to 30 meters resolution. Let us look at it closely.

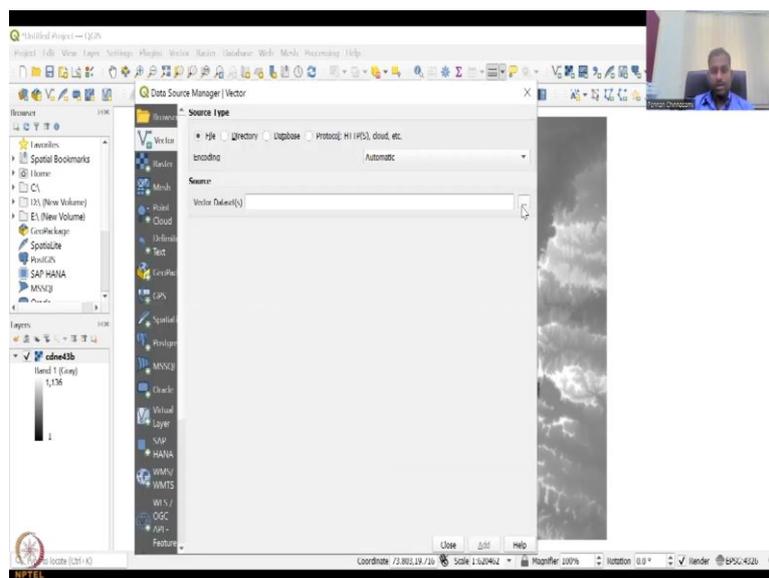
So, right now what you see in a DEM is elevation profile. And you could see that it ranges from minus 1 to 1136 meters. The unit was in meters as explained in the metadata on Bhuvan's website. What we will do now is we will look into the size of a particular pixel. Now, you could see when I zoom in, you could see the pixel boundaries. So, how the pixel is given.

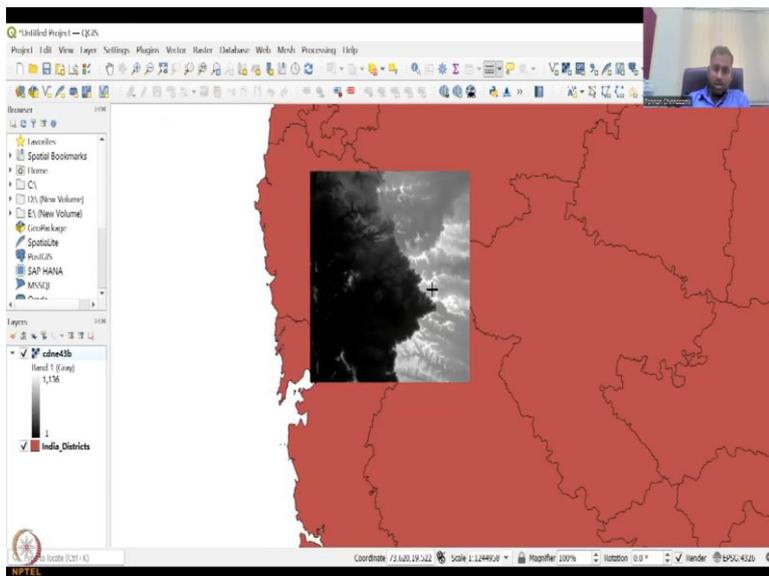
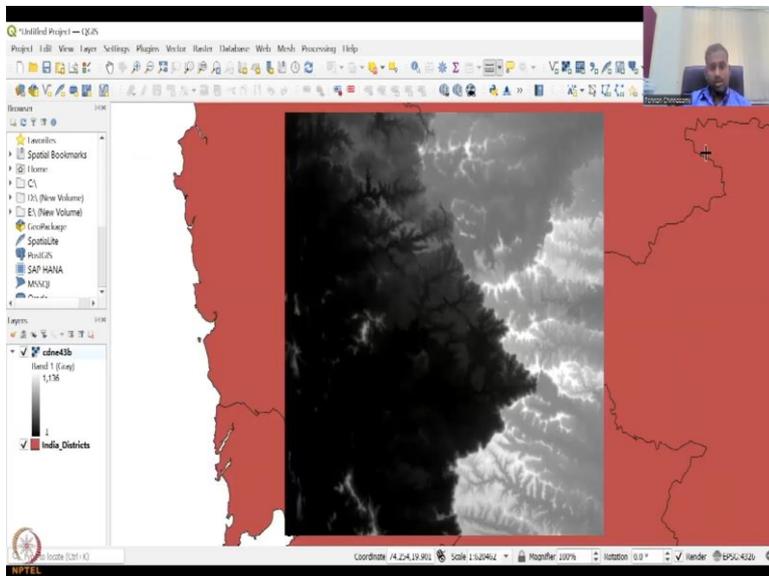
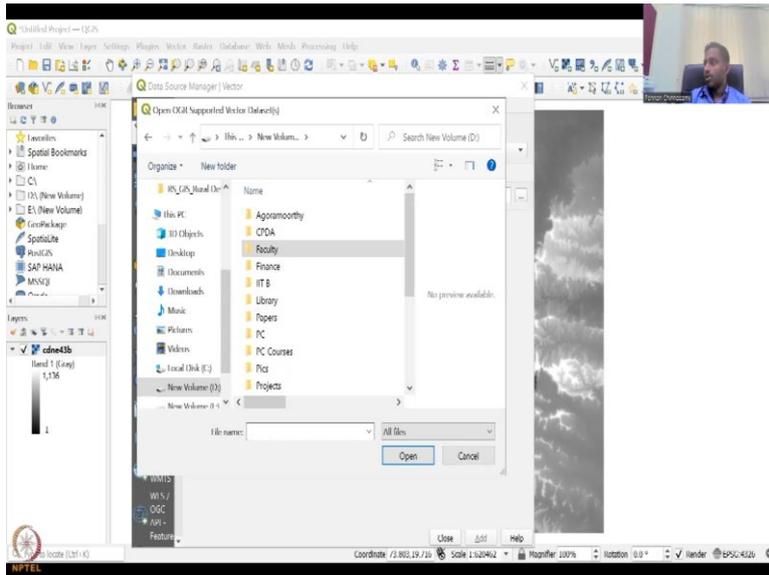
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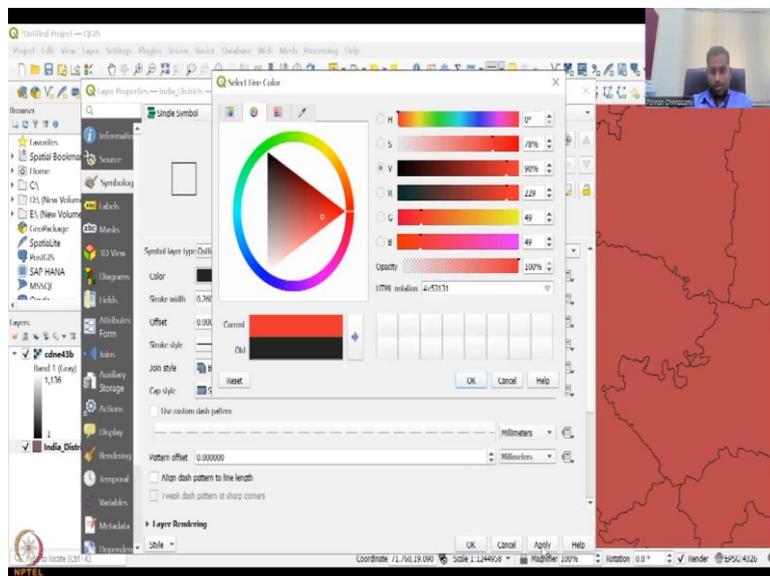
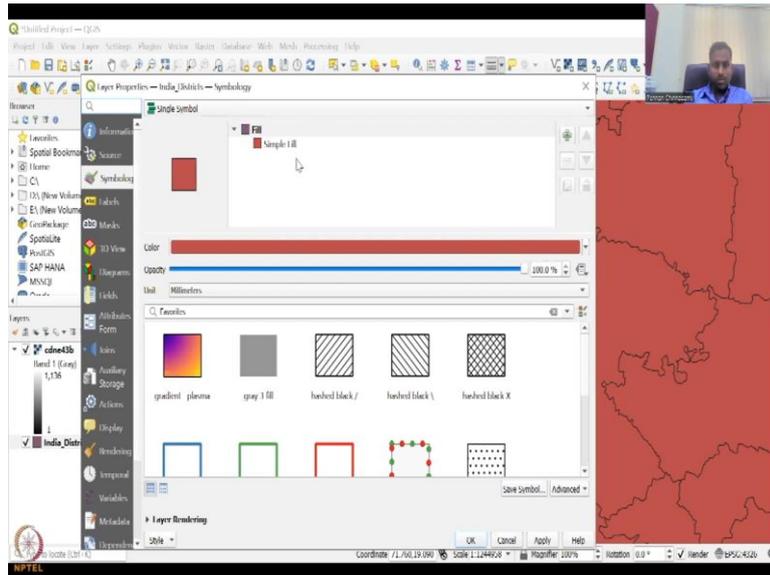


So, what I am going to do is we are going to select one side and then the other side carefully and then you can see how big the the pixel is. So, it is 30 meters because of my clicking and zooming maybe. If I zoom in more particularly, I will be able to click more accurately. So, let us see if I could capture that. Yes, yeah, yeah. So, it is approximately 30 meters. And that this is important to understand because the resolution Arc second is on the curvature and that can be different for different regions. So, now we have this. So, what is the issue here is that it is not a particular boundary, it is a tile. So, tiles you do not get a particular picture unless and otherwise the shape file is within.

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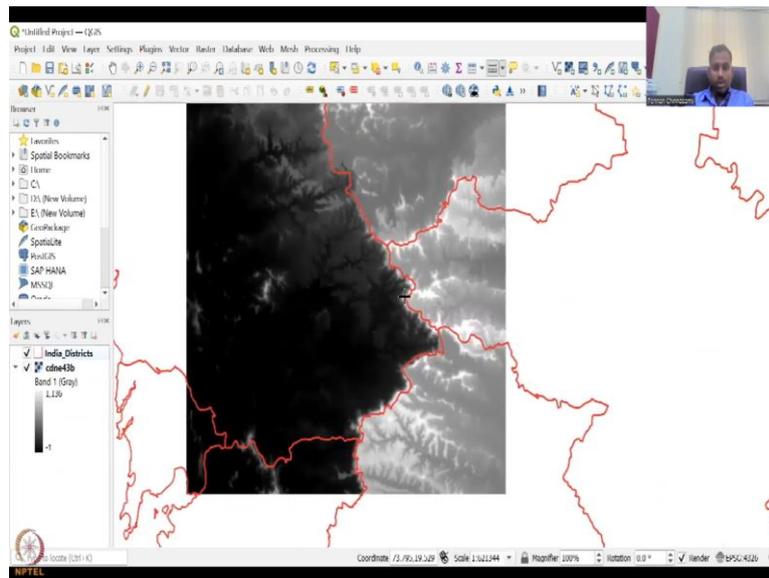




So, I am going to add the India data set just to show you how we have the data for rural development GIS we have. So, we have the water bodies and tanks but I will go into the my data set and then we will see how we could extract the boundaries that we have on to this webpage.

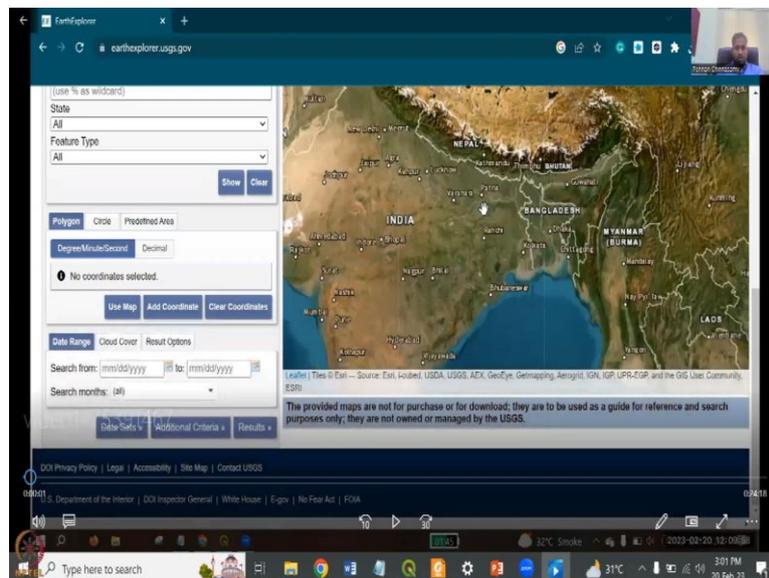
So, I am going to select only the sv shape files that I have let us say districts. So, I have added the India districts a shape file. You could see that in coming up now and then what you will see is the boundary is we took Karnataka part. Correct. But it does not lye on a particular district. You could see where the district boundary is not.

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And you could see if I drag it down that the boundary is coming on top of it but it is not for a particular district. It does not cover any particular district. So, that is where we need to merge multiple data sets to make one district's digital elevation model that is what we will do now. So, I am going to use since we use already Bhuvan, let me use Earth Explorer for the next exercise. I am going to share my screen.

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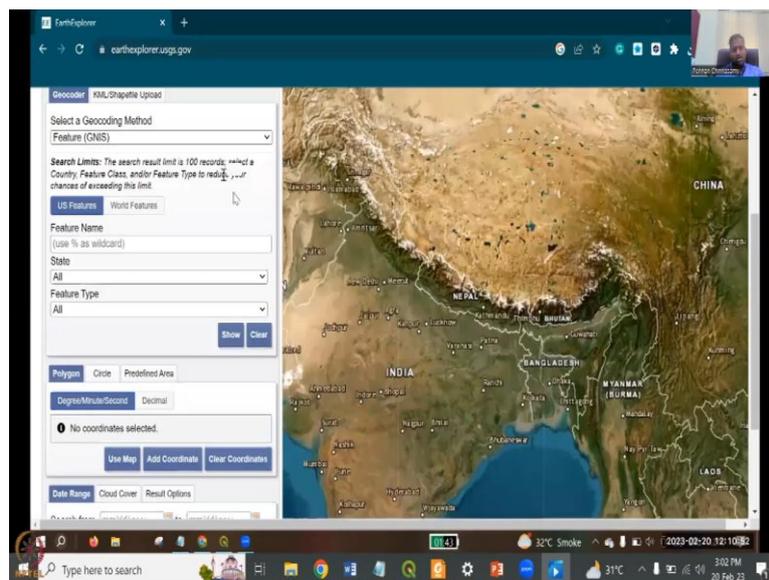
I hope my screen is visible. So, what we will be doing is we will be showcasing the Earth Explorer. So, Earth Explorer everyone should have hold off because we had discussed the

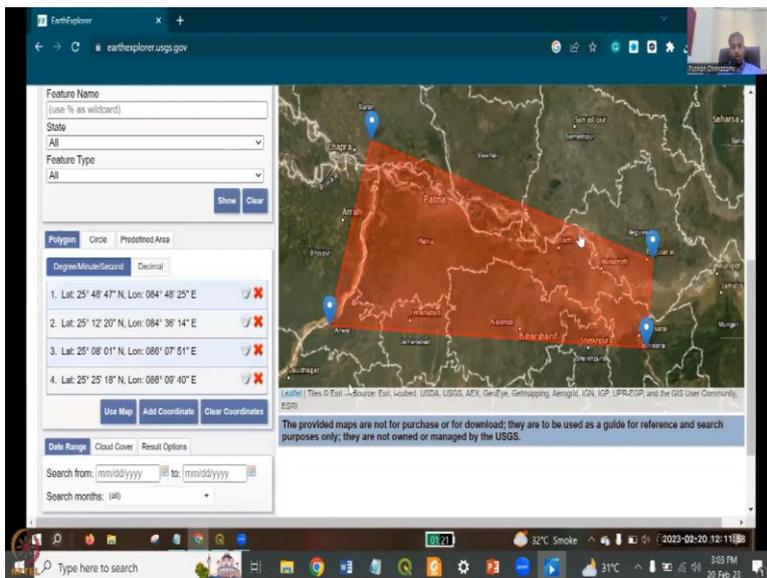
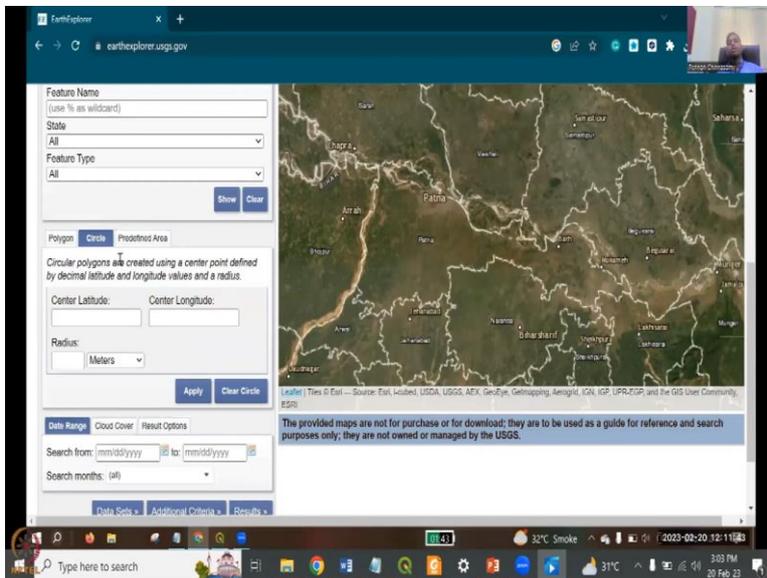
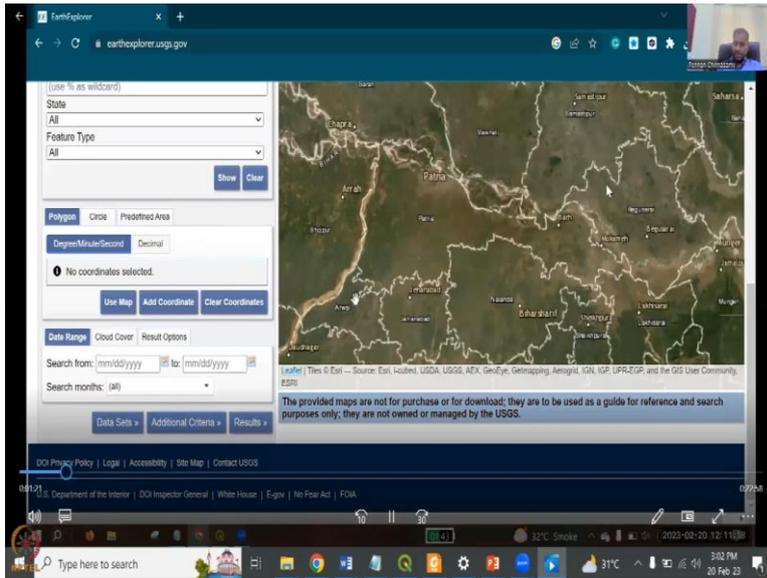
Earth Explorer in detail in the previous meetings. It is NASA's portal where a lot of data has been stored.

So, what we will be doing is we will showcase the effect of using this software for downloading data and for looking at the different data sets that are available. So, let us continue. There is three parts in this tutorial. What we will be doing is we will look at first getting the data from Earth Explorer for a particular region, Patna is the reason that we have selected today.

And number 2, download all the data into QGIS and then merge them into one boundary because each tile might be different and we need three four tiles to make one bare district. And then the third part is we will look at ARC GIS. I am sorry QGIS to look at mapping and making it as a map.

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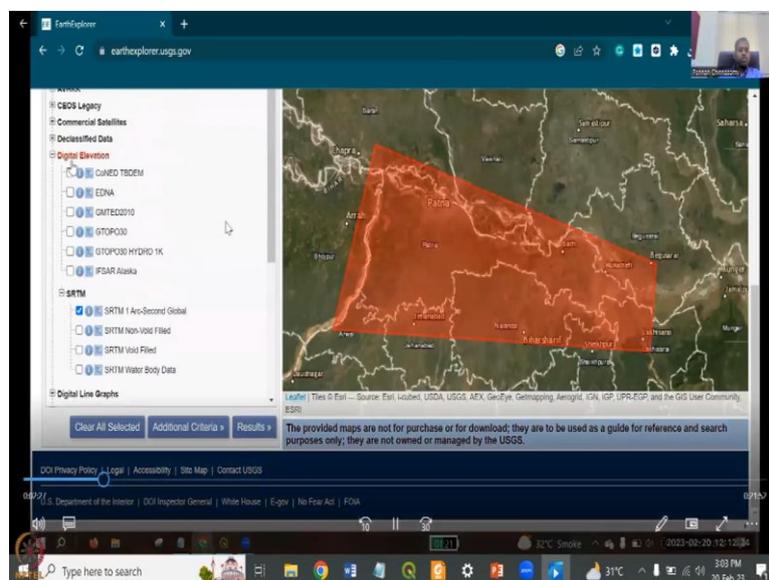


So, some of these are running in ARC GIS bare ground that is why ARCGIS was mentioned but there is a lot of potential in open source. So, we will be using open source. What we will do is we need to define the boundary of Patna. So, Patna is in Bihar. What we will do is let us zoom in and once you zoom in you can see the boundary of Patna. How do you select this?

So, if you know the range of the degrees and minutes then you can do it or you can do a shape file, if you load it. Let us say we do not have the shape file but we know that we need Patna but now just for this website you can put a circle around this point but then take it as a circle but that is too much of data that will be wasted. We do not need a circular region. So, polygon, polygon is better because we are going to draw a boundary on top of Patna and extract it.

Remember that when you draw this boundary, still the tiles will come out. So, I am going to draw four points and then this whole study Patna comes in. So, in polygon you select and then each point you put and then you take it out. Cloud cover is important but you can have cloud cover yes or no because the idea is like DEM may not have cloud cover, it would not affect your image. Cloud cover is mostly for land use land cover.

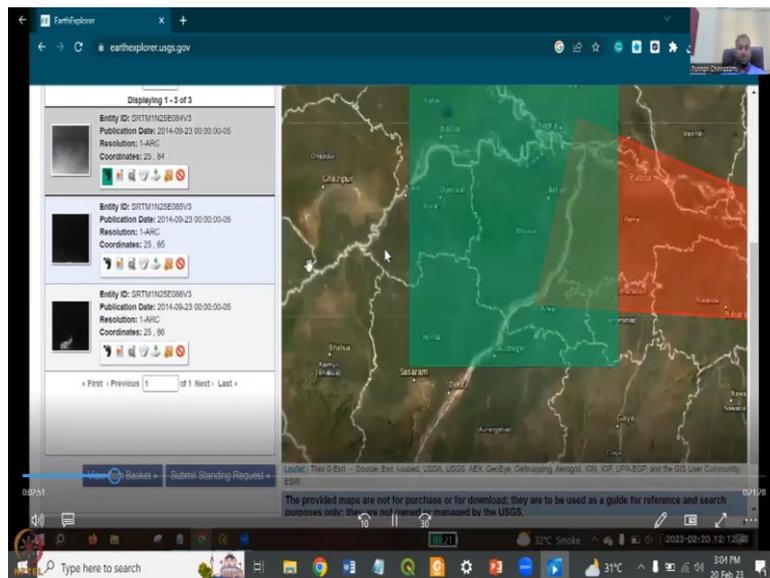
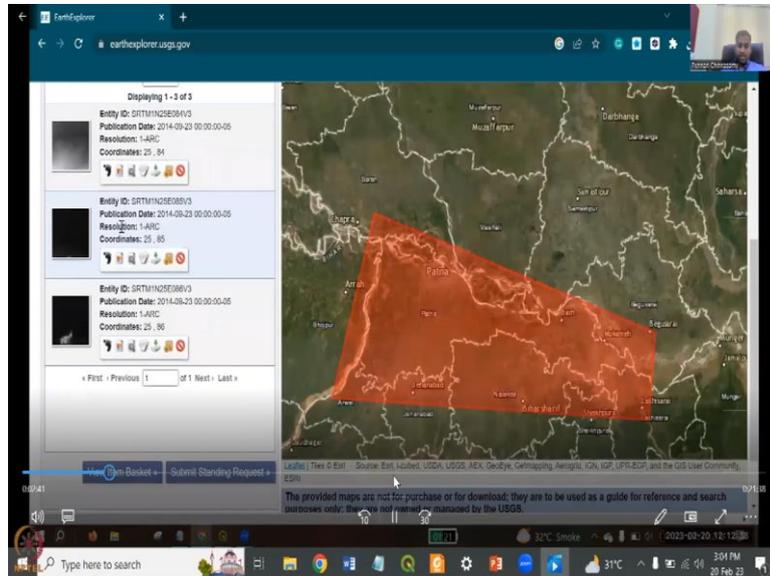
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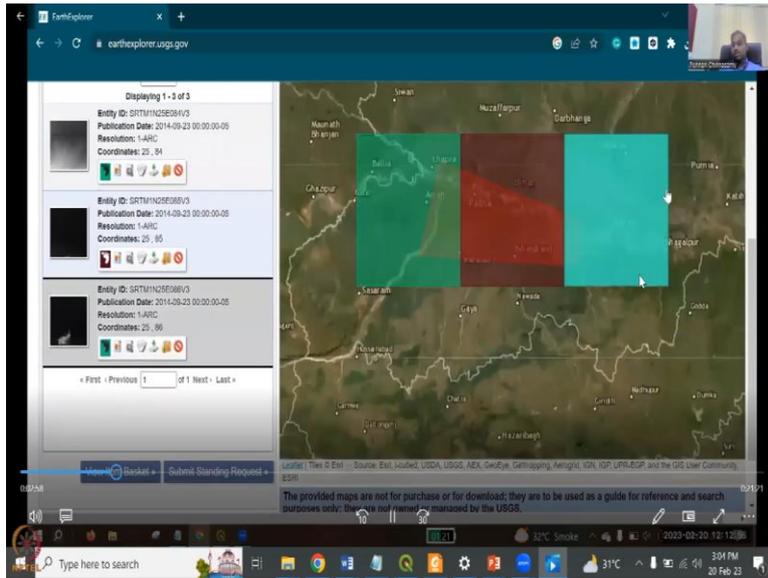


So, then we go to data. If you go down to the data part, you will see that there are multiple data options. You can take commercial satellites declassified, landsat, digital line tabs but we will be doing a digital elevation. So, I have clicked on digital elevation and in the digital elevation we will be going on SRTM 1 Arc second. Why SRTM is it has been widely used for the Indian region and we will be using it here also as per literature. It is 1 Arc second. 1

Arc second is equal to the Bhuvan. If you click the results for the boundary then you will have data.

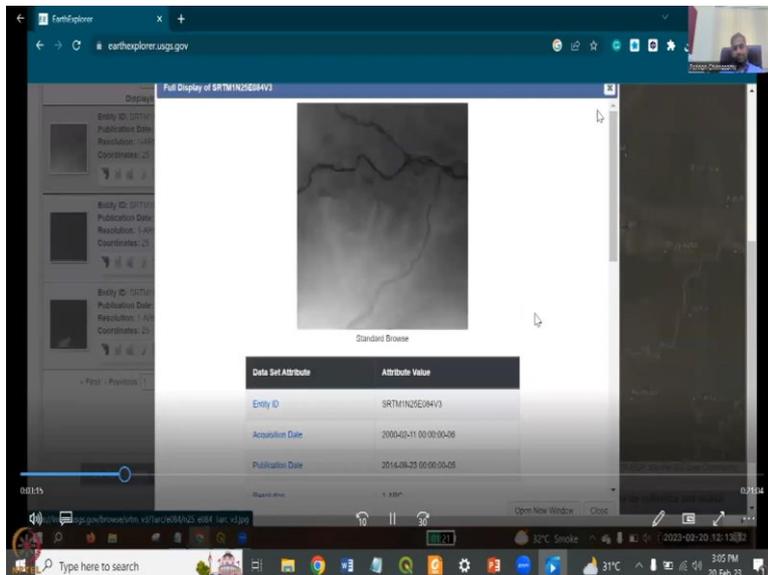
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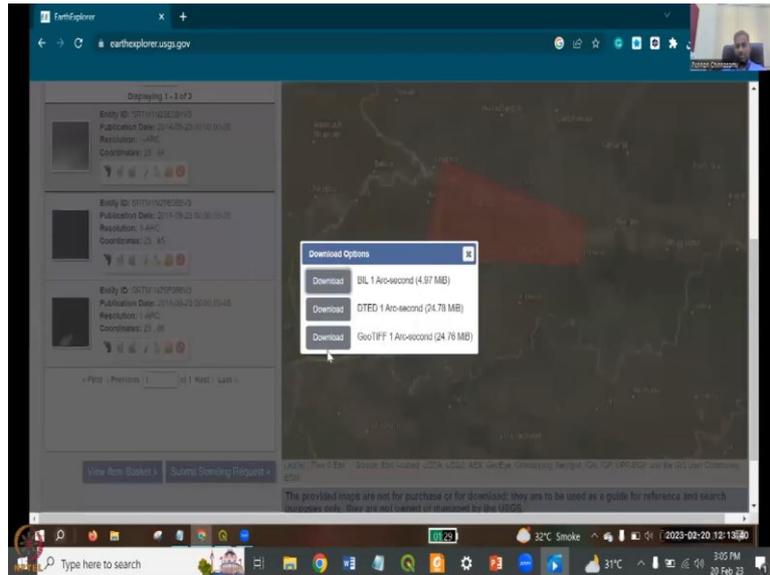




Three tiles are being populated. Icons, let us go through it. So, first is the footprint. When you see the footprint, it is an overlays, it just gives you the image of the tile and then the second would be the. So, now you can see the footprint of the tile. So, there are three tiles that we need to deal. That is the footprint, if you click go ahead and click on the footprints between the three, you will see that there are three footprints that are needed. Then you have the image. You can collect the metadata.

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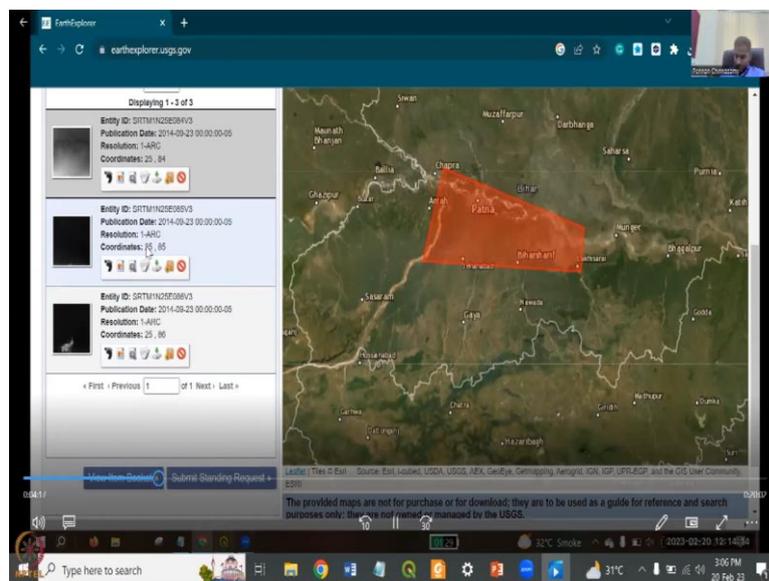
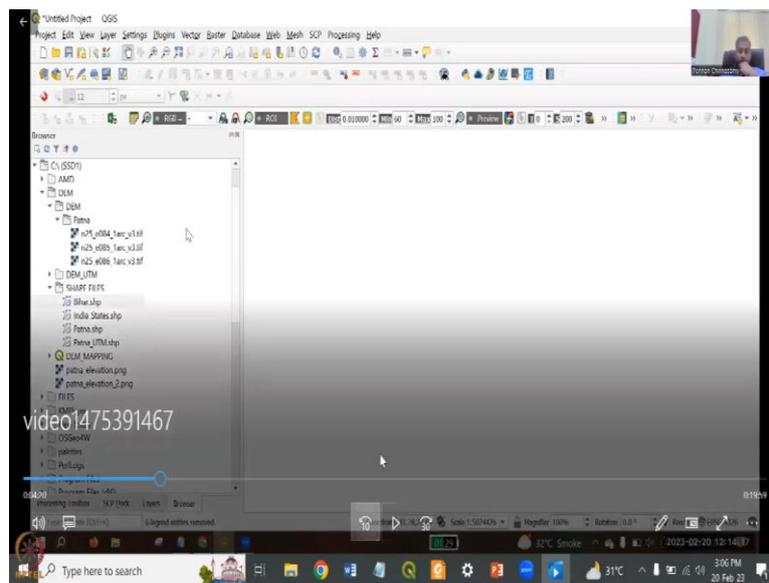


If you click the metadata point and then all the data aspects etcetera will come up. The download is very simple. If you click on the download and then download to a particular folder, you can do it. Or if you want all of them together, you can do a bulk download. Only three are there.

So, let us do individual. So, we just click, click, click three times save it in your drive. So, let me save in my drive. The file types available are three types, one is the BIL Arc second 4.97 MB or 1 Arc second DTED format or GeoTIFF format. Remember that we need a format which includes the geo-spatial location into it. So, we do need GeoTIFF, not just a TIFF.

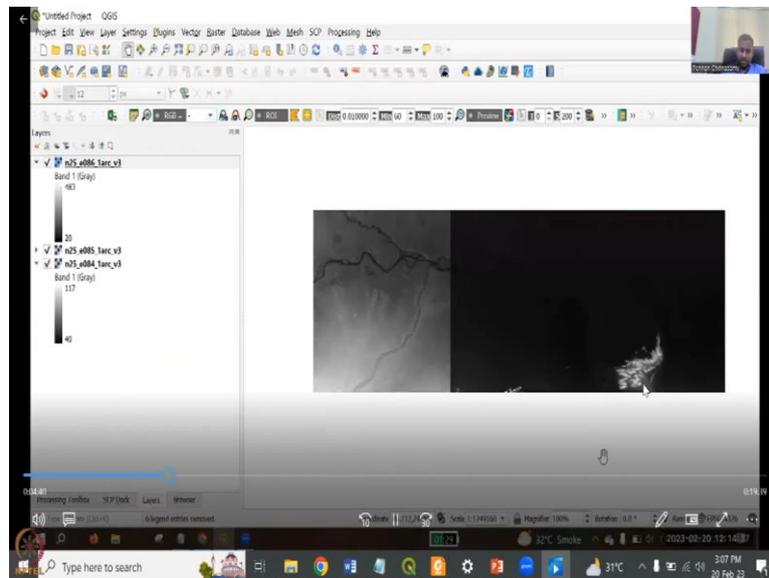
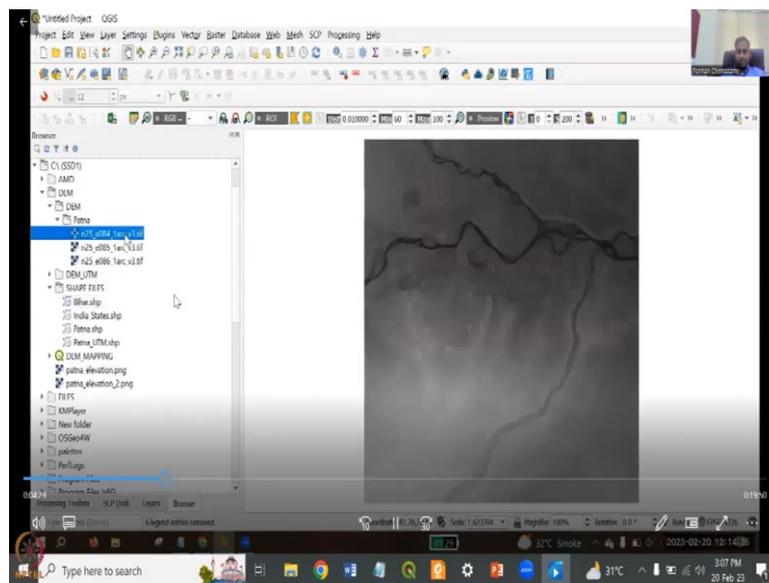
So, we click download. So, now, it has been downloading. I have multiple other things that are downloaded. So, it has been updated. Let us save all the three tiles into one folder, so that we can easily access for the QGIS part. So, Earth Explorer is done. So, let us close this and then move to the QGIS part.

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So, this is first part. The first part is done where we identified the tiles and then we went back to looking at which styles are important, we designated them, we downloaded them and then we can save these points, if needed and then move on. So, let us move on. We will be going to the QGIS. Let us share, let me share my QGIS again. So, in QGIS what you will see is add the DEMs. So, you have all these in my folder browser.

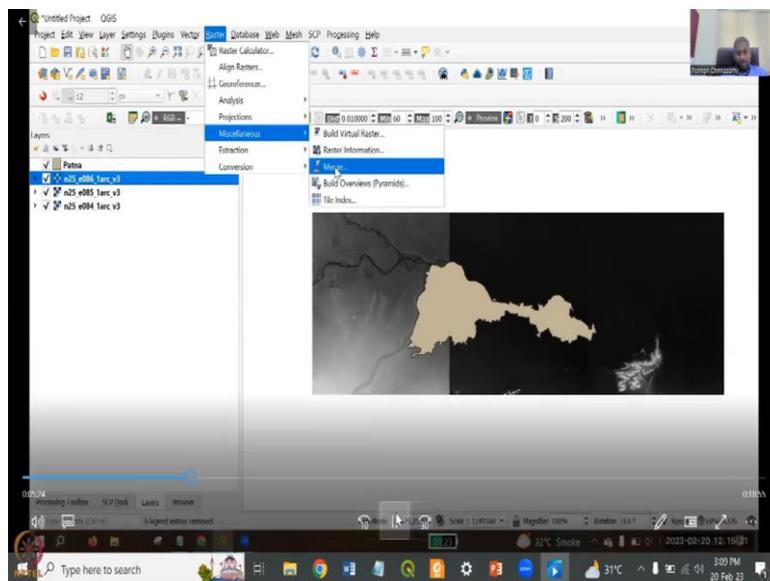
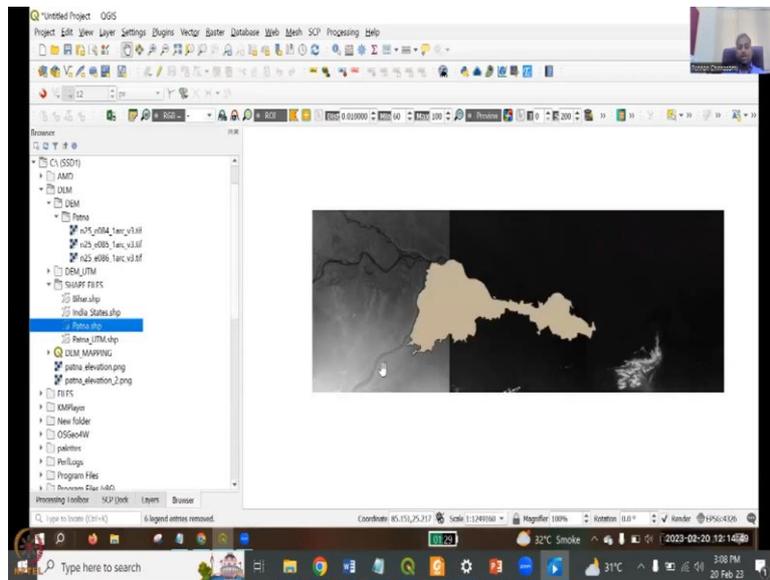
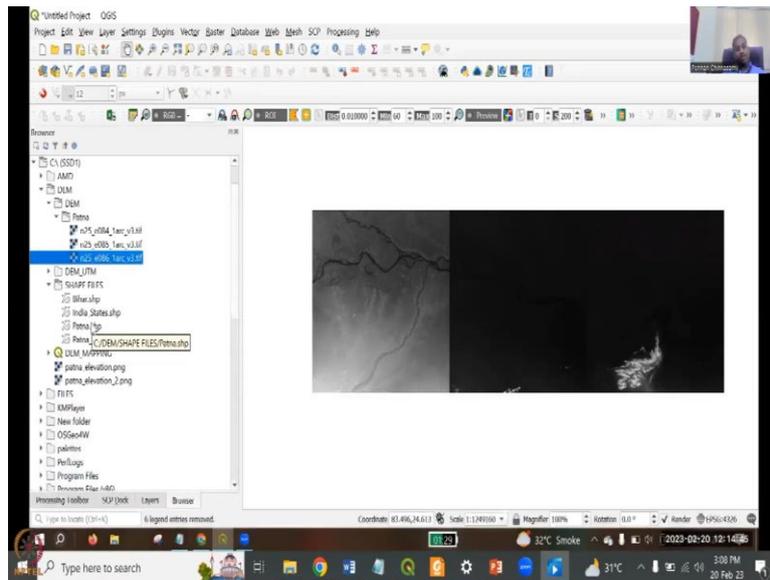
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And now, I am going to double click on all the three and then add it to my layers. So, in my layers, you could see all the three files. The coloring is different. So, the coloring is different. So, do not get shocked that why is one very bright, one is very dark. It is because the coloring extent is different. So, if you look at the extent here is 20 to 483, the band one, for the first style and the last style is 42 117.

So, within that the black and white has been applied. So, the minimum is 20 which is black in one tile whereas the minimum is 40 which is black in the other tile. So, we will have to normalize it but again normalizing is not needed for now, because we are anyway going to merge it and then normalize. Once you merge it it will get normalized by itself. So, let us do the merging part. So, you know that three tiles are required for Patna.

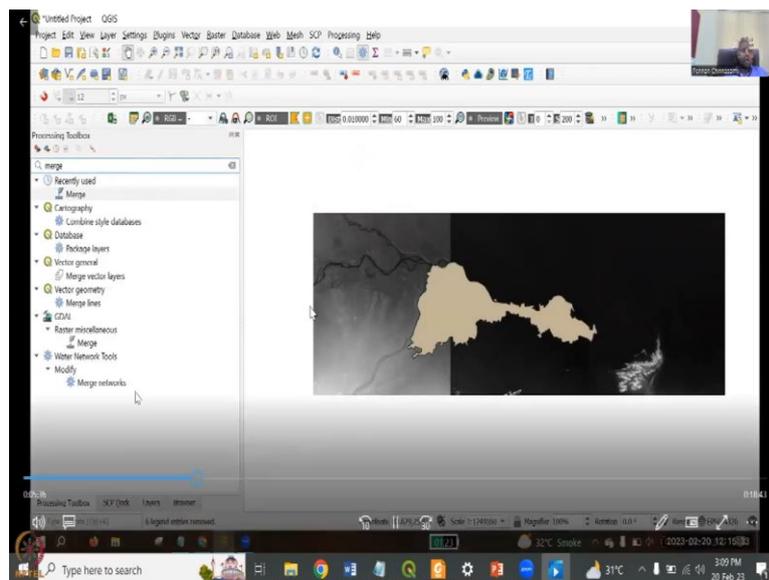
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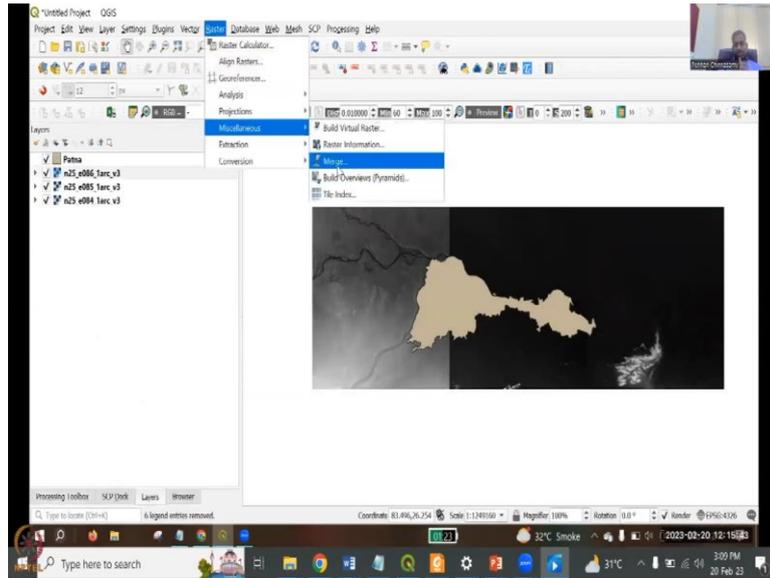


I already had the Patna shape file from the previous data that I have shared with you. For example, the audio, the Survey of India reports. Survey of India website we have taken this shape file where when I add it into it. So, I have added it to my portal QGIS layer page and you can see that three tiles are covering mostly the digital elevation. So, these three tiles have to be merged. How do you merge it?

Because the study area is across the three we need to merge it. And this was already explained in the raster tool sets, when we were discussing the raster tool sets which is on the top. So, we did look at miscellaneous tools and other tools. So, in the miscellaneous there is something called merge. As the image or icon says it is two tiles and then there is a glue which is merging it. So, that is what we are going to do in this exercise, we are going to merge.

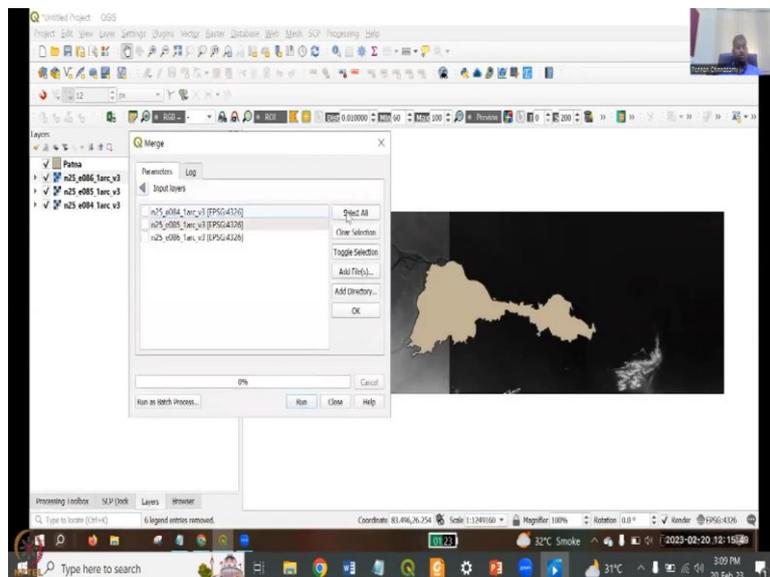
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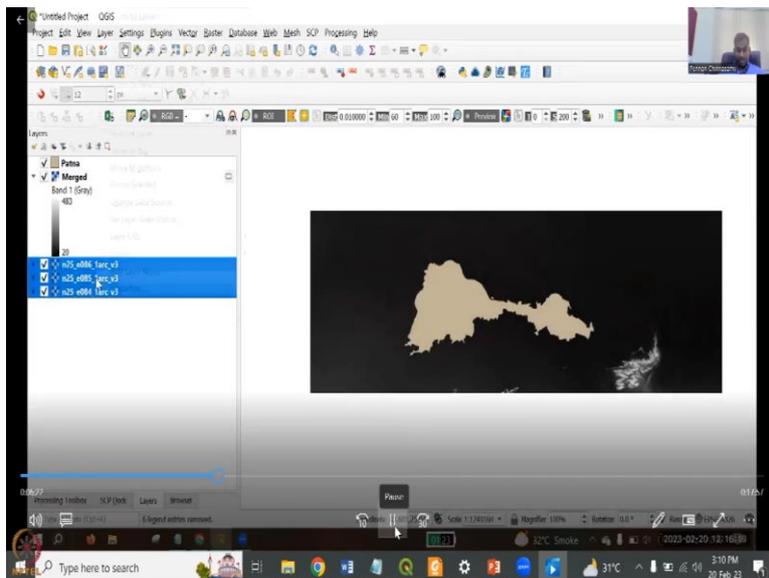
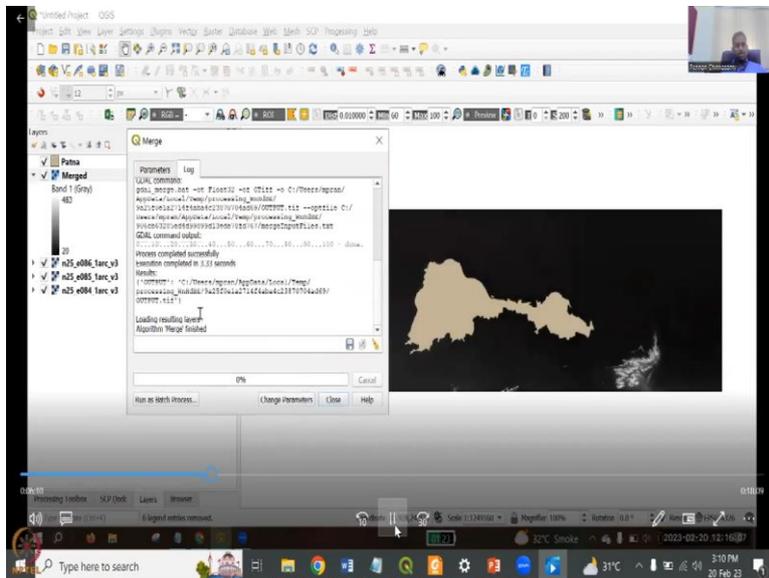
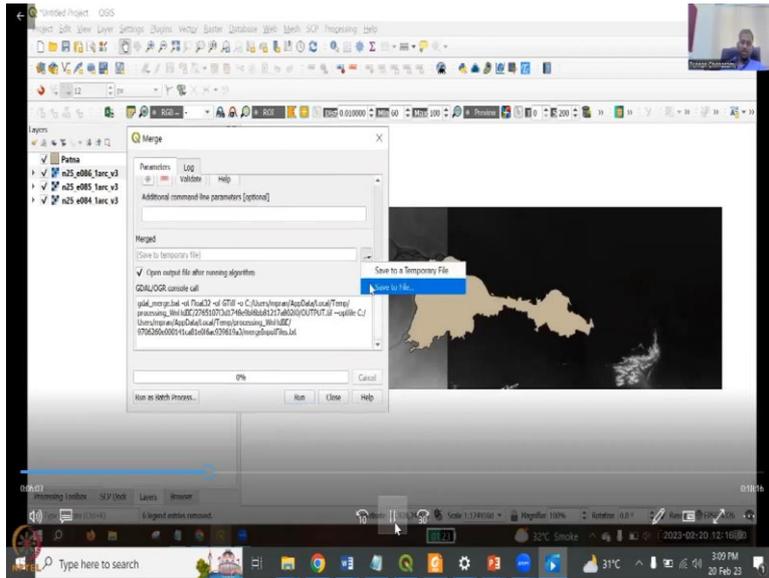


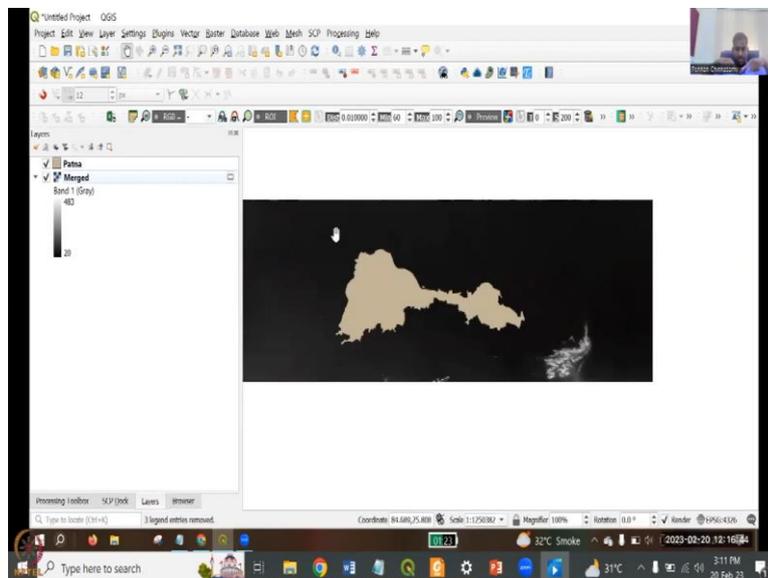
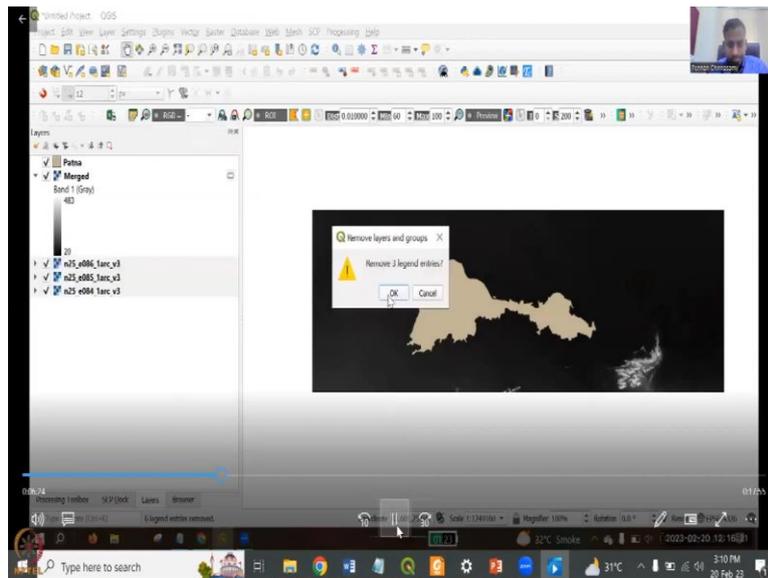


Or you can go to the processing toolbar and then type for merge and it is like a searching, you are searching for toolbox of merge. Plugins may also have merge but for now, we will just take the merge from the top toolbar, raster, miscellaneous and then go to merge.

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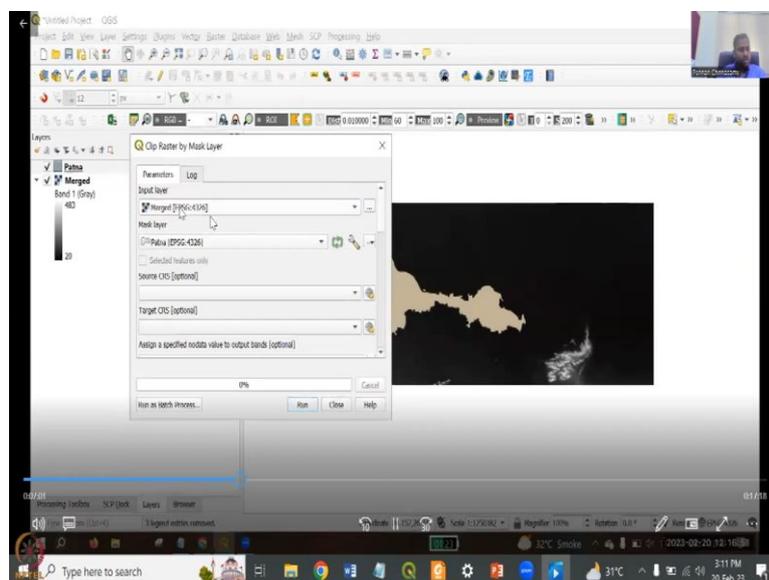
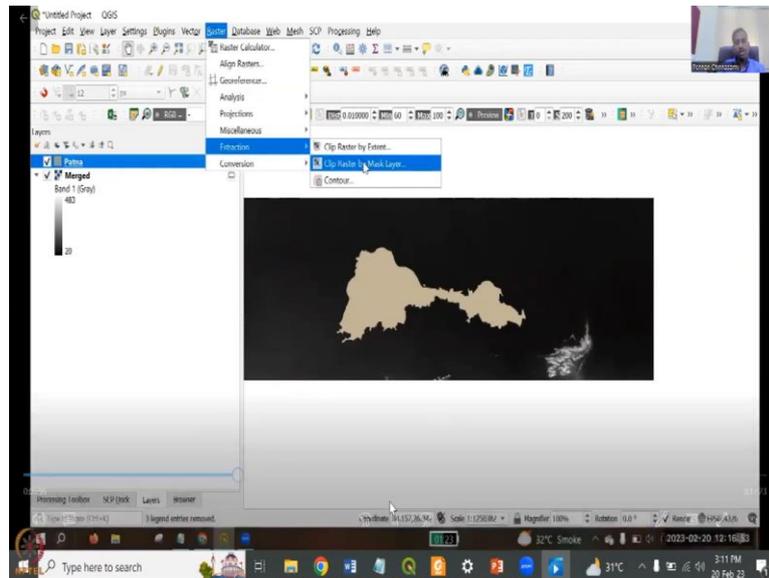


The input layers. See the input is a raster layer. So, in the merge, you are going to merge certain data sets. So, that becomes your input. So, we are inputting these all the three have been selected then we say okay. Do you want to say save it or open a temporary file. So, as I said normally temporary is okay and then I click it runs.

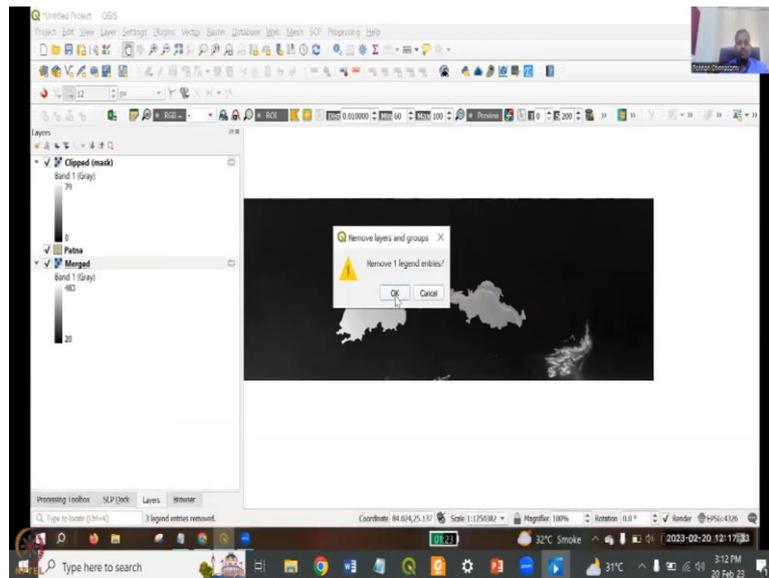
So, it runs the algorithm merge has finished, the merge file has come out. What you could see here is the coloring the now the coloring has been normalized. So, instead of 40 it has jumped to 20 which is the lowest of the three values and then 483 is the highest of the three values. What I have done is I have removed the other three tiles which is because they are not important now. It is already double populated.

So, let us remove it. Please, understand that the three have become one now. So, one tile is what we have, it is called merge. Again this is not saved. So, we have to save it. We will do the same later. Patna boundary we do not need for entire boundary, the raster we do not need for entire boundary.

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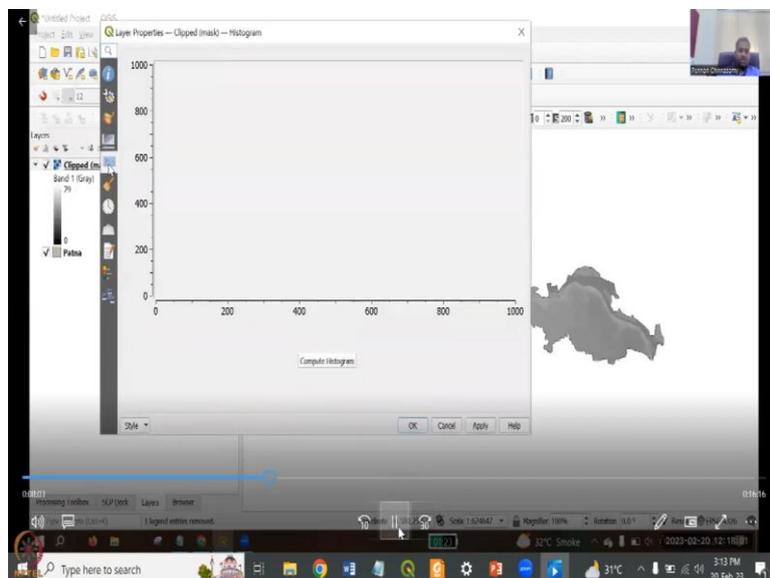
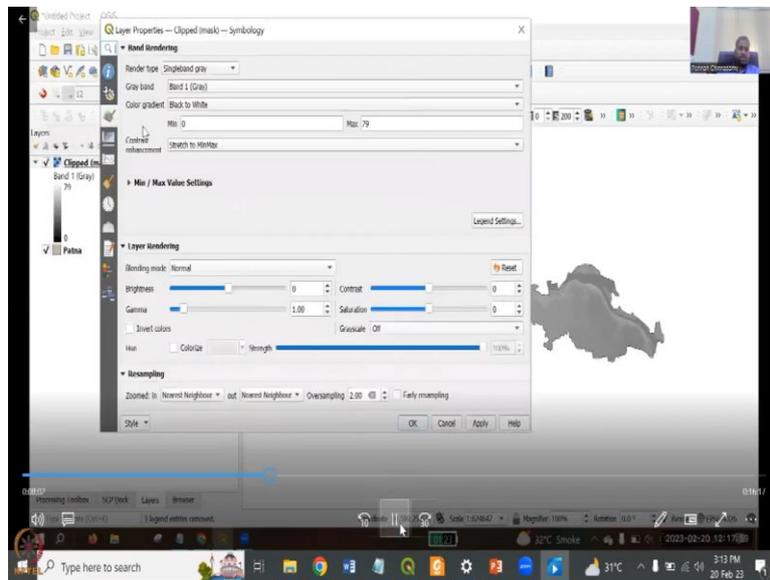
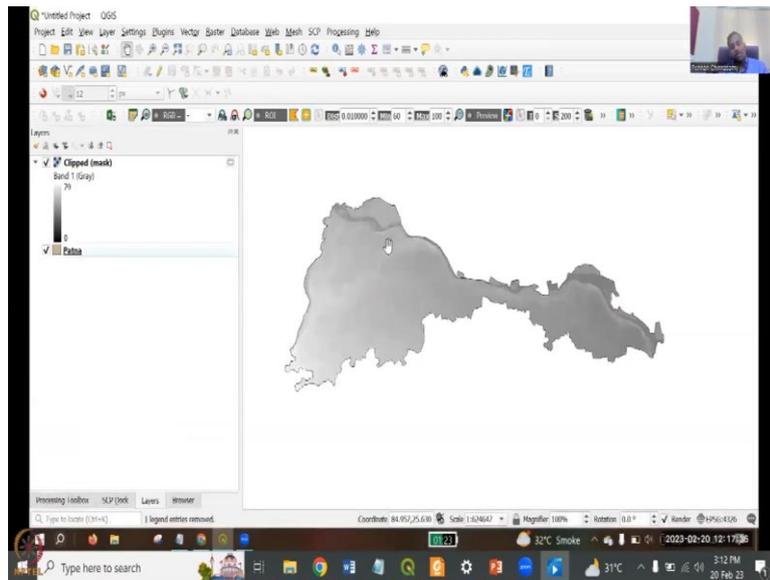


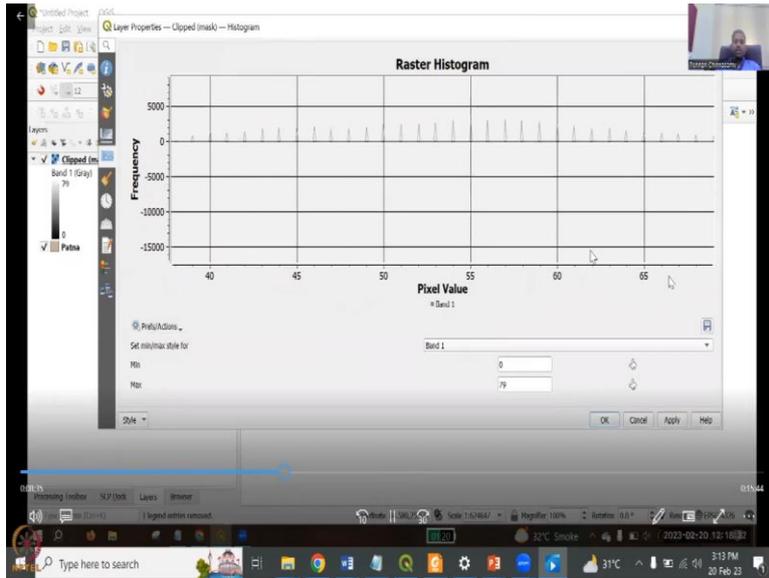
So, we are going to take only the DEM the digital elevation model output for the Patna region, for that we need to use the shapefile to cut as a mask. So, for clipping, we go to raster extraction which we already saw in the raster toolbox. So, go to raster toolbox, come to extraction and then click by mask layer.

The mask layer is the Patna layer. We are going to use a Patna as the mass layer. So, input layers is only one, the merge layer. Patna is mask layer, the other things you should be more default but create an alpha bound band can be kept and then match extent of the clipped raster to extent of the mask layer.

Last time also it was giving errors. So, we will remove it. You can clip the save file or run as a temporary. Now, it runs very quickly compared to proprietary softwares, the open software runs very quickly. It is already run and you have it. So, you have a merged, we have a merge and a clip raster, both are for the Patna region. But the merge has the entire band of tiles whereas clip will only be clipping the boundaries for Patna. So, let us look at the difference by removing the merge we do not need merge now. So, let us remove it.

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**Layer Properties — Clipped (mask) — Symbology**

Band Rendering

Render type: Singleband gray

Color ramp: Grayscale

Min / Max Value Settings

Min: 0  
Max: 79

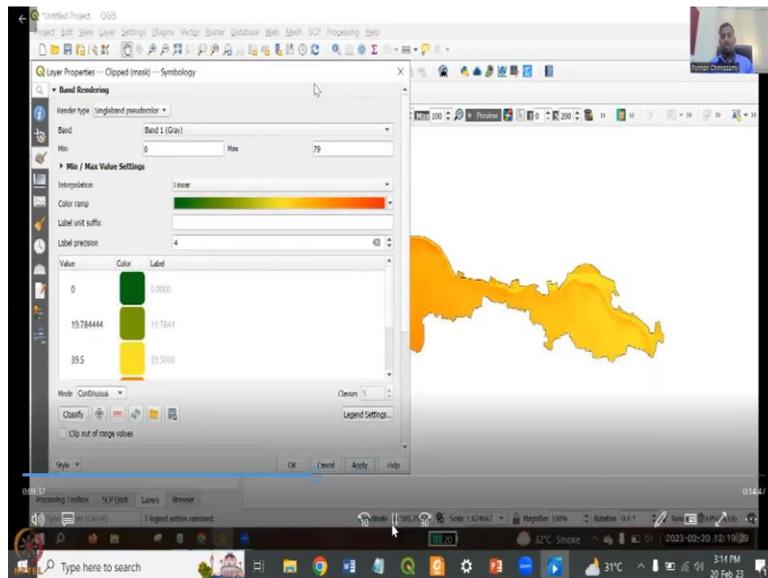
**Layer Properties — Clipped (mask) — Symbology**

Band Rendering

Render type: Singleband pseudocolor

Color ramp: Lancz

Value	Color	Label
0	Green	0.0000
19.784444	Light Green	19.7844
39.5	Yellow	39.5000



And now, you could see only the Patna, the merged raster file is now clipped for Patna and only the Patna region is there. And you can see the differences in elevations only, 0 to 79. The overall you had 483 which is very very high but now you have 79 as the highest. So, now, let us color it because we need different colors to look at the properties.

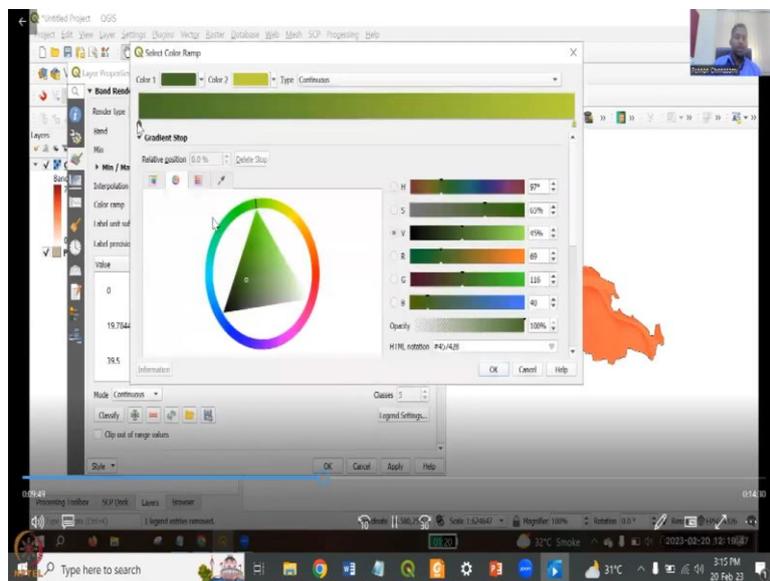
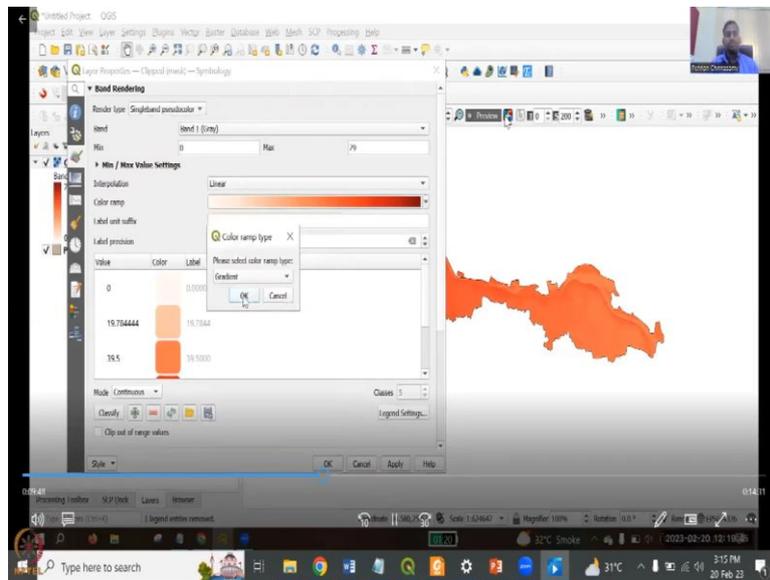
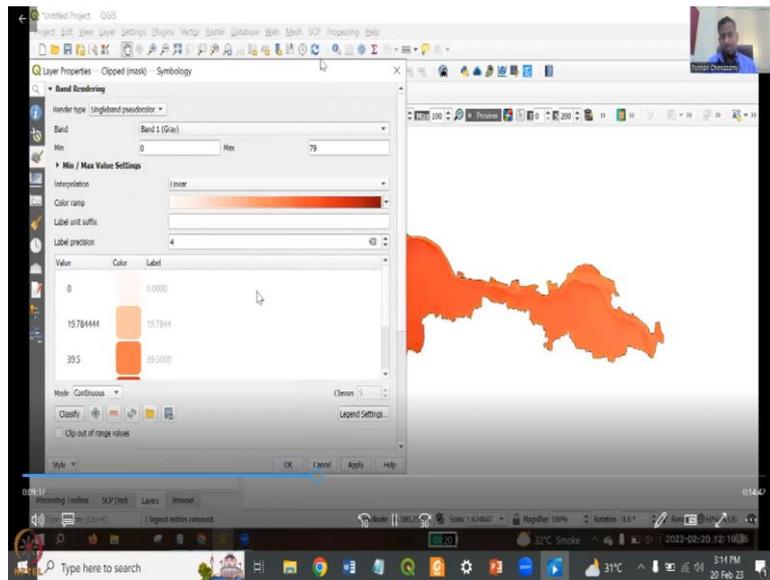
Go to properties and in the symbology you can look at the histogram, under the symbologies. If you click compute histogram you will get only one band value is there. So, in the preferences in action, go to show selected bands, the entire what the histogram will give you is the entire band and how the grayscale has been given.

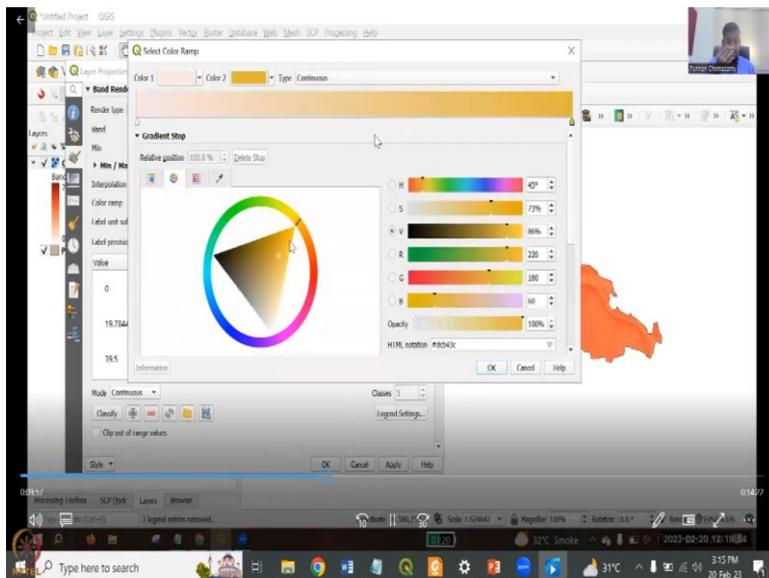
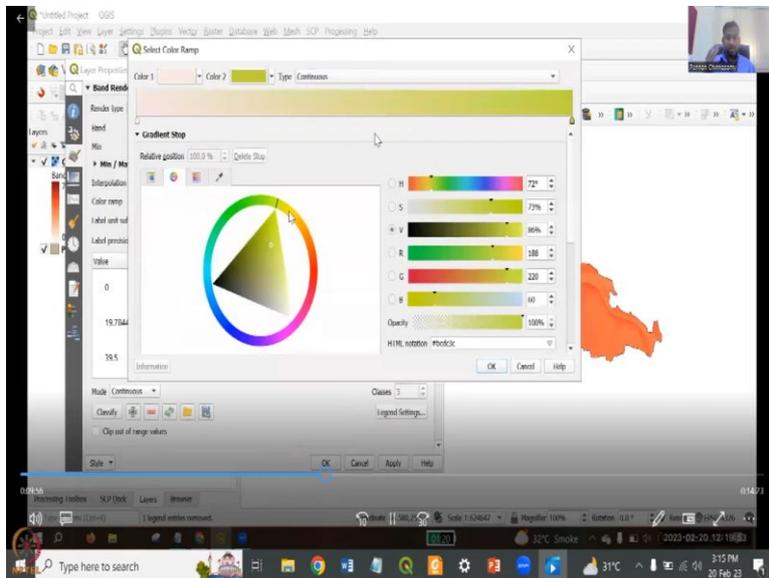
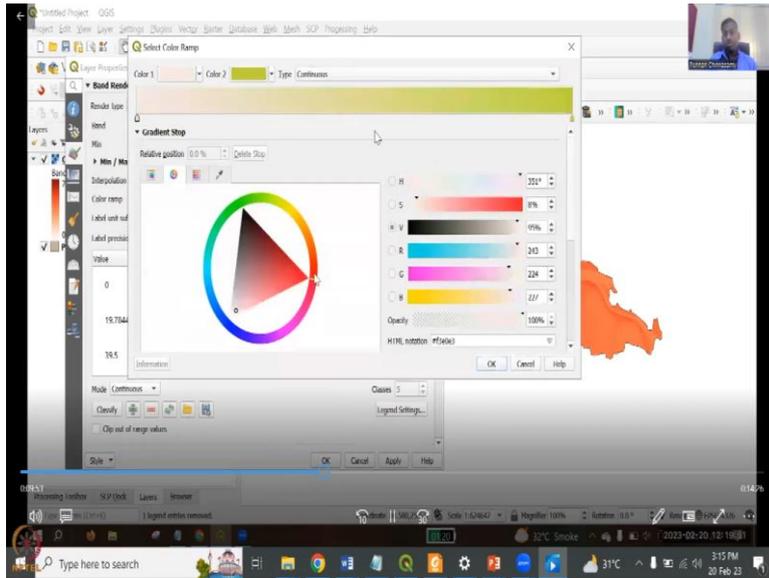
So, each pixel value and where the the colorings is there. A closely look at 40. So, the elevation is mostly at 40 to 70 but you can see only very very small. So, we are going to make it bigger and then show. Histograms needed to show the differences. So, you can know that it is from only from 40 to 70 and that is the range we are going to use in the criteria for range of values in the colorings.

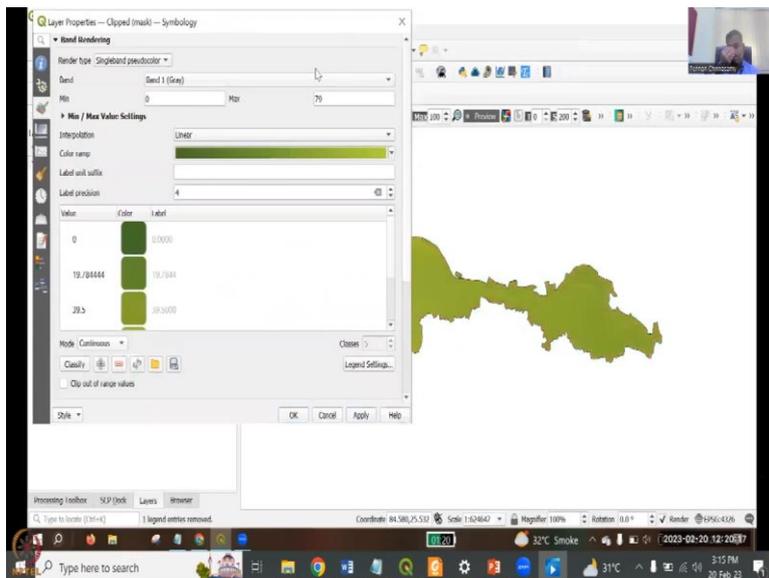
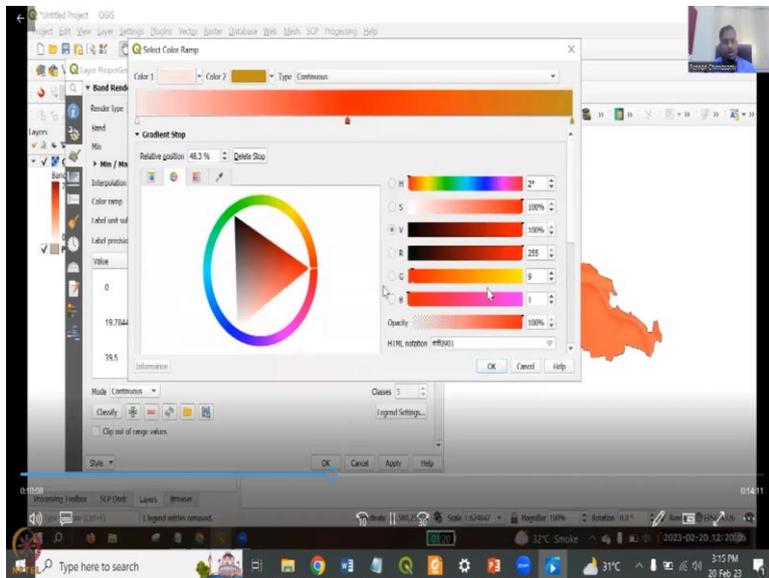
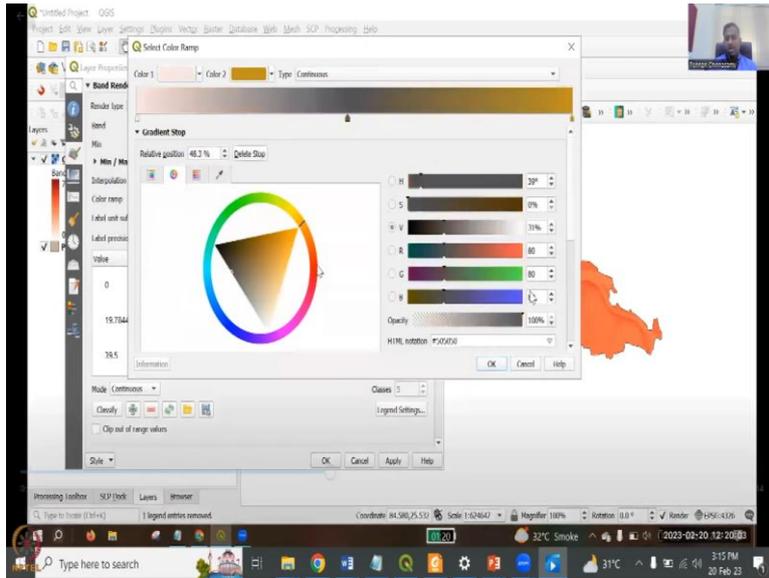
So, let us go back to the symbology and in symbology we need to do the coloring. So, we are going to color single band, zero color, not the single band gray color, only one band now zero color. The minimum and max value can be given. This is the minimum is the minimum elevation and max gives the maximum elevation.

The interpolation can be kept linear which is default. We can give a color range, but we need to do a color map and this color map is taken as your interest. For example, if you use a different color set, it will be brighter all depends on your report and reporting style.

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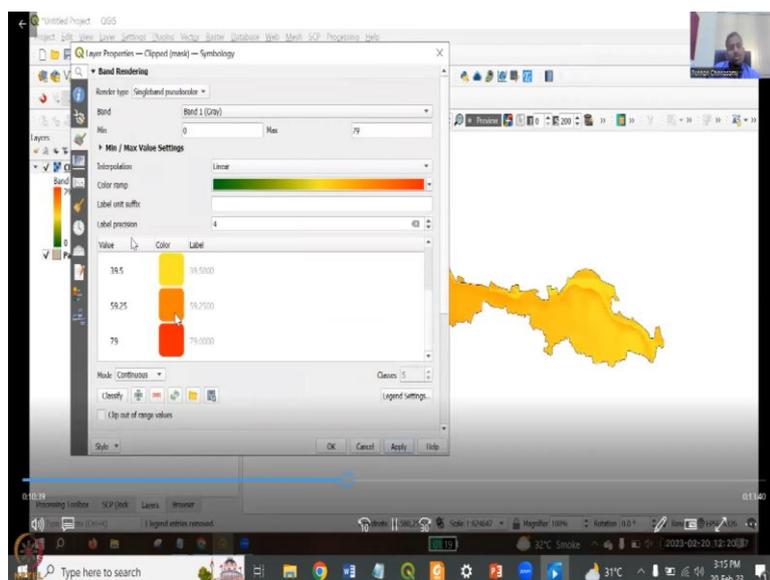
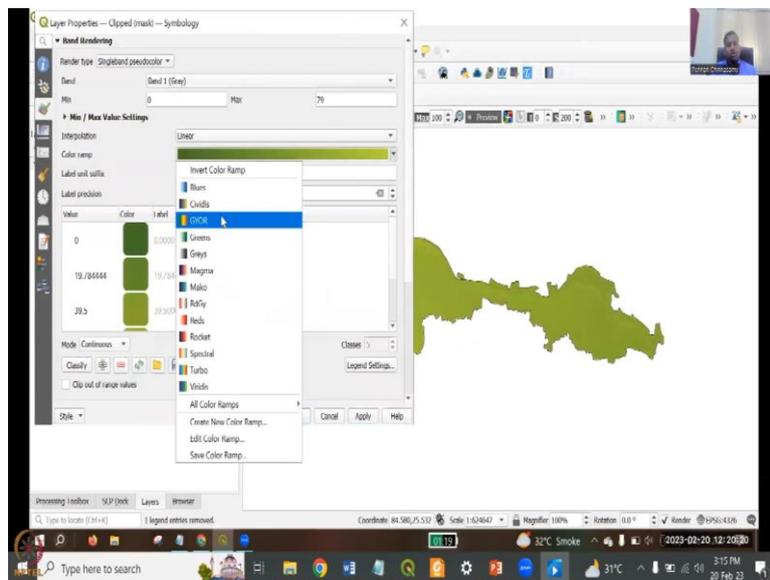


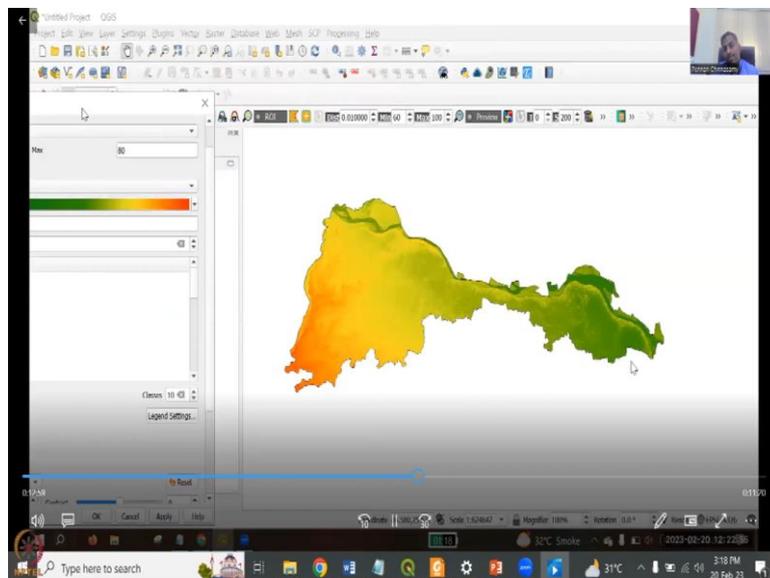
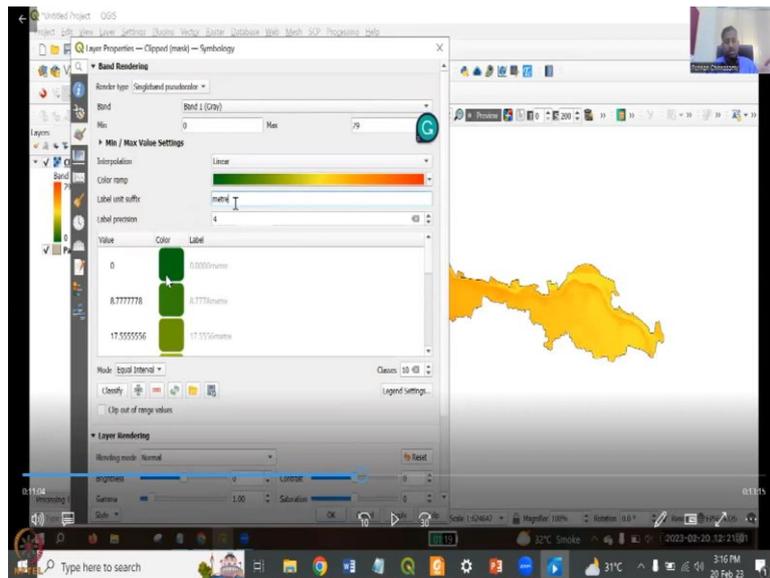




Let us style and change it from zero red to where 0 is white and 79 is red, it automatically changes. You can also create a new color ramp and then the gradient type you can say green and then you can change your own may basically make your own grading and color ramp. These are not as easy as done here in property software but you can see that we have we can change all these colors and then make a color ramp. We can have our own color ramp and maybe name it as your own color ramp but let us go back to the green color ramp which is the default, one of the defaults.

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G O Y O R. Yeah, which has been done green yellow and orange. But then some areas are not represented. Why? Because the values are by default taken out. So, the orange is taking as 59.25. So, let us adjust it. So, basically what QGIS does is it takes the entire bands and then it creates intervals and based on each interval a color is given.

So, we are going to change the intervals or add or minimize the intervals so that we have more colors. So, go to equal interval and five classes are there, five colors would be given. Now, we are going to increase it to 10. Once we go to 10. Let us we can give us labels, unit, suffix, which is different.

See you have a value on the left hand side and then you have a label on the right hand side. So, after the color. So, the value gives you the value of the color whereas label gives you how

you want it labeled in the legends and system. So, since we know that it is going to be an elevation, let us give meter. So, label unit suffix is meter and precision is number of decimals. We can remove it for time being because it becomes too lengthy and then labeled precision is number of decimal points, numbers after the decimal point. Let us keep it zero, so that we know that it is meter. So, let us do the meter and it is cleaner.

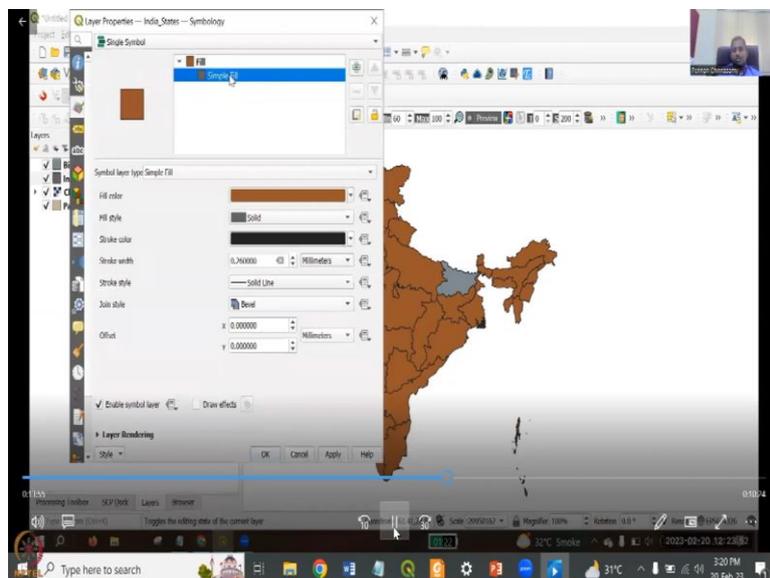
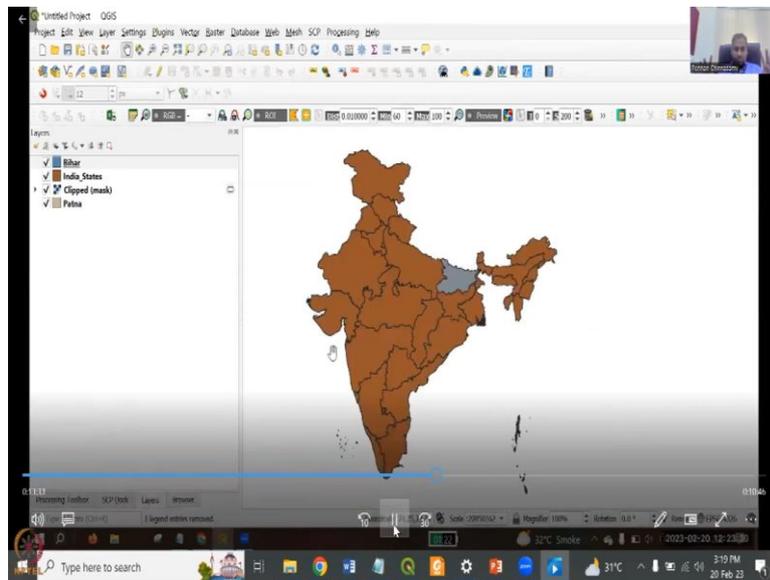
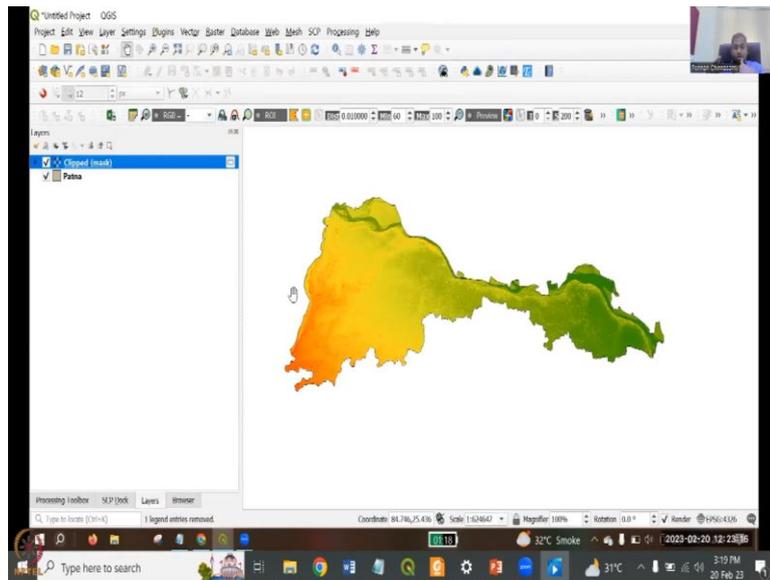
In legend settings you can say use continuous legend, you can uncheck it. Here we have a single color, correct. So, on the left hand side you see there is one single color and then it is one legend but if you unclick it then it breaks into different color packets and the labels are given differently. So, let us do that.

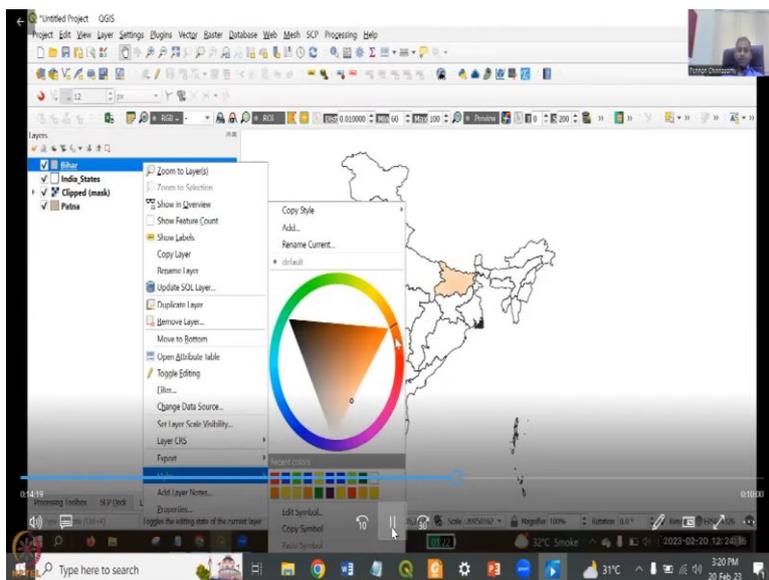
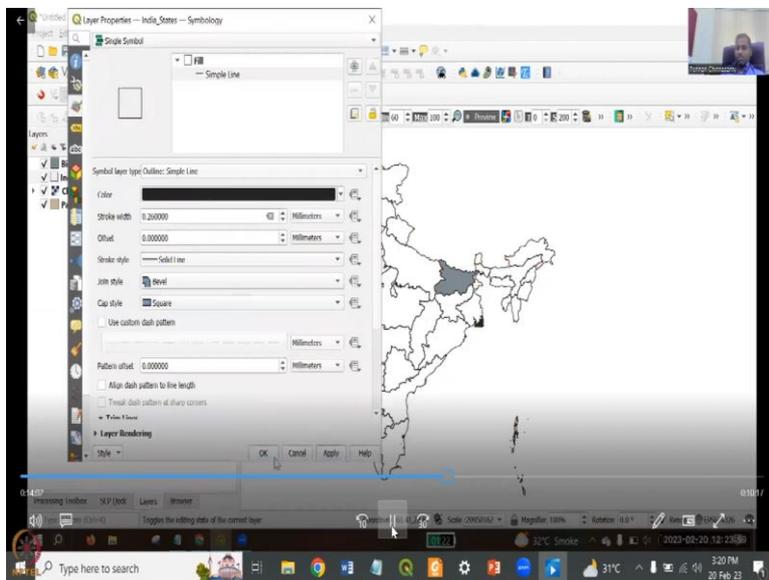
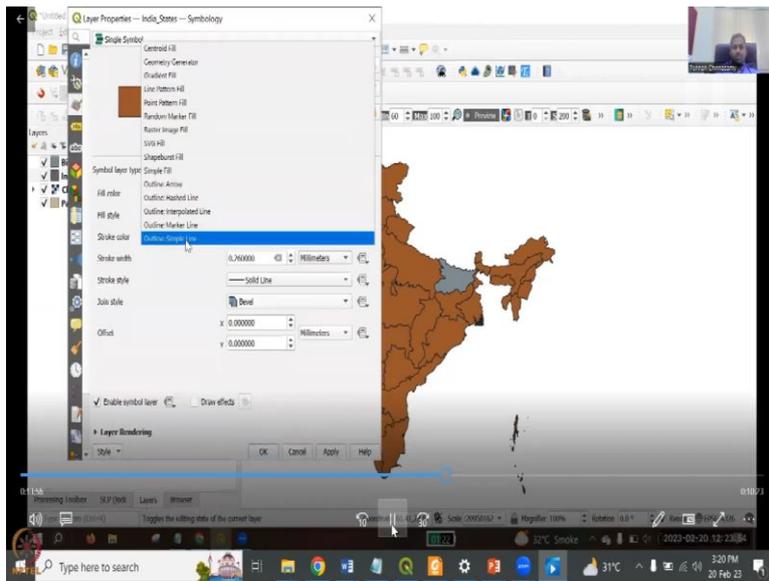
Now, we are done equal to 10 classes. We can also increase the class based on the number of colors which we will say on the histogram. We see that most of the elevation is 40. So, after 40 only you get the elevation pixel. This we saw it and the histogram. In the histogram when we looked at the frequency of the values we saw that 0 to 40 there are values but very very less but after 40 it picks up.

So, let us jumble everything from 0 to 40 as 1, so that it helps you in bringing the values. So, 0 and 55 and then each time we change these values, you could see that the labeling also changes. Because we are making it as a single number rather than having too much decimals. So, all the 10 values is the same but we do not take the values given by QGIS.

We are giving a value and as per QGIS will change the colorings of the elevation profile. Now, a more meaningful image will come up where higher elevations are in the red and then the lower elevations are in the green. So, 0 40 etcetera etcetera. Now, we say okay, it is done. So, let us see if they have the elevation map looks at.

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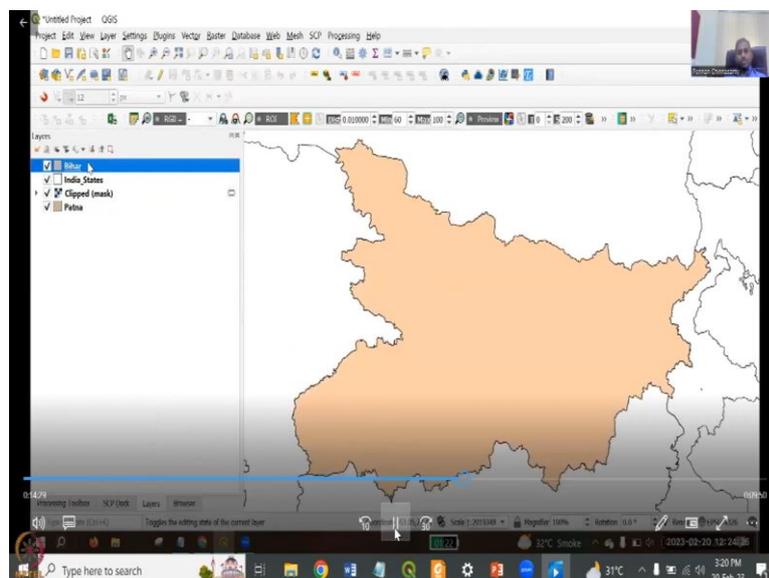


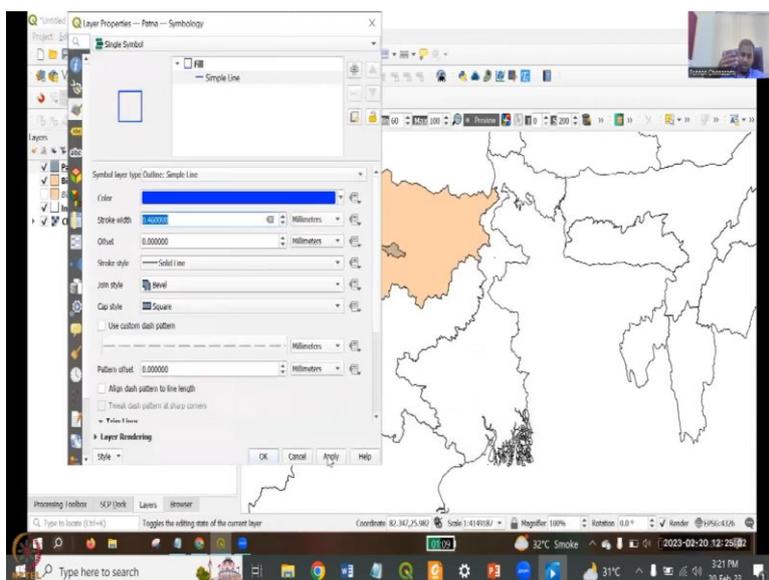
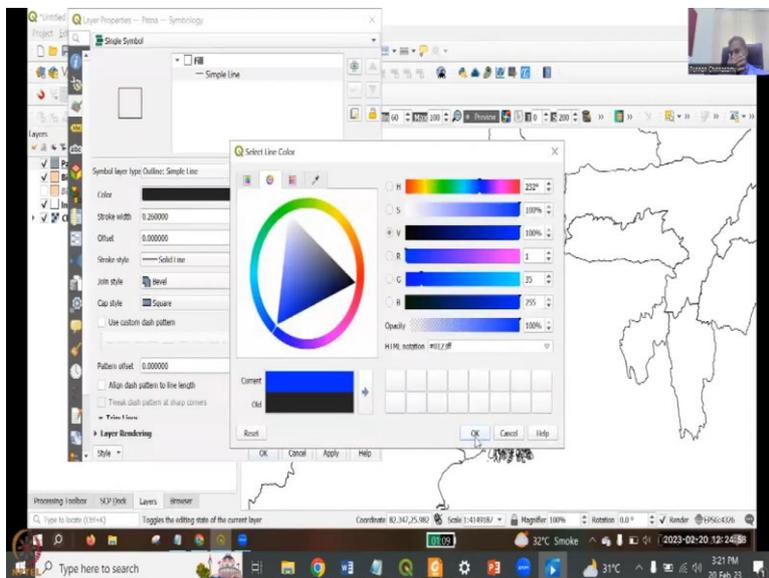
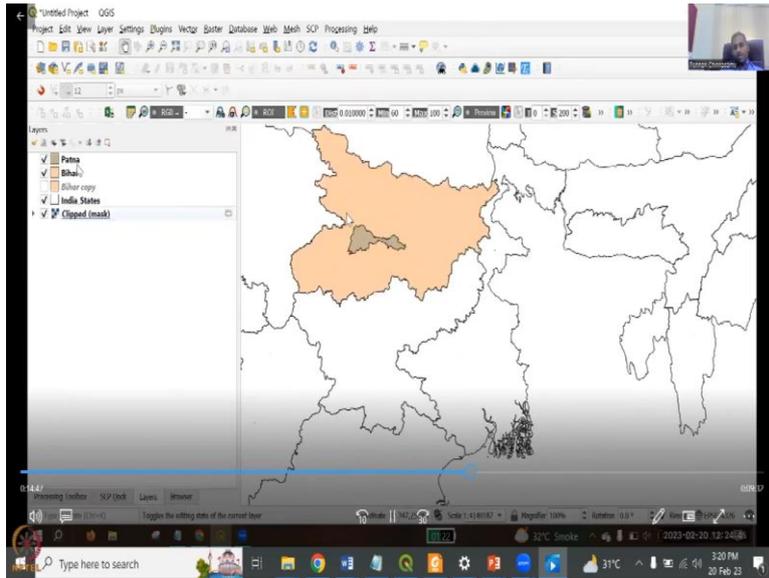
This is the Patna's elevation and is good for us over QGIS. But when you are writing a report, we need to import it into a boundary, so that we know that we show how, where the Patna district exists. So, for that we need to add the India boundary and the state boundary. So, I am going to add India, States and Bihar.

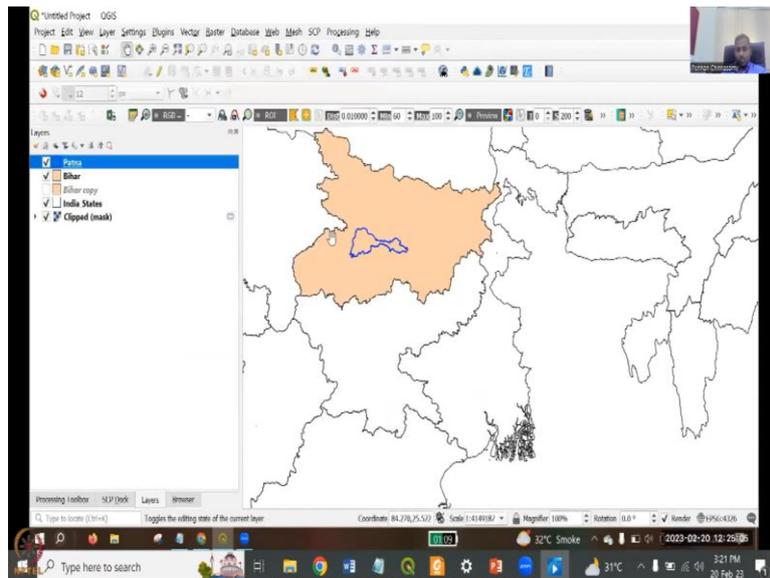
So, you could see the India full boundary and then we have Bihar. The Patna is invisible because it is at the last. If you pull the Patna on the top, it will come on the top. But again as I said we do not need the solid colors inside India. So, we will just change the properties, we will just change it as outline.

We have done this multiple times in this lectures now. So, go to simple fill and then in the simple fill, you can just simple outline and then you can change the thickness, you can keep the black color it is oaky. Now, you can see India the whole map and same thing we can do the Bihar. And then let us change the color. Let us adjust the color so that we have a different coloring scheme.

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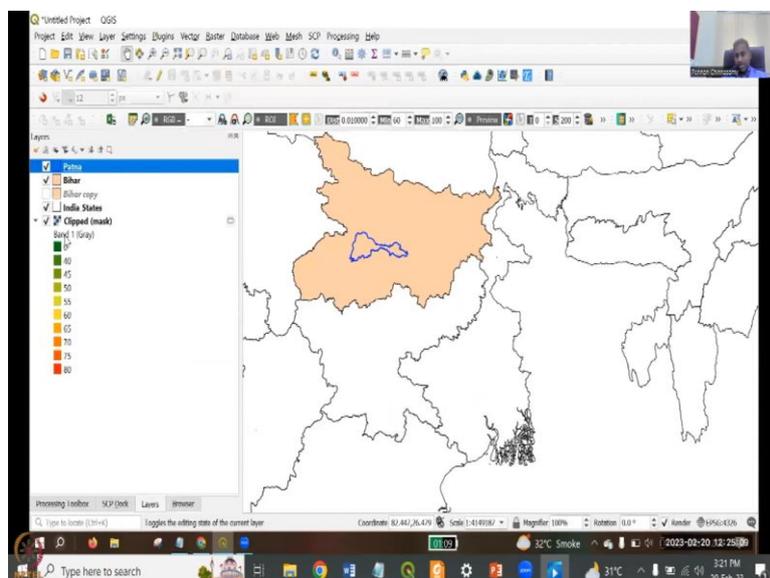


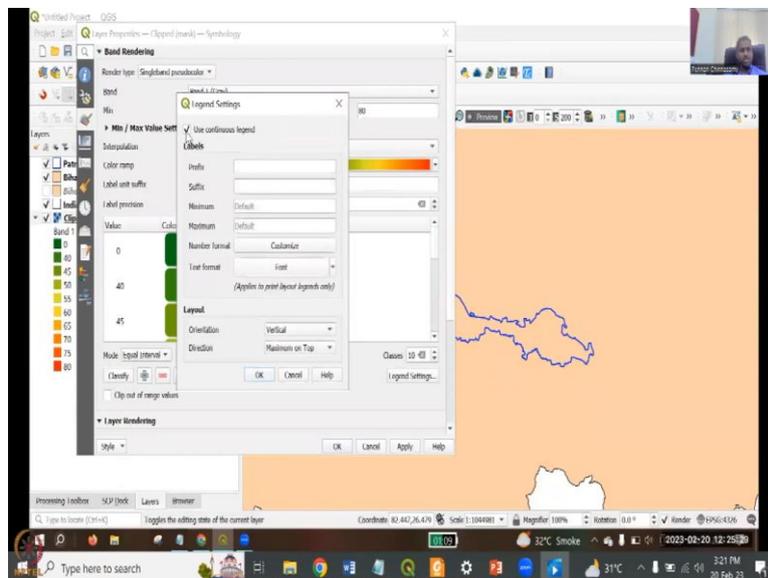
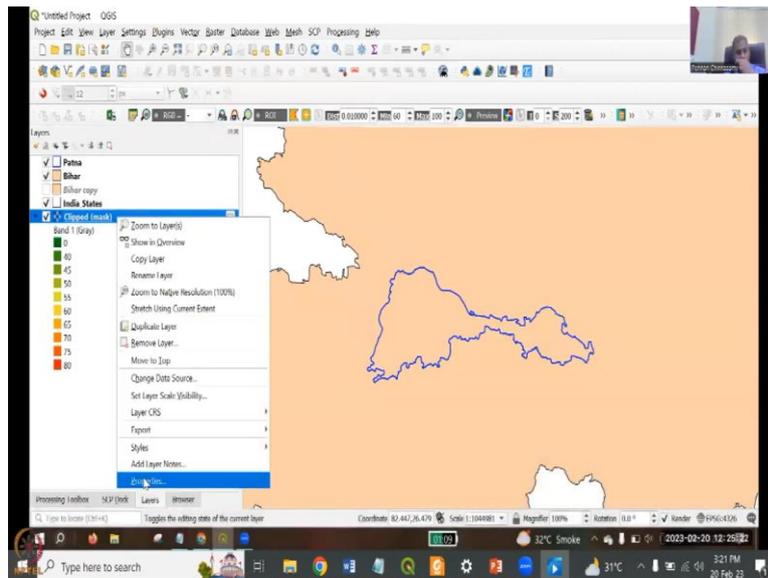




Now, let us zoom in and make it a duplicate layer. Why? Because we need two maps. We do not want to add some data that corrupts the Bihar value. So, let us do that again. Now, let us push Patna to the top and you could see how it has come up on the top. Then let us do the same process because we will save the line. So, let us do the same thing. Patna also we just need the outline, we do not need the full colors inside, the solid colors inside. So, Patna district is only going to be blue. So, this is different than the clipped mask.

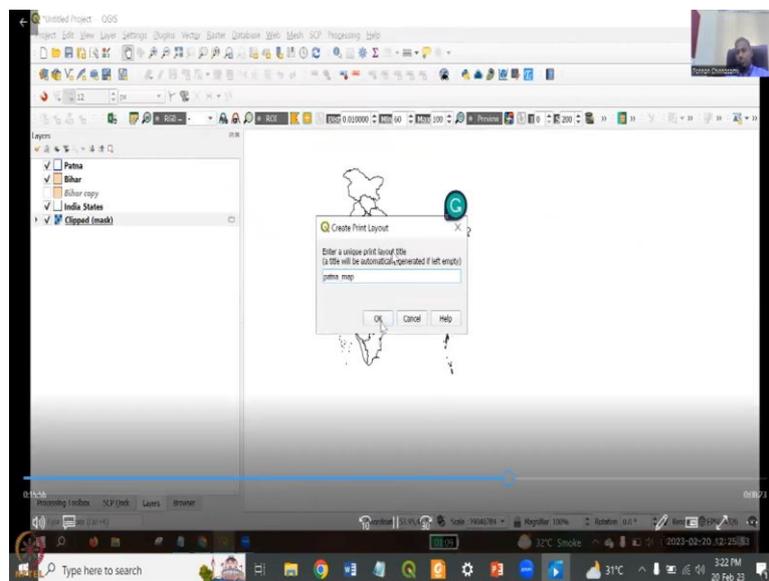
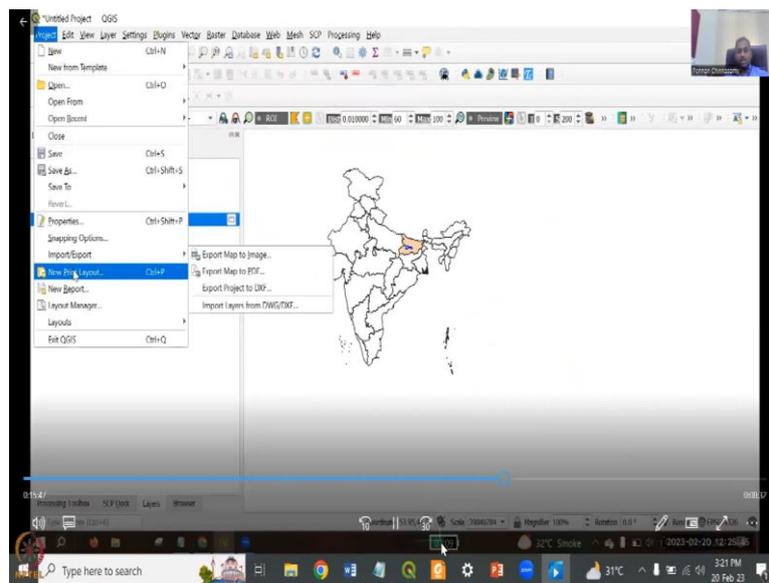
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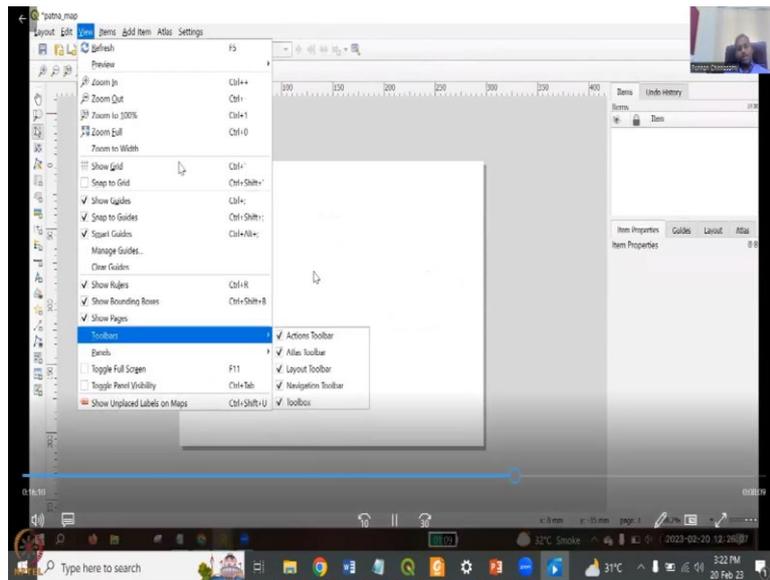
The clipped mask is there. But it is at the bottom. So, you will see it. So, let us look at the legends. You can see that is not a continuous legend but a class. We set 10 divisions and then 10 classes and then the numbers we gave is there. We can also change some things. If you want the continuous setting, you can just say use continuous, if you go to continuous. So, now you can see that it has changed. You can go back and forth on applying the legends differently or continuous.

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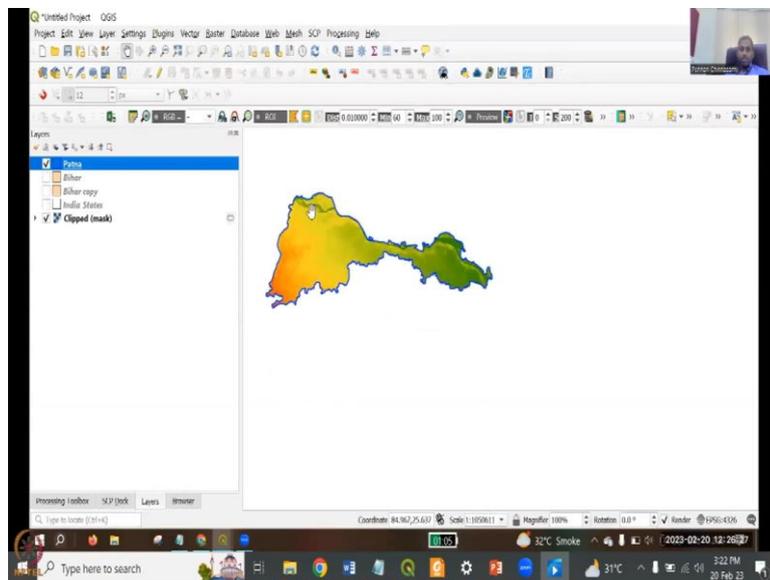
So, now, we have the two layers that are necessary for our map. We want to show India and then we want to show the location of Bihar in which Patna is there and then we are going to show Patna. So, these are three layers and top of which we will also add the DEM of Patna. Now, what we are going to do is we are going to open the map composer and say create new print layout and in the new print layout, we are going to create a map.

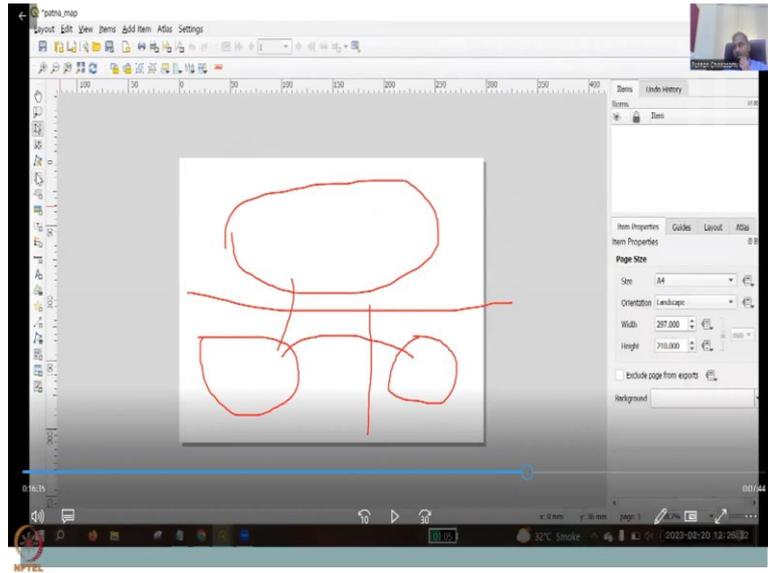
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There are a lot of toolbars on the top. The view bar will give you the toolbars that are necessary but before we do that we need to adjust the visibility of the map. See it is in the corner and it is not in the center.

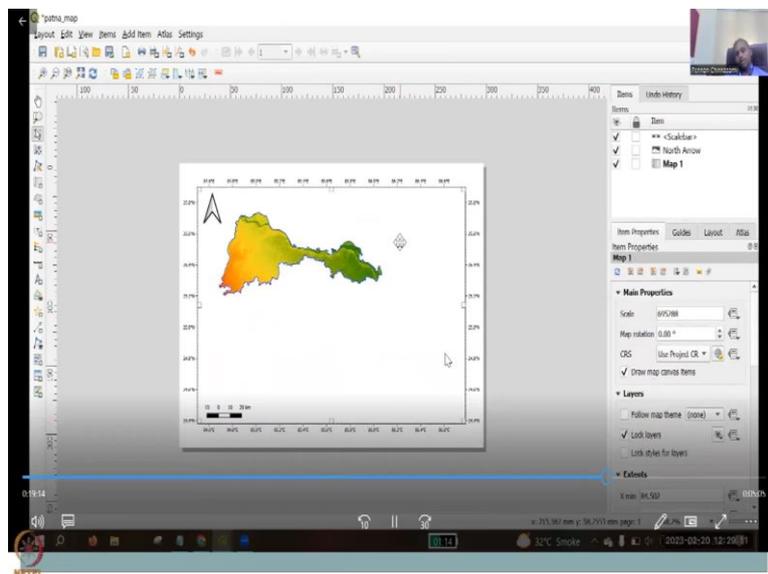
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So, let us do the base map first. For the base map Patna is important. So, this is the in a major map. So, how do you visualize this part is we are going to let me draw a small thing on top of it so that we could see where we want. So, we can divide this map into a couple of smaller maps. One is where the entire study area comes up and then you have the location of the study area in India and within India where which state it is. So, this helps you in actually making your presentation good because it helps you in showcasing a map in the whole thing.

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So, now, when you draw the map, rendering. Again those who need to know basics of this please look at QGIS tutorials on how to make a map. I have given you the link and lot of online tutorials are there. What we are going to do is you are going to add this map and then

move the content from the left hand side. The first button is to create the composer. Once you create a composer, whatever is there in the QGIS comes in.

Now, you can move, you can click the map thing and move. Now, we are moving. So, add size, resizer. We can also move the entire screen also. When you move the entire screen, the location of Patna also changes. As I said, we also need a grid because we want to give the lat long.

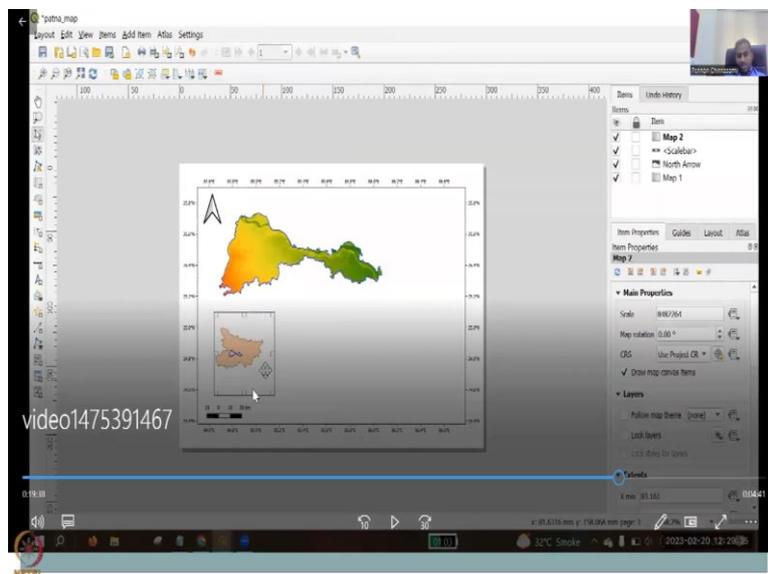
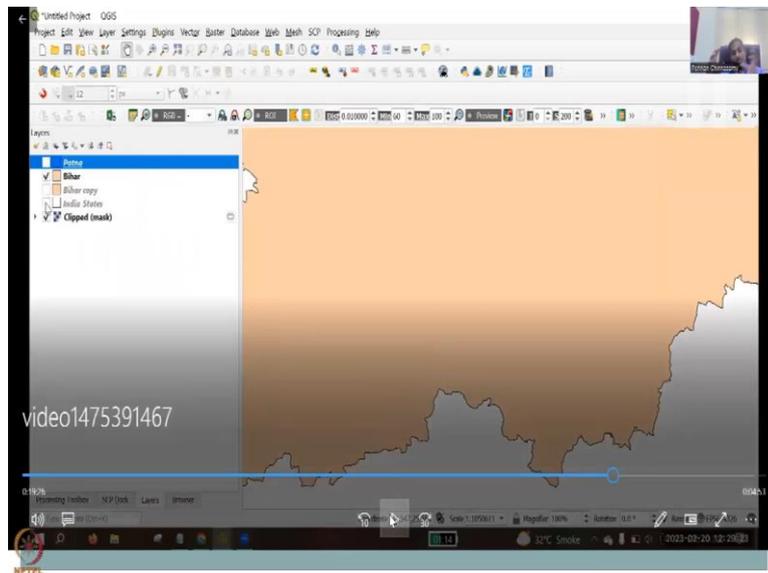
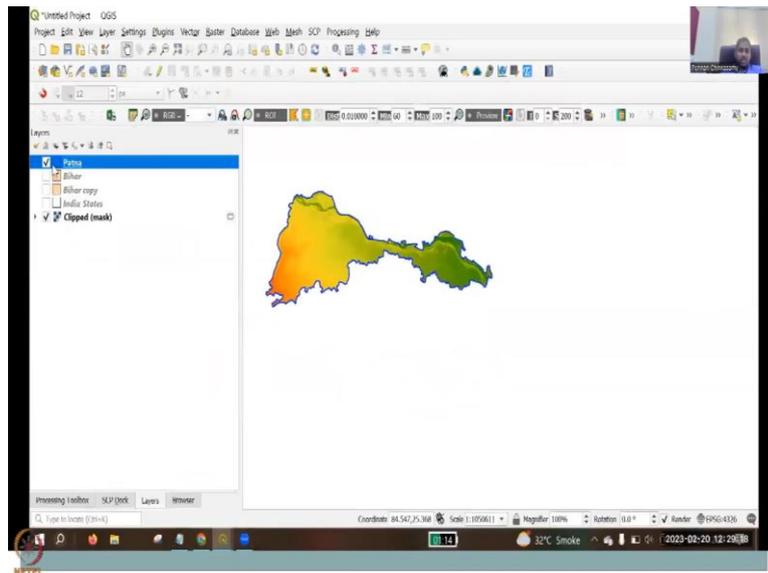
So, that let us go to the right side and then go to options, go to grid, plus grid. What type of grid you want solid, cross, markers etcetera. So, let us customize the appearance of the grid and then go as frames and annotations only. I just want the frames and the frame type is exterior.

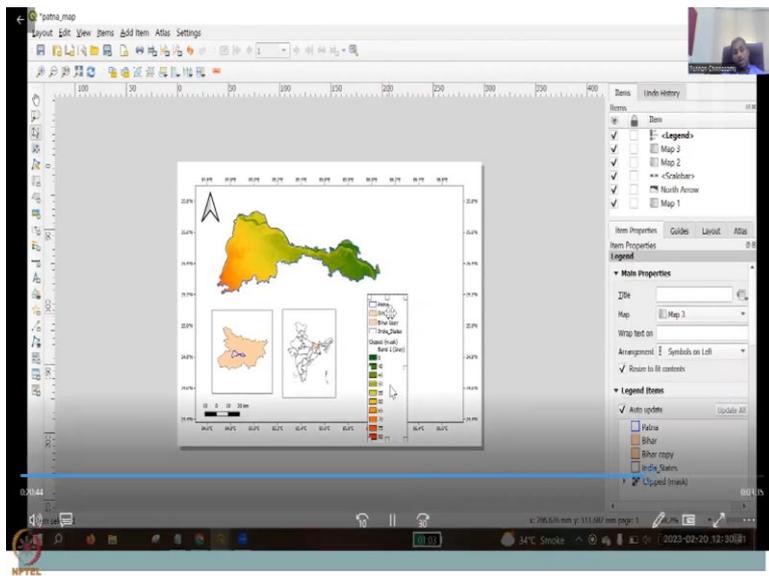
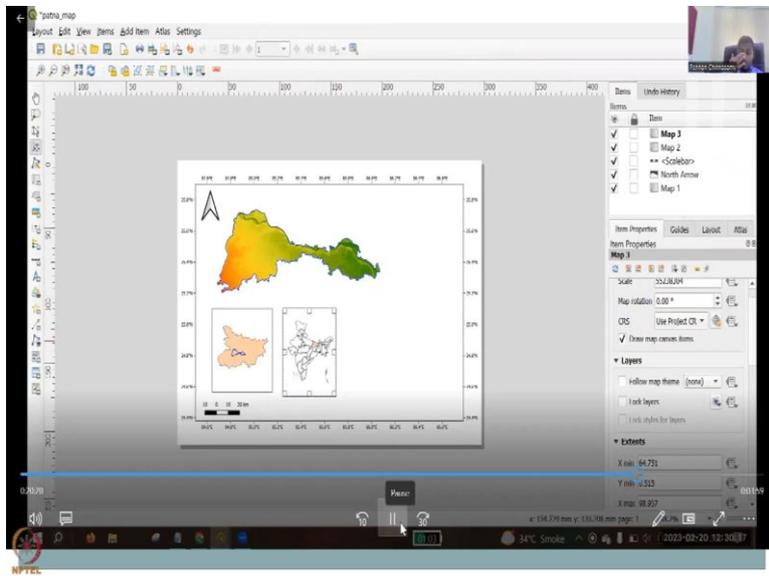
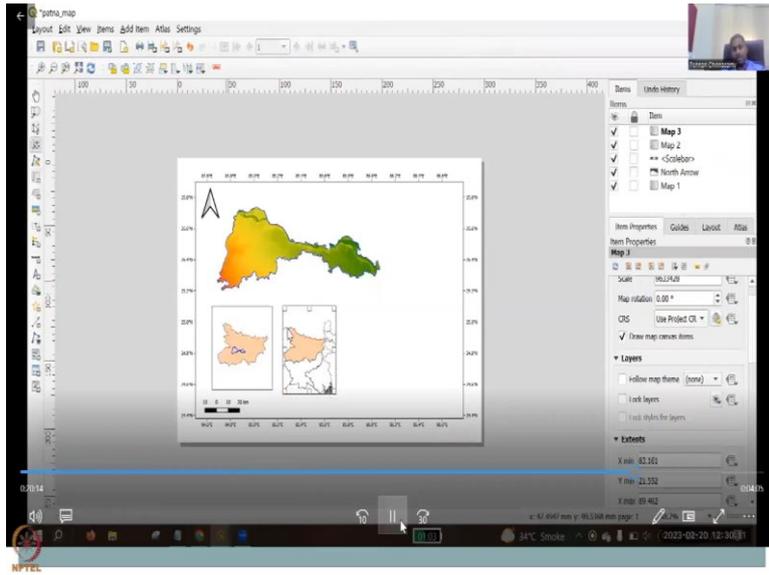
The tick marks will come outside not inside. And then we will also click the dropout, decimals, etcetera. The visibility we have given the X and Y values. So, the X and Y is the interval between the grids. So, let us give point to point based on the map that we have. So, now, that the grids have come up. There is no solid lines but only on the exterior as we wanted.

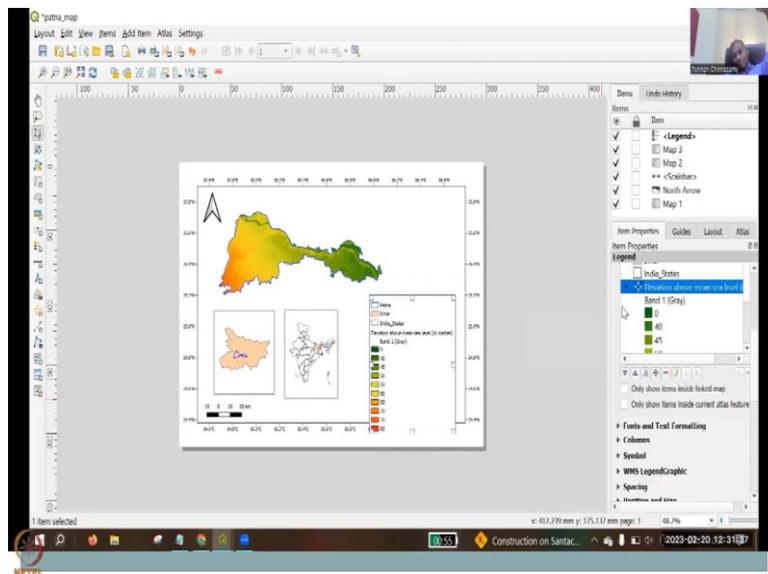
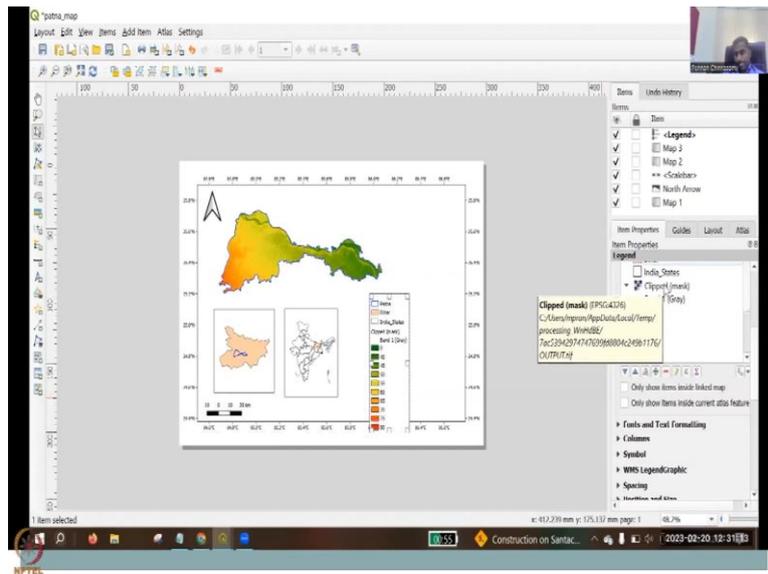
If you want smaller smaller, you can do 0.1, you can make it smaller and more intervals but let us say 0.2. And then the decimals you do not need so many. So, you can make it small we can say one decimal is enough so that that is not getting to overcrowded. There are some certain things that things that are setting for the map, the first is the map data but then a North arrow to show the direction, a legend and a title. So, let us add all this. All these are in the left hand side.

So, I am putting a North arrow. So, North arrow comes up. And we have a direction which says where the map is pointing. Then the scale, the scale, the length, how the map scales of the real world. So, we are going to add the scale from the left. We add it here and then you can change the scale, size, numbers or units can be changed. Once you click it on this side there is item properties. So, the base map has been created and then you can lock all these there so that it does not change when you add other layers. So, we have locked the layers.

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Now, we go back to QGIS main window. So, in QGIS the main window is different, the map composer is different. Once you open the map composer, which is on the top, you will see that you are getting different location where you put the map. So, now, we are going to do the Patna. Patna and where Bihar is.

So, now, go to the base layer again and then inside the base layer, you can add another map. So, now, we have gone to QGIS and removed the Patna which means make it invincible and then only keep Patna and Bihar together. So, the boundaries are together. Now, when we draw this composer. It will only show what is there in the QGIS currently. Now, we can change the size, make it center, etcetera, etcetera. Let us do the same frame, go to a frame is given.

And then if you want you can lock layers so that it does not change. Now, go to GIS. So, now, we are going to show the location of Bihar in the planet or at least in India where it is. So, because once in India we know where it is, we will just keep Patna, the boundary, go on out and then you add only the India boundary plus Bihar boundary. So, now, what you could see is because the QGIS we had a smaller vision, we only looked at Bihar part, you will only see Bihar part in the map composer.

So, you have to zoom out. So, you can zoom in, zoom out using your mouse and then the move the tool. The move tool we have used. And then we have done the three maps. So, these are the three maps that are needed and we are going to lock all the maps. So, now, we have all the data. Is it enough?

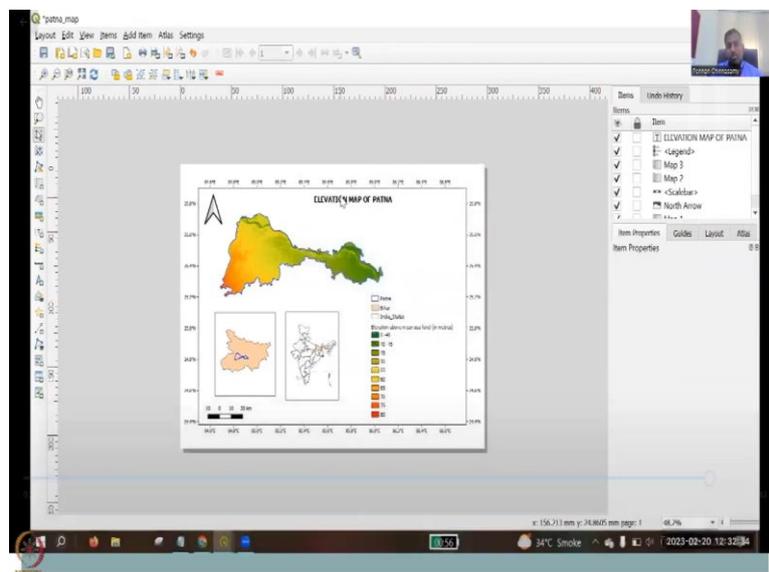
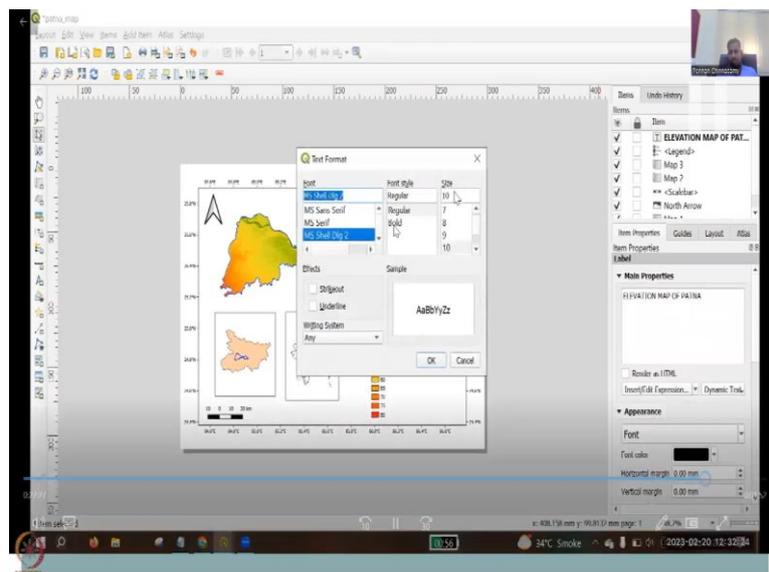
No, we need to have the legend, we need to show the people what is the coloring means. So, I am just going to draw the legends. Once you add the legends, all the shape files, all the data that has been clicked, will come. And then we can see Patna Bihar we have copy in India. So, but we do not need Patna two times and then we can go to auto update in the legend. So, here we are at what we already have, we can remove the Bihar copy.

We have Patna, India States and then the other things. Here is where you can also edit the names, if you want the spellings which are not editable in QGIS you can do it here. The clip map is not a right name. So, let us type it and rename it. Double click and then change it. We are going to say elevation and then above mean sea level. So, normally elevation is considered above mean sea level.

Mean sea level is zero and then from there how how tall it is. So, now, the unit has also given us in meters. We do not need band 1 gray because that is not needed. Now, we will remove it. So, now, it is more clean. You can see 0 to 80 the 10 classes. You can also change the label of the values. But please, understand that here it does not change the coloring. So, if you say 0 is not 0 is 100, it will still show 100 as a label but we are not going to have it across the system.

What happens is this is a labeling thing. So, you have a data but you can label it different. For example, you can take a bottle of sugar and then if you label it salt it is going to be read as salt but the inside is sugar. So, only if you go back to QGIS and change the labeling, there the map part then it will change. This is a map composer, it is purely visual. So, we can repeat the whole process 0 to 40, 40 to 45 to go through this.

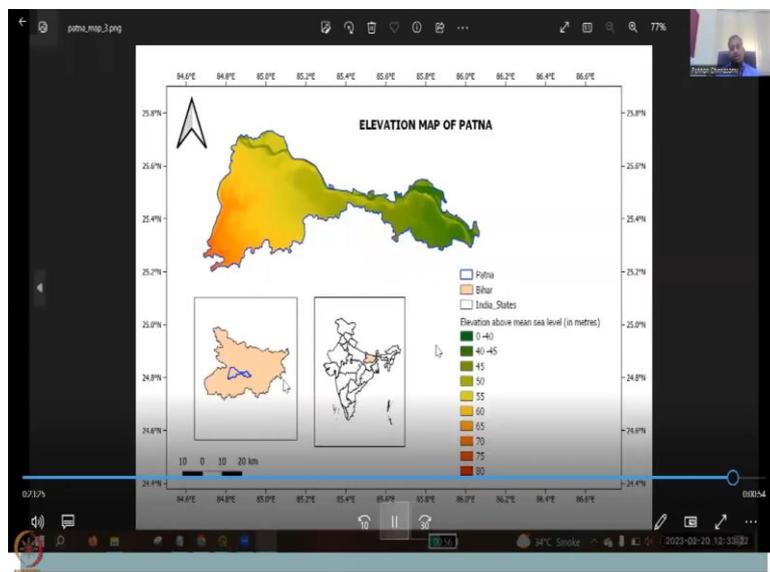
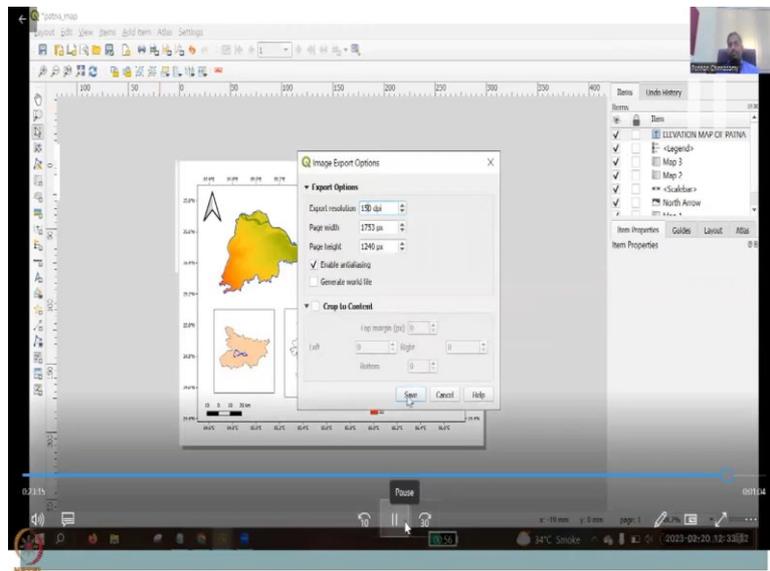
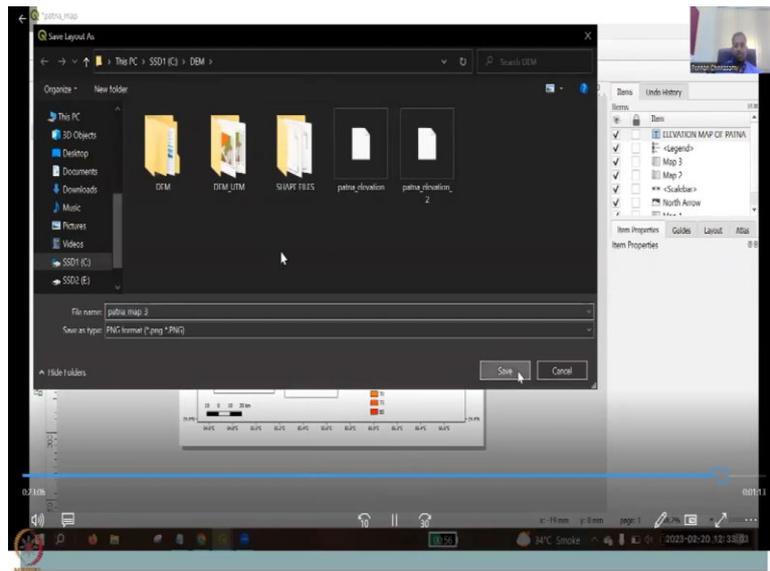
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One more thing is a title. If you want to send this someone just add a title. So, you have to add a text box you can add the text box and then put elevation map of Patna. And then you can also increase the font size, font style, bold, all these things you can do it on the right hand side. So, there is a lot of tools given to you to make it more pretty and readable.

You can also move the location, click it and then once the plus sign comes you can move it. Once you want to change the font etcetera, you click on it, the icons will be select item properties then you can do it. So, now, we have done the process. We do not want to label everything but we will run the process. Let us export.

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So, export as image shall be clicked. I am going to click it as a png format Patna map three and then what type of resolution. So, if you are looking at putting it into a larger report you have to have high resolution. So, you can go to highest resolution. But if you are just sharing between friends and partners, you can give a lower resolution.

So, we are giving a DPI which is pixels and then once it saves, it goes to a particular location that we are given. Let us open it and it has come out. It is loaded properly and now, you can see the entire map of India and Patna and Bihar. So, you can save this map if you want or you could take all these data into one part and then save this project.

So, here it is we have finished taking a data set from Earth Explorer, merging the data set into one data set in QGIS and then using a map composer to make the elevation boundaries and maps. So, with this I would request you to try it at your own pace. The good thing about NPTEL is it gives you as a tutorial in a video format. So, you can convert it and use it whenever you would like to use it and slowly slowly, step by step you can go. There are multiple multiple tutorials on this DEM approach. We have done it just to showcase you how this works. I will see you in the next class. Thank you.