Remote Sensing and GIS for Rural Development
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Centre for Technology Alternatives for Rural Areas
Indian Institute of Technology, Bombay
Week - 06
Lecture - 03
Digitization of scanned maps into raster data

Hello everyone. Welcome to the NPTEL course on Remote Sensing and GIS for Rural Development. This is week 6, lecture 3. In this week we have been looking at different coordinate systems, projections, and looking at how to collect data from other sources. The projections and coordinate system is also important while downloading vectors and raster data, especially from drone and satellites. However, there are already many maps that can be scanned and used for GIS purpose. The focus is also more on the rural development aspects.

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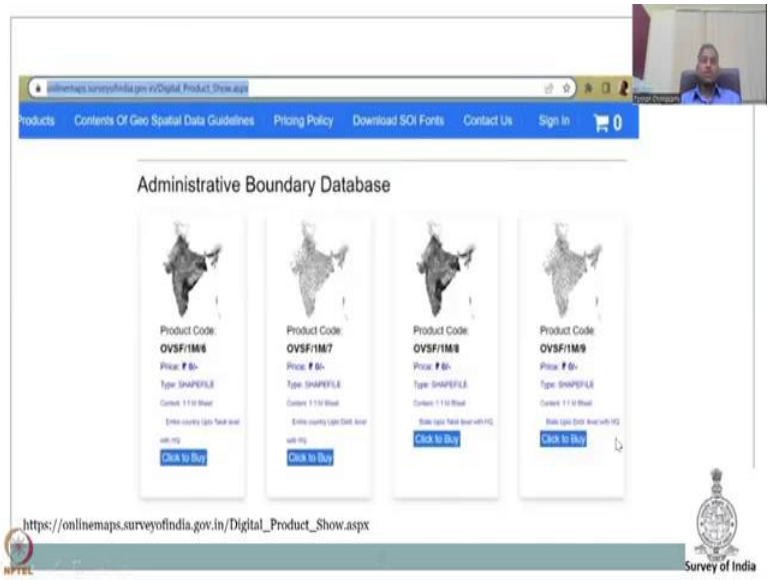

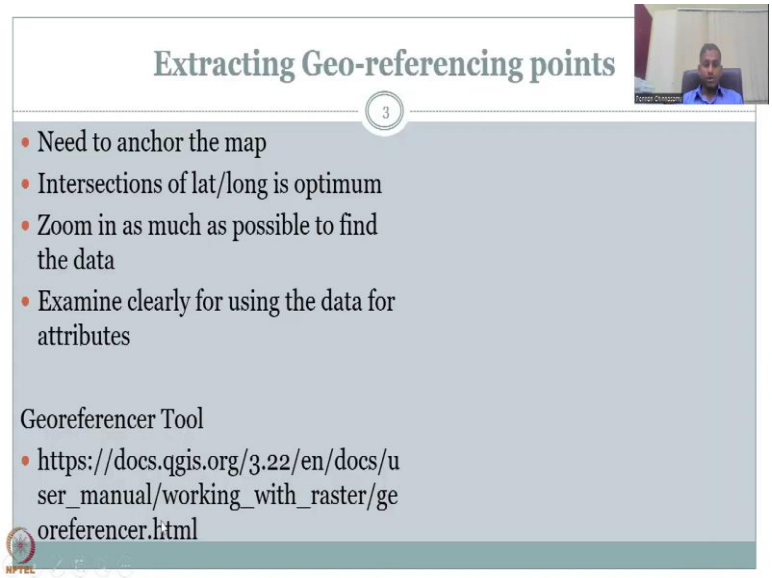

In the last class we looked this database for buying or accessing data. So, let us once again revisit this website and download and show an optimum dataset that we can use.

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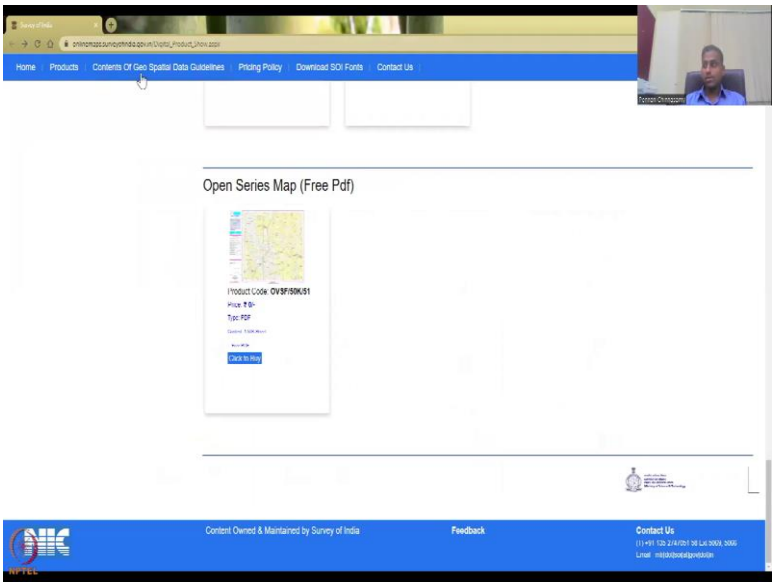

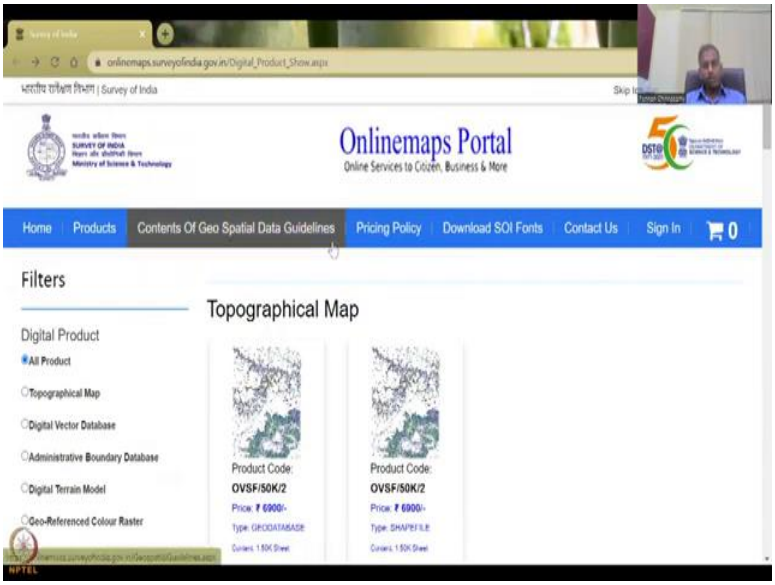
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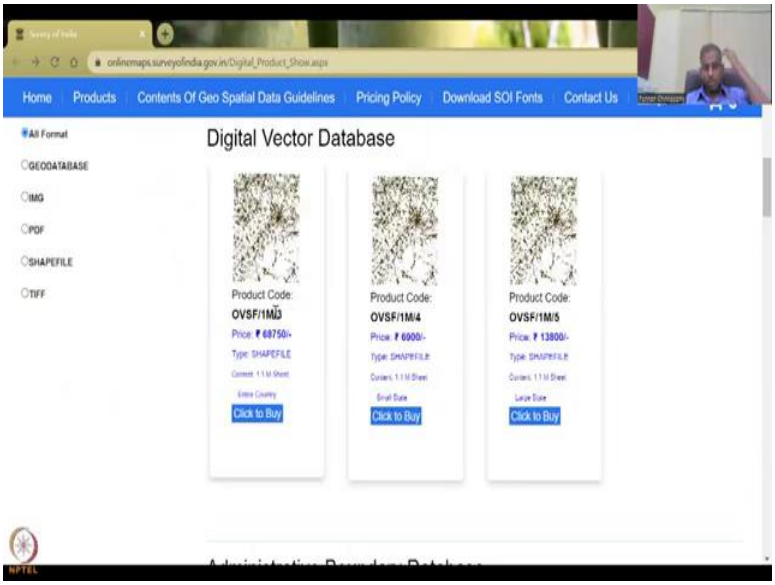
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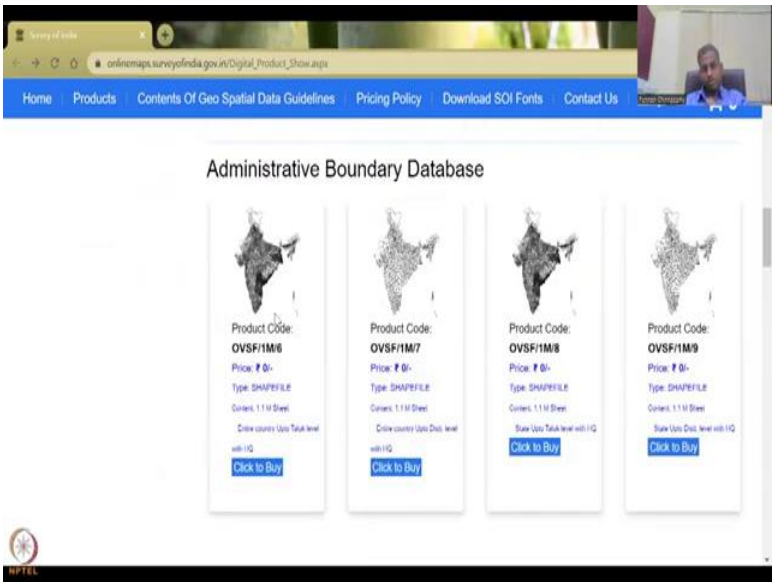
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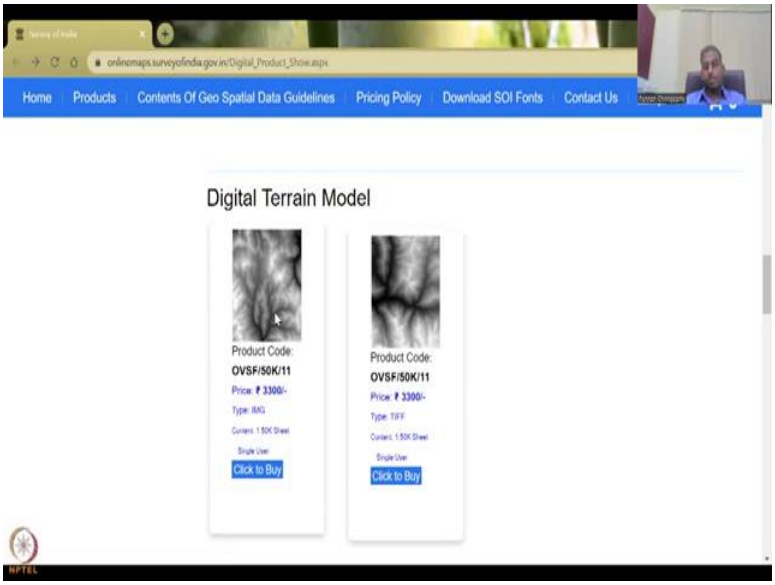
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Price: ₹ 3300/-
Type: IMG
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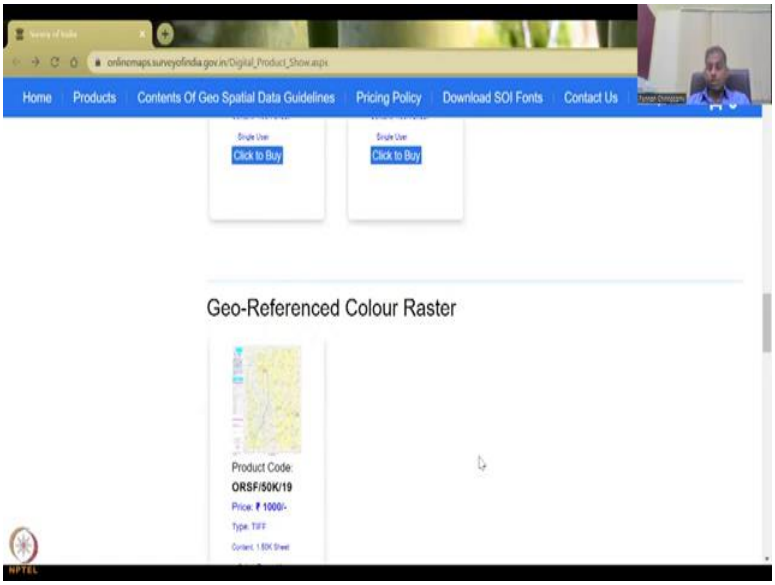
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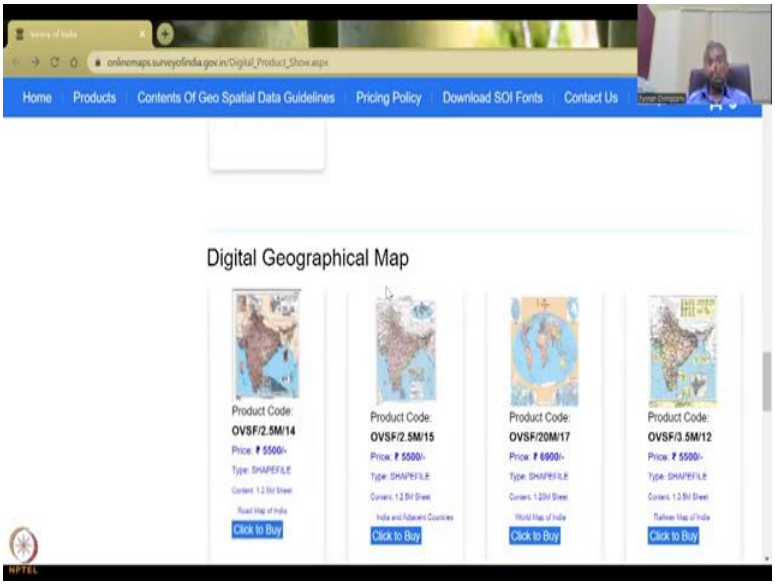
Type: TIFF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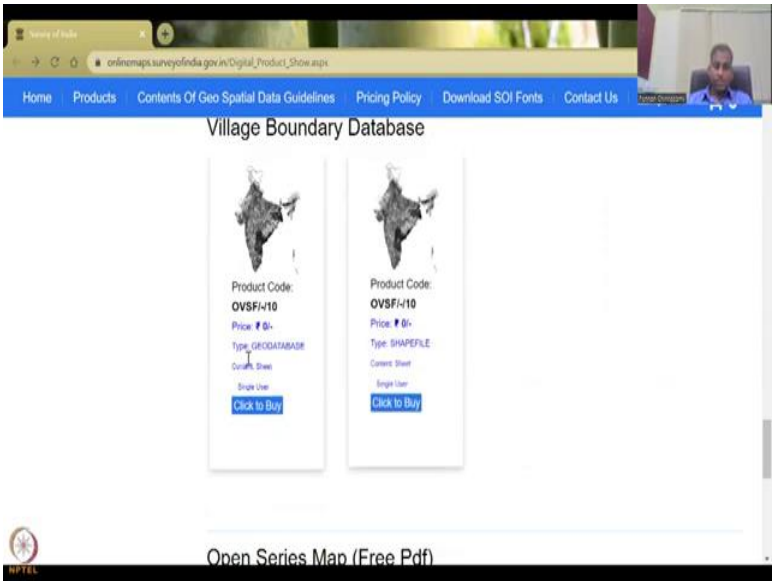

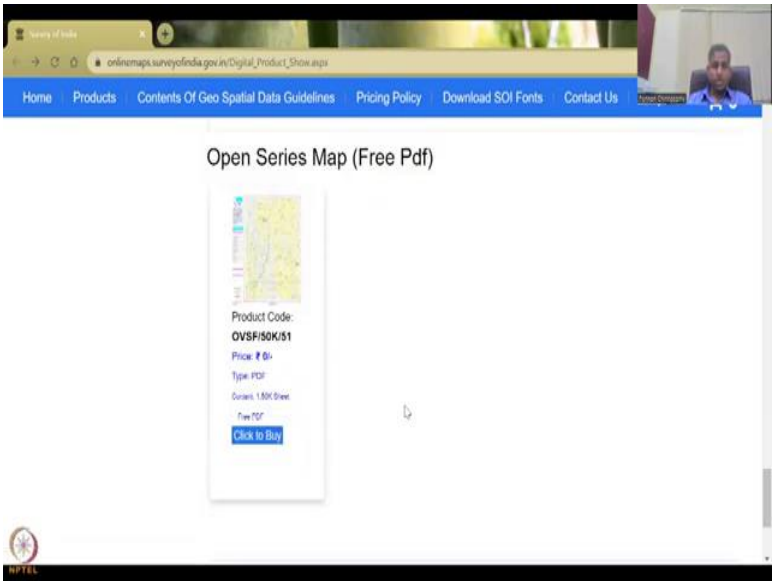

So, I am opening it in a particular screen. So, you could see that when you open the link that I gave, you will come to the online portals directly to the products, and you can see all products visualized here. We look at what each product is digital vector database, administrative boundaries, digital elevation model or DEM here it is called digital terrain model and then you have geo-referenced colour raster.

So, you have, then you also have digital geographical maps, and each one is a particular attribute. We can go ahead and look at it. So, one is the road map, Indian and adjacent countries, world map of India, railway roads of India, etc. But you have to buy, 5500 and there are lot of rules and regulations on how you can share, or use it.

There you can go to village boundary database, which is free of cost. You have Geo-database, and Shapefile, database full of lot of data or just a Shapefile you can buy. And then we come to open series free PDF map, which we going to use for this. Some maps online, it will say 77 rupees, 100 rupees, but when you go to the 'Buy map' section, it will say that there is no cost.

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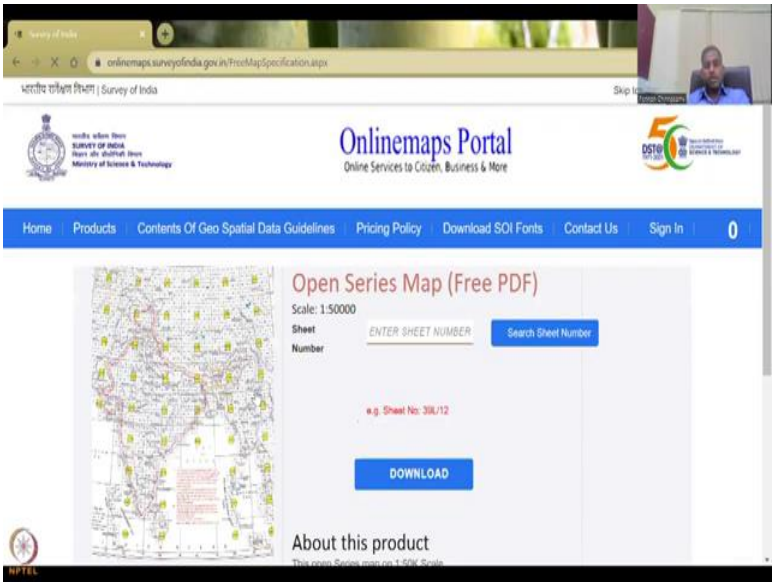

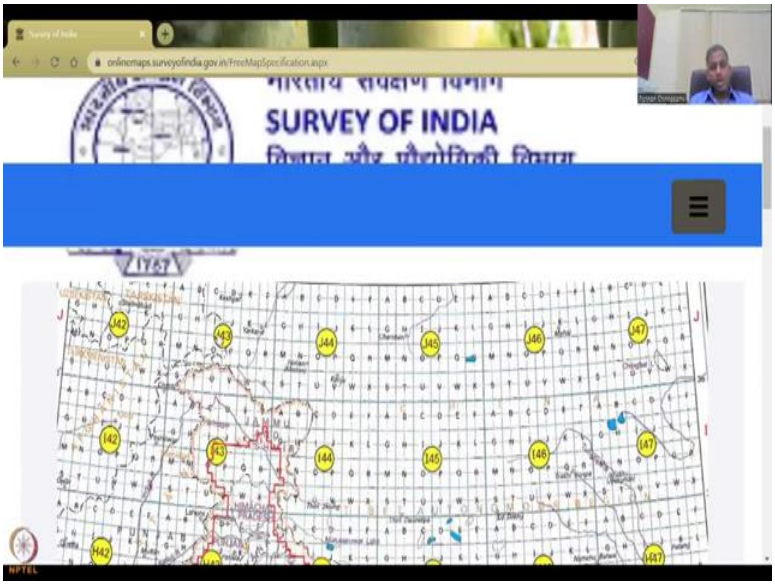

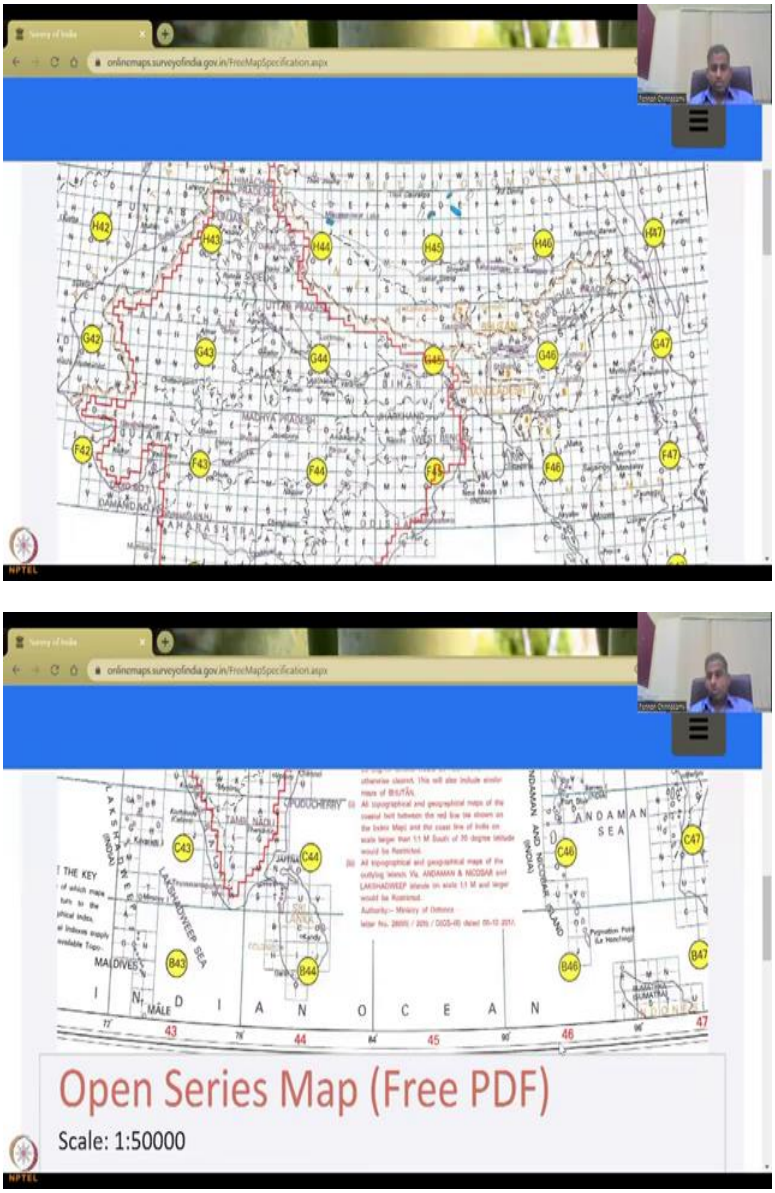

So, when I click on, click to buy, you get this image or this page where all the of India is divided into grids. There is one sheet that is available for a particular grid and then you have to zoom in for the number of the type. So, there is a sheet and a type. So, it is asking what is the number, enter the sheet number, etc. So, an example, 39L12. Let us zoom in and see if we could look at some of them.

So, now you could see J43, J44 is there and then there is ABCD and within ABCD there is 4 small, small grids. So, each location is divided into multiple grids and there is a naming scheme. So, there is J', and on the top there is new numbers to show which numbers you want to go. It is kind of difficult to just looking at this map and collect that data, So, for that they have given you a help window for taking out the data, let us go and visit it.

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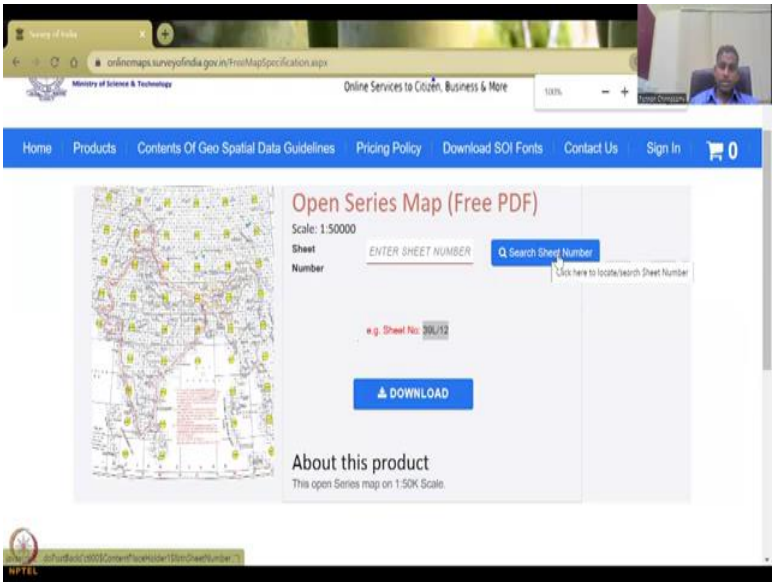

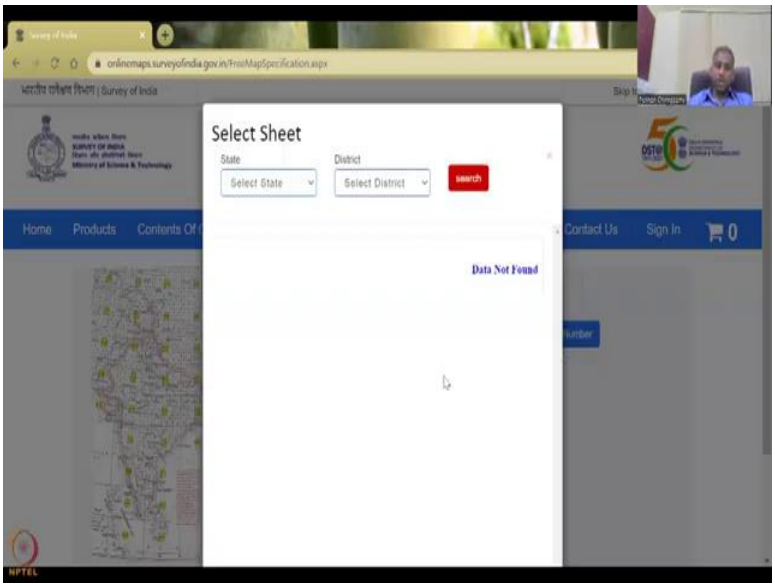

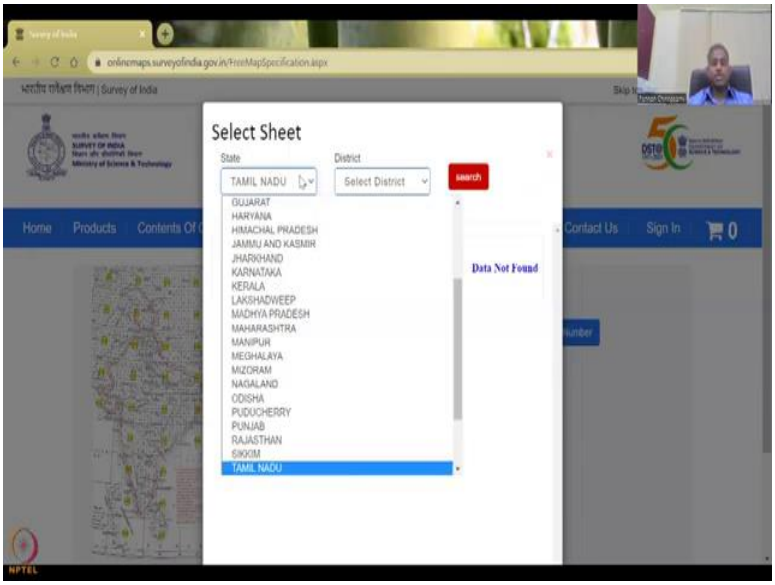
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District
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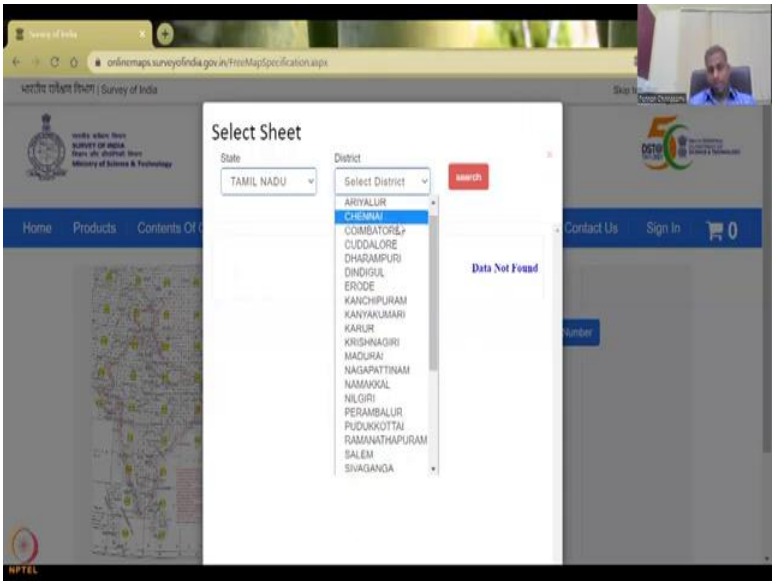
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KANYAKUMARI
KARUR
KRISHNAGIRI
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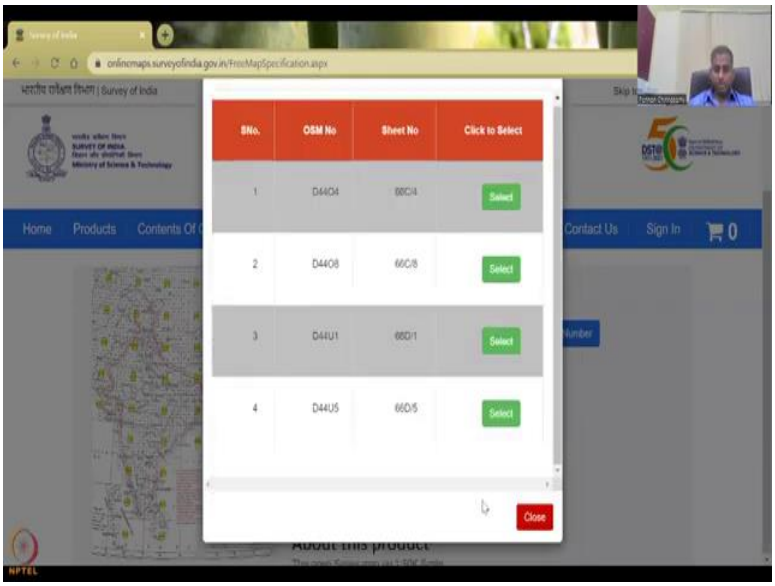
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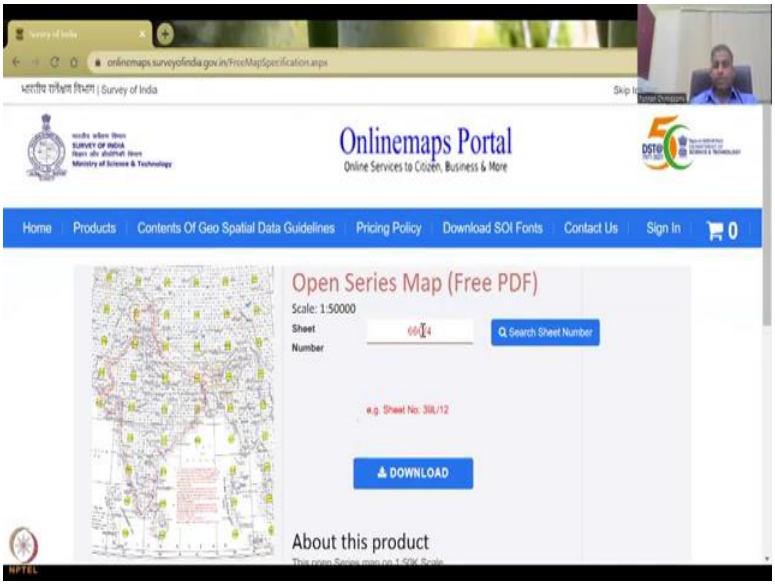

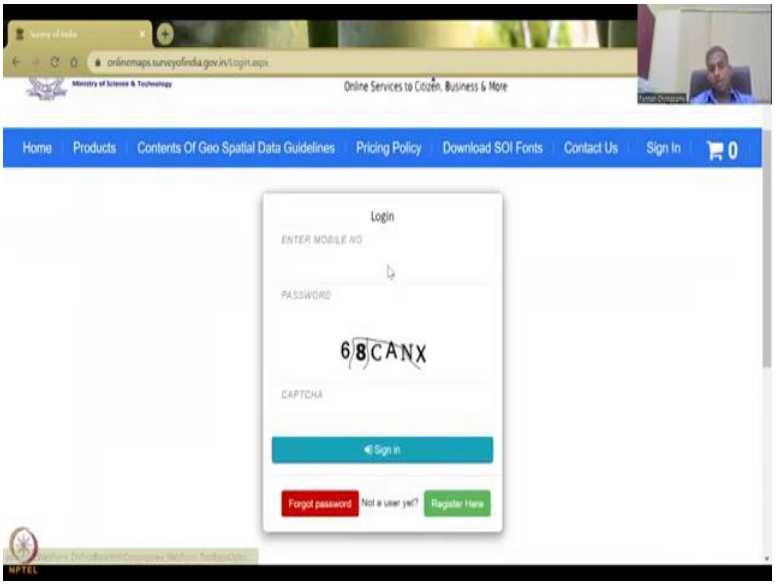

So here go to search, sheet number. If you click it, this page will come where you can select the state and we are going to do Tamil Nadu for example and just wait for it and then you can go to select district. Let us say Chennai and then you have all the different numbers. So, you can see here open street map is D44O4, so there is a location and within that it is 1, 2, 3, 4 divided into multiple OSM numbers and a relevant sheet number is there for it.

Again you do not have to worry about how these numberings have been done, but you can zoom in and collect the data. So, once you have OSM number or sheet number, you can press select the place in order and then there it is, it is selected. Just give it a second, so that it gets populated here, the sheet number and then you can download. So, when you hit download, you will have to login, and then mobile number, password, etcetera.

I will prefer not to put it on a, on my numbers here, so but still it is just straight forward you sign in, you register and then, or if you do not have an account, please register and download the image.

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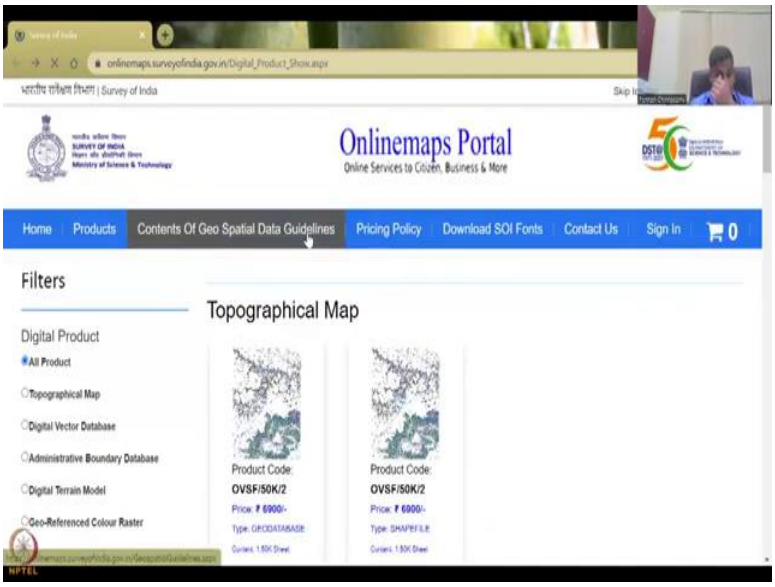

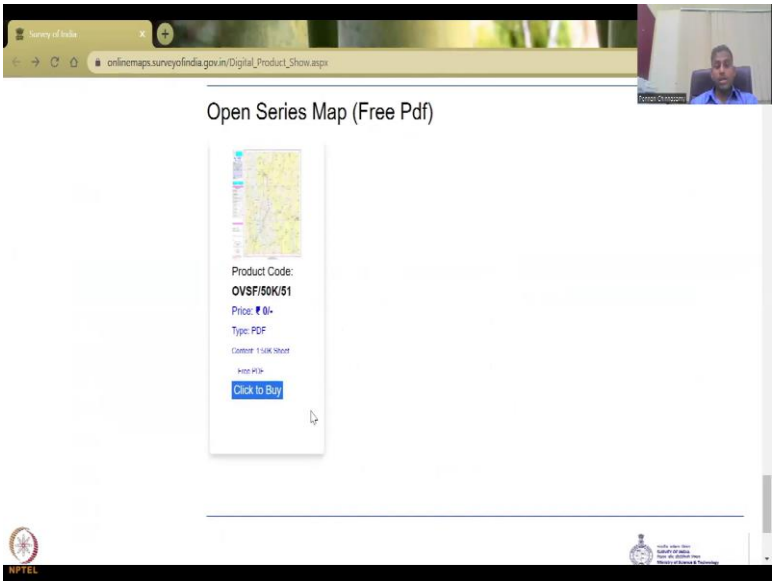

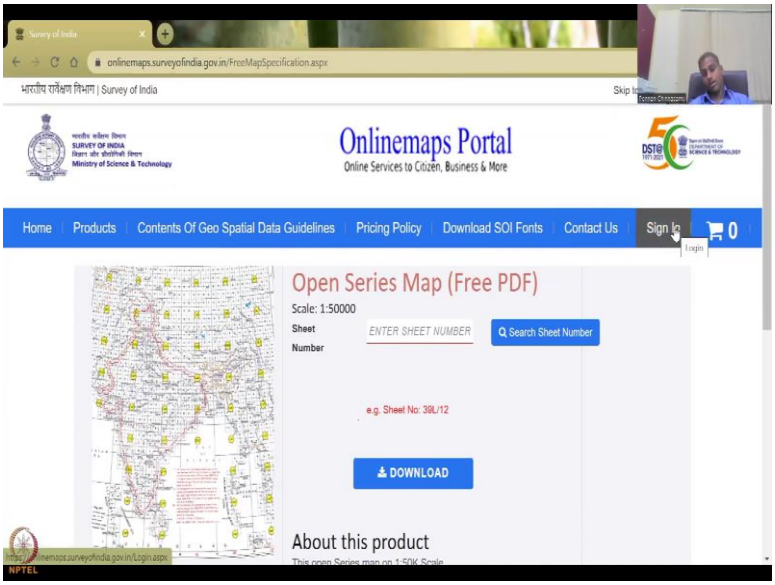

So we are going back to the main page where all the data is there and that you can buy. Now if you click on this, since it is already been there, it will ask you the same questions of which tile number, etcetera, you can have. The boundaries are pretty accurate from here, so please only use these boundaries. You can sign in here or create a login here based on your need.

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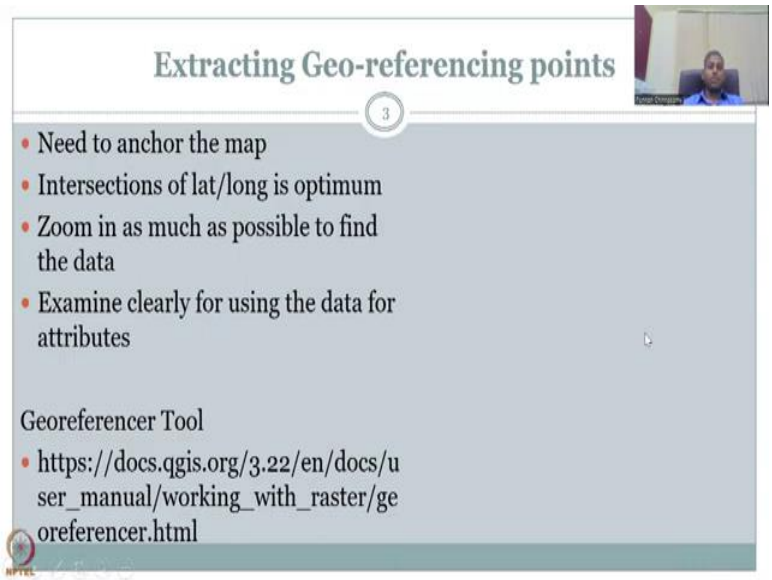

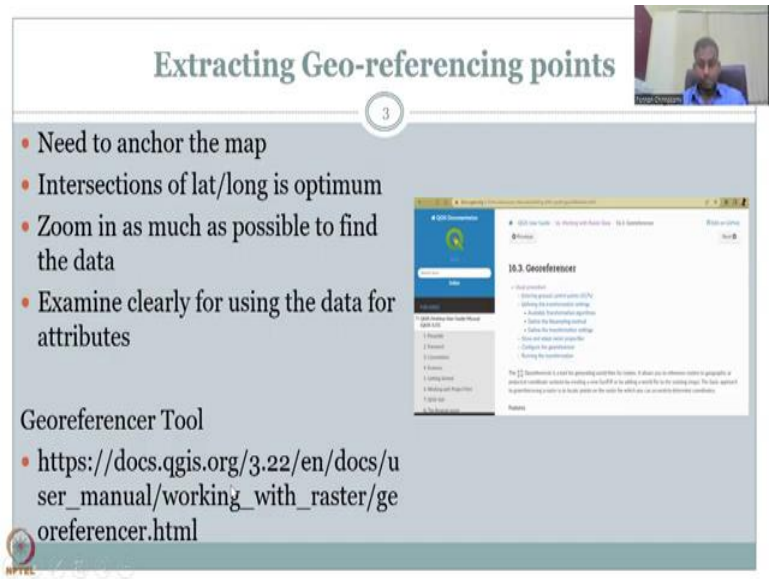

Let us go back to the slide that we were presenting. Yes, so moving on. The next part is extracting Geo-referencing points. So, for extracting the data from a paper map or a toposheet that we just saw. We need to put points on the map with locations. So, these locations should be known by the user, so that the paper map can be anchored.

Without this the paper map can float any location, so to make it anchored, you need to have at least 4 to 6 points depending on the methods that you are using to anchor the map. So, we will see what does that mean. What does that mean? So, without a proper location the map can go anywhere, so that is why you need to anchor like ship can go anywhere, but it stands because it is anchored. So, that is the same word we are using here. And then since we are

using maps, maps already have latitude and longitude, so it is optimum for us to use lat, longs. So, we could use the data that is already in the map populated and then use it for the lat, longs.

Zoom in as much as possible to find the data. We will work on this part when we do a hands on soon. Examine clearly for using the data for attributes. So, first step is to collect the points on the map that is going to anchor your map and then put locations for those points and then make sure that you zoom in as much as possible to get the accurate location and then examine clearly for using the data for attributes.

So, then the last point is once the map is projected, you can go zoom in and collect the information that is needed. So, the geo-referencing tool, manual, is given in this link which is on the qgis.org webpage. I will open it now for the, just going through on what it is. So, that we will see here is we will go to the QGIS referencing tool, and then look at the manual that has QGIS tutorials. We have already used it in the previous, previous versions.

In the documentation we went and looked at the modules, and then… So, let me open this link, I have opened it now. I am going to share the screen.

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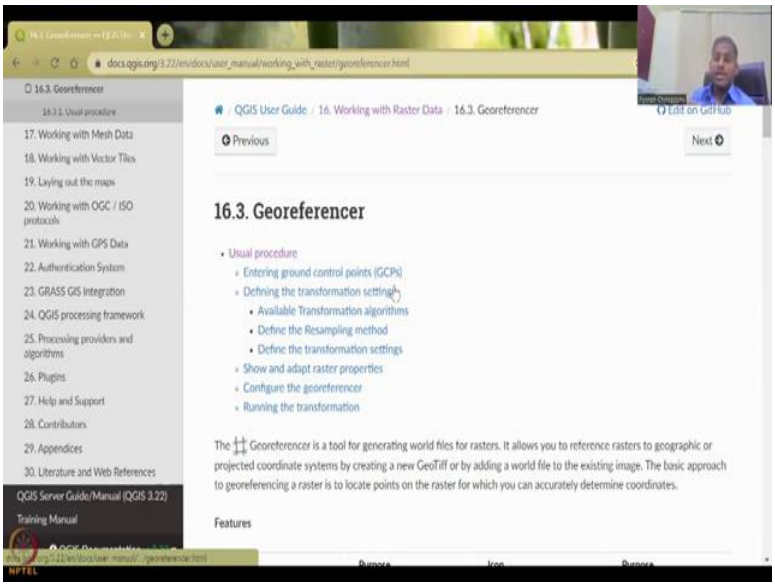

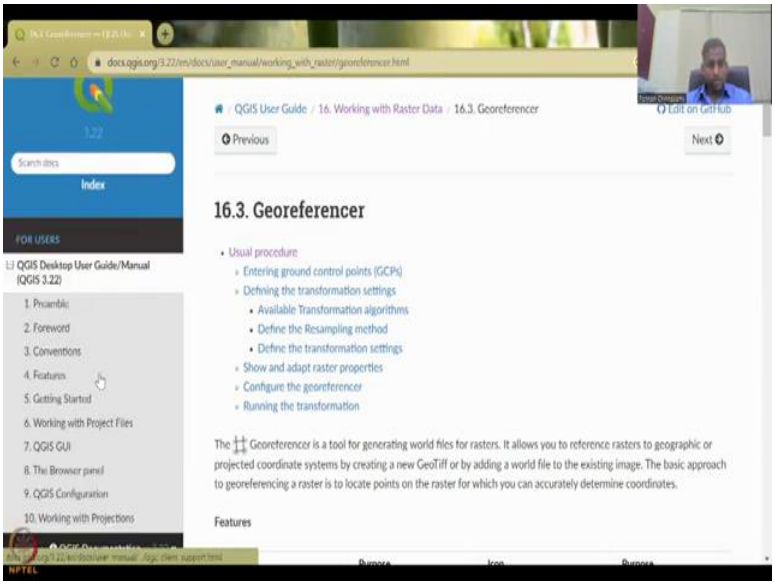
docs.qgis.org/3.22/en/docs/user_manual/working_with_raster/georeferencer.html
QGIS User Guide / 16. Working with Raster Data / 16.3. Georeferencer
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6. Working with Project Files
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8. The Browser panel
9. QGIS Configuration
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16.3. Georeferencer
Usual procedure
Entering ground control points (GCPs)
Defining the transformation settings
Available Transformation algorithms
Define the Resampling method
Define the transformation settings
Show and adapt raster properties
Configure the georeferencer
Running the transformation
The Georeferencer is a tool for generating world files for rasters. It allows you to reference rasters to geographic or projected coordinate systems by creating a new GeoTiff or by adding a world file to the existing image. The basic approach to georeferencing a raster is to locate points on the raster for which you can accurately determine coordinates.
Features
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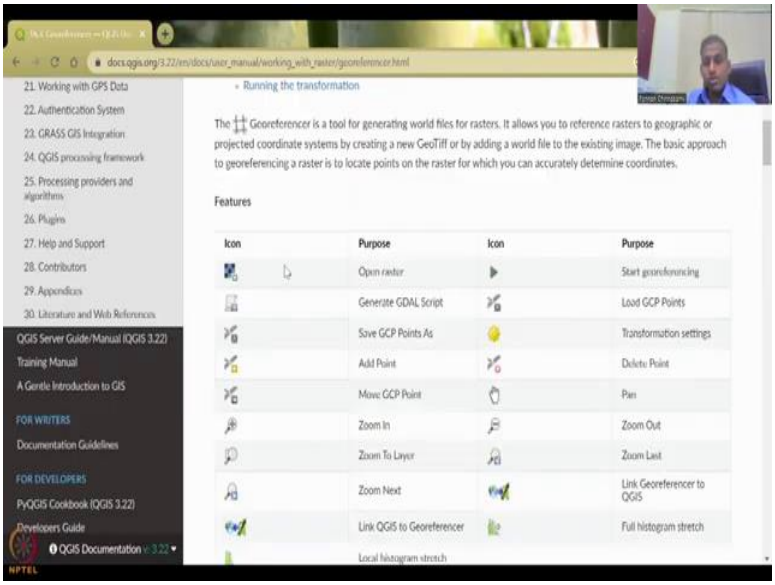
docs.qgis.org/3.22/en/docs/user_manual/working_with_raster/georeferencer.html
21. Working with GPS Data
22. Authentication System
23. GRASS GIS Integration
24. QGIS processing framework
25. Processing providers and algorithms
26. Plugins
27. Help and Support
28. Contributors
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Training Manual
A Gentle Introduction to GIS
FOR WRITERS
Documentation Guidelines
FOR DEVELOPERS
PyQGIS Cookbook (QGIS 3.22)
Developers Guide
QGIS Documentation v: 3.22
Running the transformation
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Features
Icon
Purpose
Icon
Purpose
Open raster
Start georeferencing
Generate GDAL Script
Load GCP Points
Save GCP Points As
Transformation settings
Add Point
Delete Point
Move GCP Point
Pan
Zoom In
Zoom Out
Zoom To Layer
Zoom Last
Zoom Next
Link Georeferencer to QGIS
Link QGIS to Georeferencer
Full histogram stretch
Local histogram stretch
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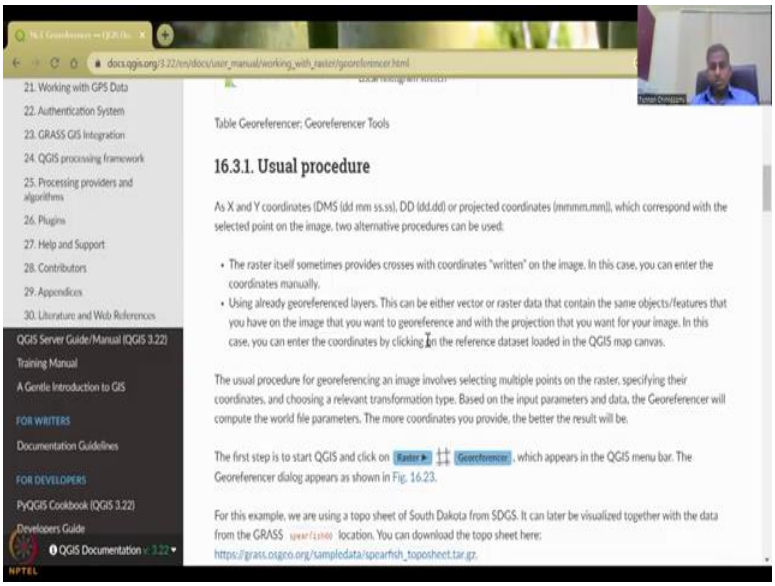
docs.qgis.org/3.22/en/docs/user_manual/working_with_raster/georeferencer.html
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23. GRASS GIS Integration
24. QGIS processing framework
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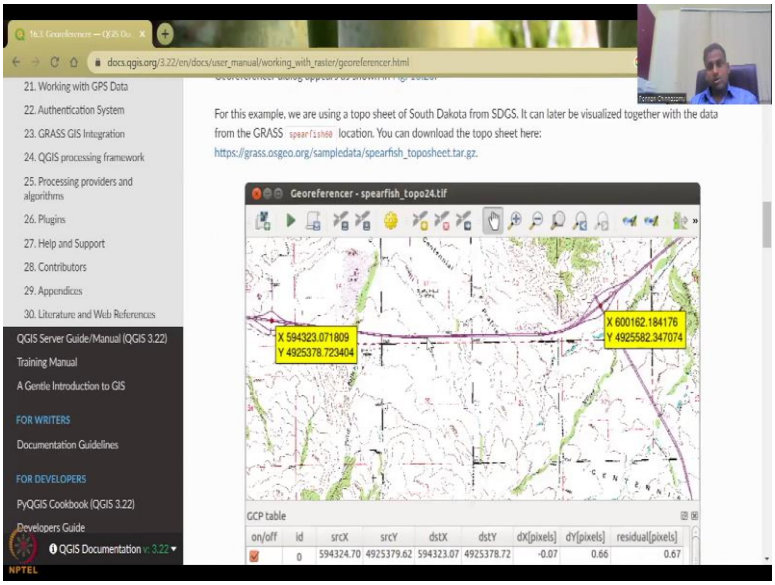
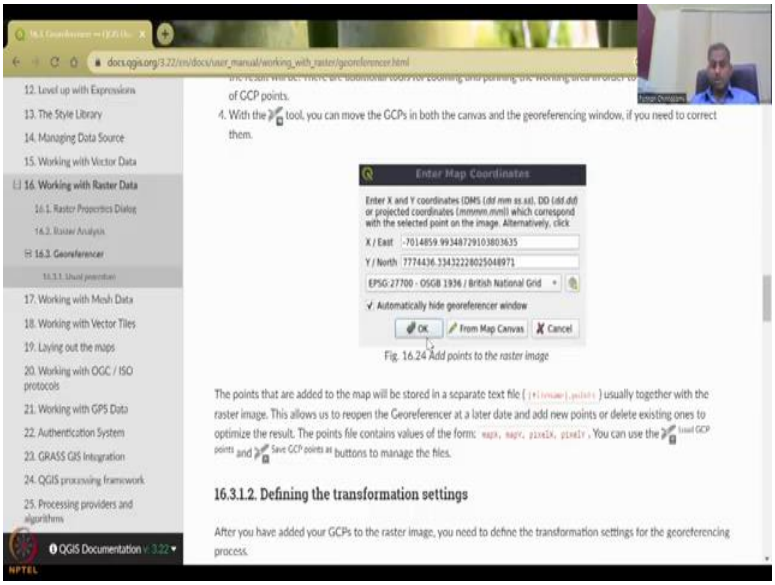
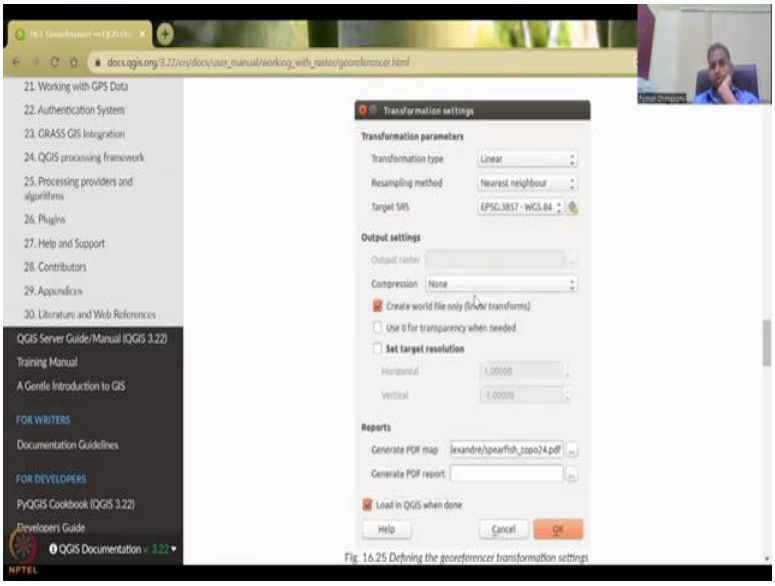
Documentation Guidelines
FOR DEVELOPERS
PyQGIS Cookbook (QGIS 3.22)
Developers Guide
QGIS Documentation v: 3.22
Table Georeferencer: Georeferencer Tools
16.3.1. Usual procedure
As X and Y coordinates (DMS (dd mm ss.ss), DD (dd.dd) or projected coordinates (mmmm.mm)), which correspond with the selected point on the image, two alternative procedures can be used:
The raster itself sometimes provides crosses with coordinates "written" on the image. In this case, you can enter the coordinates manually.
Using already georeferenced layers. This can be either vector or raster data that contain the same objects/features that you have on the image that you want to georeference and with the projection that you want for your image. In this case, you can enter the coordinates by clicking in the reference dataset loaded in the QGIS map canvas.
The usual procedure for georeferencing an image involves selecting multiple points on the raster, specifying their coordinates, and choosing a relevant transformation type. Based on the input parameters and data, the Georeferencer will compute the world file parameters. The more coordinates you provide, the better the result will be.
The first step is to start QGIS and click on Raster ▸ Georeferencer, which appears in the QGIS menu bar. The Georeferencer dialog appears as shown in Fig. 16.23.
For this example, we are using a topo sheet of South Dakota from SDGS. It can later be visualized together with the data from the GRASS spearfish60 location. You can download the topo sheet here:
https://grass.osgeo.org/sampledata/spearfish_toposheet.tar.gz
NPTEL


docs.qgis.org/3.22/en/docs/user_manual/working_with_raster/georeferencer.html
21. Working with GPS Data
22. Authentication System
23. GRASS GIS Integration
24. QGIS processing framework
25. Processing providers and algorithms
26. Plugins
27. Help and Support
28. Contributors
29. Appendices
30. Literature and Web References
QGIS Server Guide/Manual (QGIS 3.22)
Training Manual
A Gentle Introduction to GIS
FOR WRITERS
Documentation Guidelines
FOR DEVELOPERS
PyQGIS Cookbook (QGIS 3.22)
Developers Guide
QGIS Documentation v: 3.22
For this example, we are using a topo sheet of South Dakota from SDGS. It can later be visualized together with the data from the GRASS spearfish60 location. You can download the topo sheet here:
https://grass.osgeo.org/sampledata/spearfish_toposheet.tar.gz.
Georeferencer - spearfish_topo24.tif
X 594323.071809
Y 4925378.723404
X 600162.184176
Y 4925582.347074
GCP table
on/off id srcX srcY dstX dstY dX[pixels] dY[pixels] residual[pixels]
0 594324.70 4925379.62 594323.07 4925378.72 -0.07 0.66 0.67
NPTEL


docs.qgis.org/3.22/en/docs/user_manual/working_with_raster/georeferencer.html
12. Level up with Expressions
13. The Style Library
14. Managing Data Source
15. Working with Vector Data
16. Working with Raster Data
16.1. Raster Properties Dialog
16.2. Raster Analysis
16.3. Georeferencer
17. Working with Mesh Data
18. Working with Vector Tiles
19. Laying out the maps
20. Working with OGC / ISO protocols
21. Working with GPS Data
22. Authentication System
23. GRASS GIS Integration
24. QGIS processing framework
25. Processing providers and algorithms
QGIS Documentation v: 3.22
of GCP points.
4. With the tool, you can move the GCPs in both the canvas and the georeferencing window, if you need to correct them.
Enter Map Coordinates
Enter X and Y coordinates (DMS (dd mm ss.ss), DD (dd.dd) or projected coordinates (mmmm.mm)) which correspond with the selected point on the image. Alternatively, click
X / East -7014859.99348729103803635
Y / North 7774436.334322280250489 71
EPSG:27700 - OSGB 1936 / British National Grid
Automatically hide georeferencer window
OK
From Map Canvas
Cancel
Fig. 16.24 Add points to the raster image
The points that are added to the map will be stored in a separate text file (<image>.points) usually together with the raster image. This allows us to reopen the Georeferencer at a later date and add new points or delete existing ones to optimize the result. The points file contains values of the form: mapX, mapY, pixelX, pixelY . You can use the Load GCP points and Save GCP points as buttons to manage the files.
16.3.1.2. Defining the transformation settings
After you have added your GCPs to the raster image, you need to define the transformation settings for the georeferencing process.
NPTEL


docs.qgis.org/3.22/en/docs/user_manual/working_with_raster/georeferencer.html
21. Working with GPS Data
22. Authentication System
23. GRASS GIS Integration
24. QGIS processing framework
25. Processing providers and algorithms
26. Plugins
27. Help and Support
28. Contributors
29. Appendices
30. Literature and Web References
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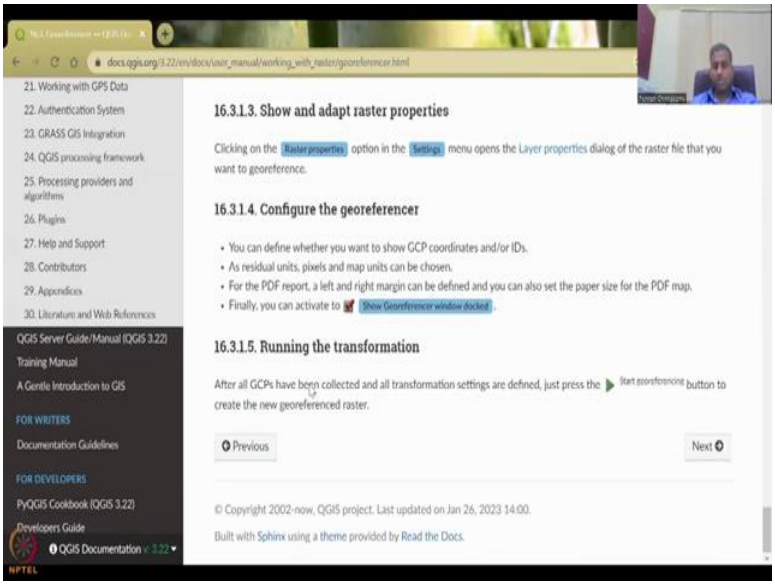
FOR WRITERS
Documentation Guidelines
FOR DEVELOPERS
PyQGIS Cookbook (QGIS 3.22)
Developers Guide
QGIS Documentation v: 3.22
Transformation settings
Transformation parameters
Transformation type Linear
Resampling method Nearest neighbour
Target SRS EPSG:3857 - WGS 84
Output settings
Output raster
Compression None
Create world file only (for affine transforms)
Use 0 for transparency when needed
Set target resolution
Horizontal 1.00000
Vertical -1.00000
Reports
Generate PDF map lexandre/spearfish_topo24.pdf
Generate PDF report
Load in QGIS when done
Help
Cancel
OK
Fig. 16.25 Defining the georeferencer transformation settings
NPTEL



Yes, now it is visible. So, what you see is, you see under the manual, desktop user guide manual 3.22, you have 16.3 is Georeferencer. The usual procedure is entering ground control points, GCPs as I said you find locations and those are the ground control, the anchor points are called GCPs and then you could see here, some other tools that are at the tool box. And then you have defining the transformation systems.

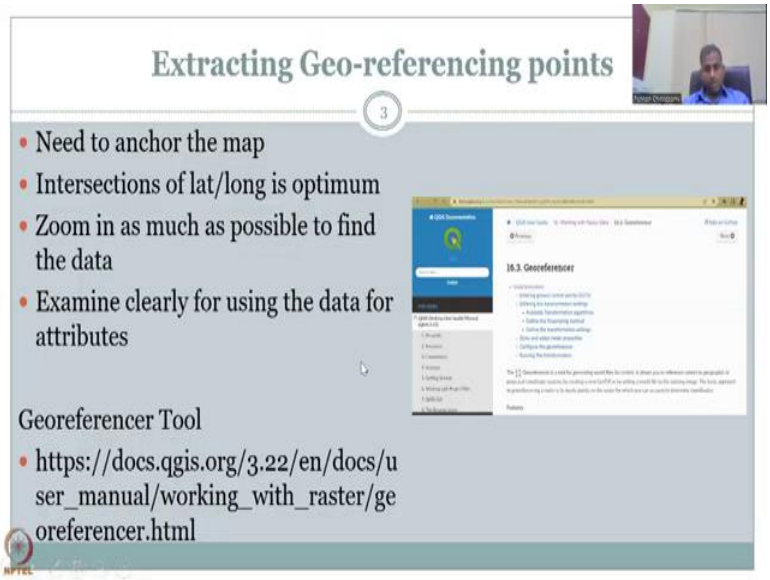
What are the transformation systems that can apply the lat longs based on the 6 points? So, you have a image frame. In the image, I will just show like a paper example. In that image, let us say the whole image is in the centre, but you have a full A4 size map, so what you will do is you will just anchor 4, 5 points along the paper and throughout the paper it would interpolate.

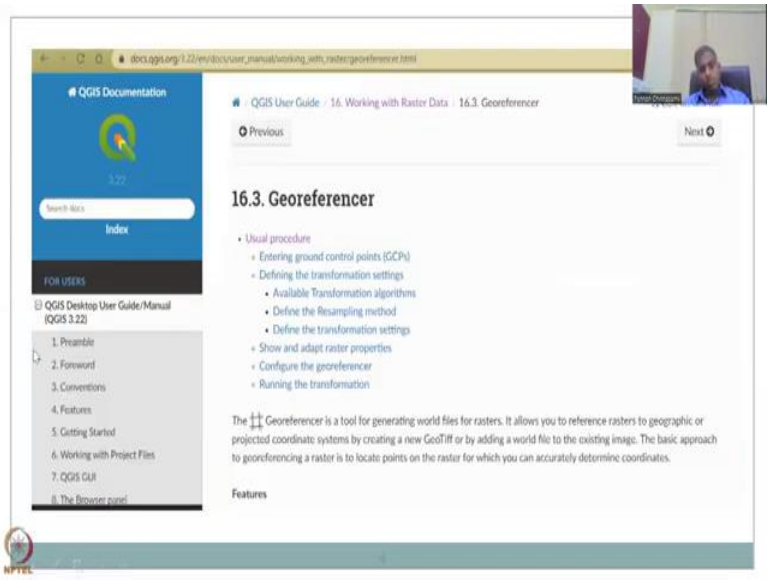
So, that is what throughout the paper map it will interpolate and then it will become digitalized is your model. So, that part is look, is known as transformation and then defining the resampling method if you need and then show and adapt properties, configure the georeferencer, running the transformation.

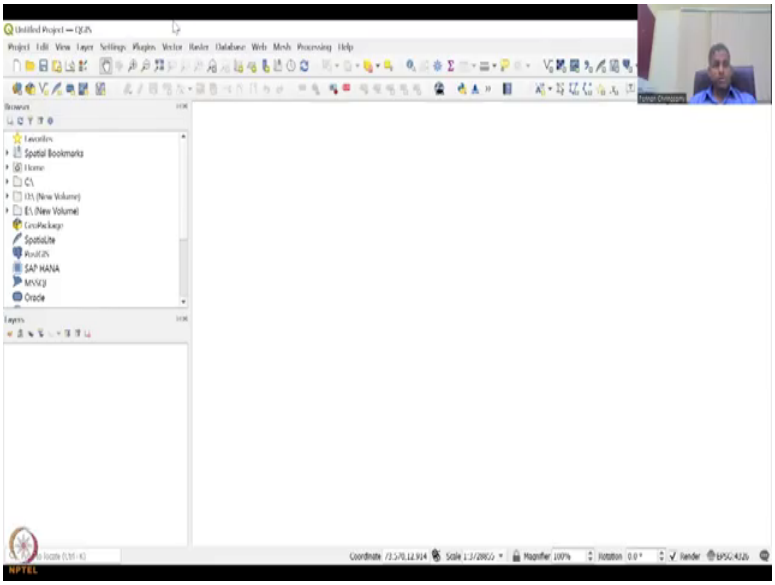
So, please go through this manual, I will definitely do a hands on soon on this, so that you will know what is the difference in these properties and methods. Here is where you would enter the data and you could enter the data as per the different formats, DMS, dd mm ss, which is degrees, minutes and seconds, or DD as dd dd, just degrees degrees and mins or project coordinates mmm. So, mostly the maps have DMS version, which is degree, minutes and seconds.

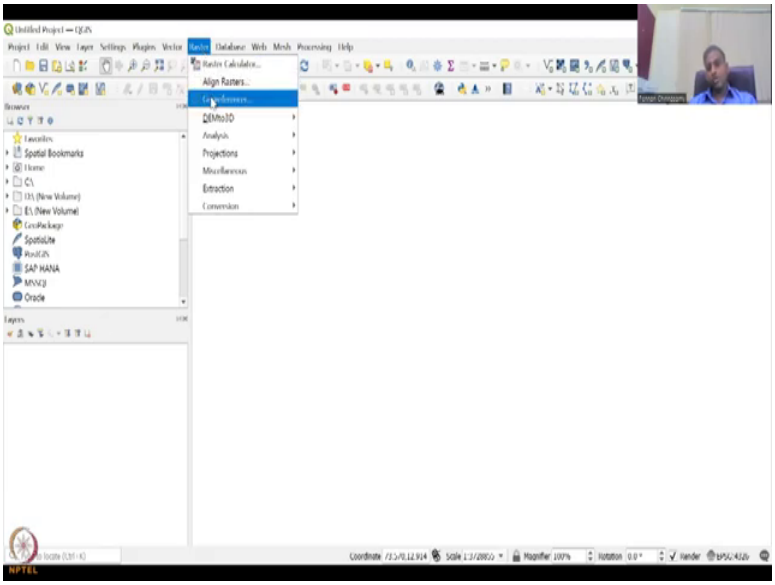
We will look at the transforming part. There are multiple algorithms to transform. It is just interpolation methods, but then once it does, it will give you the running I feel on the transformation. It will give you the errors based on the model and how the model has performed. Let us go back to the slide.

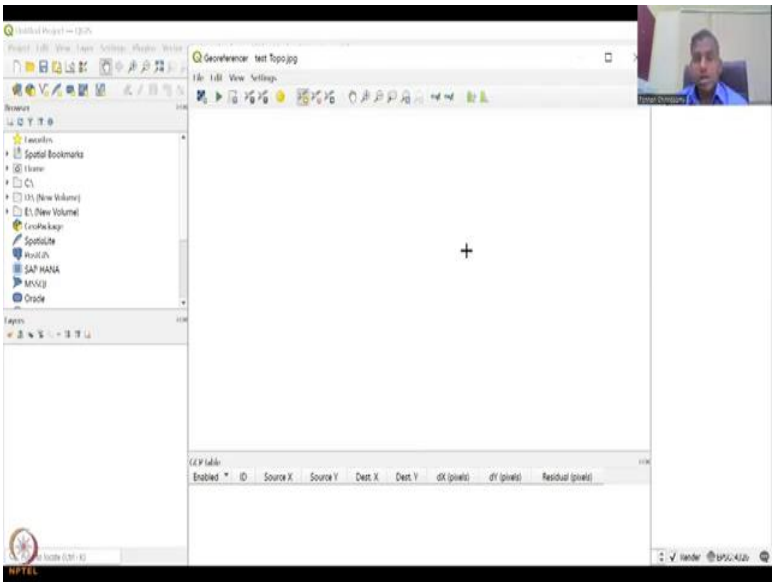
(Refer Slide Time: 12:08)

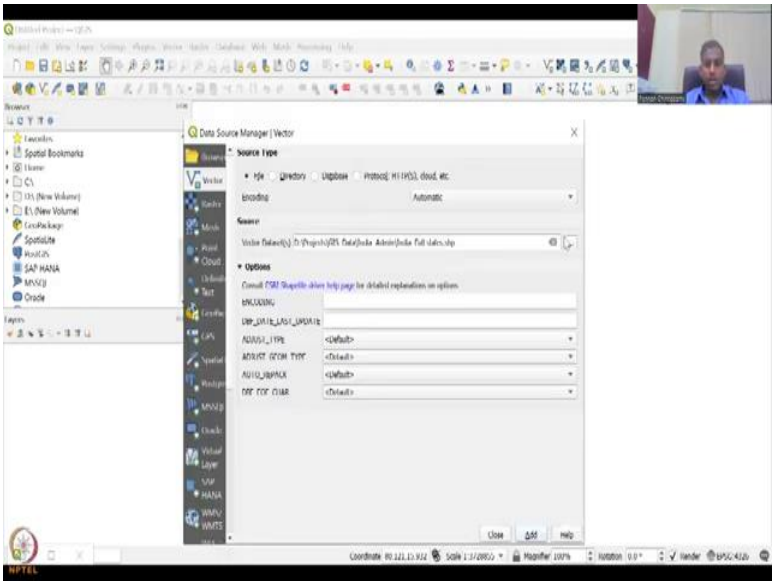


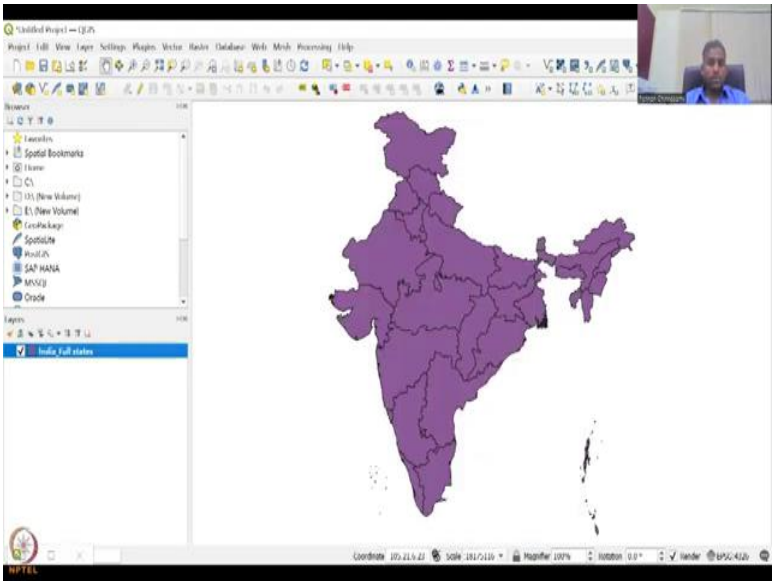


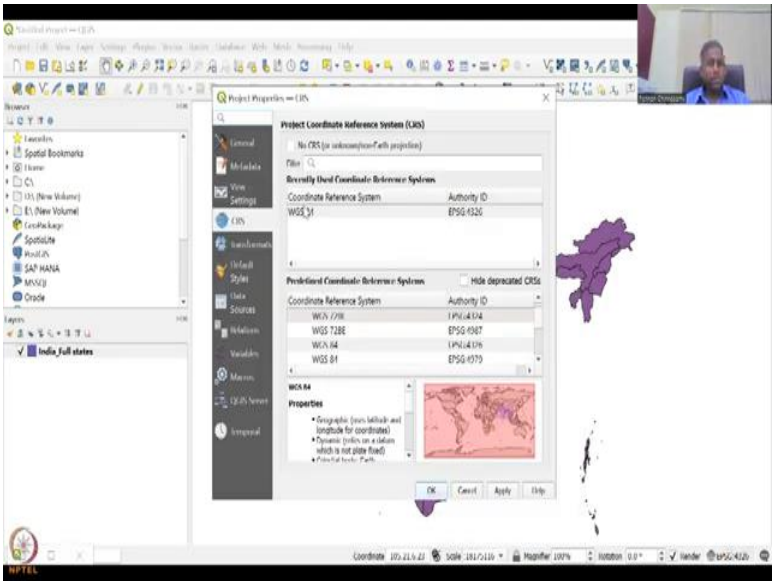

Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Browser
Favorites
Spatial Bookmarks
Home
C:\
D:\ (New Volume)
E:\ (New Volume)
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
Layers
NPTEL

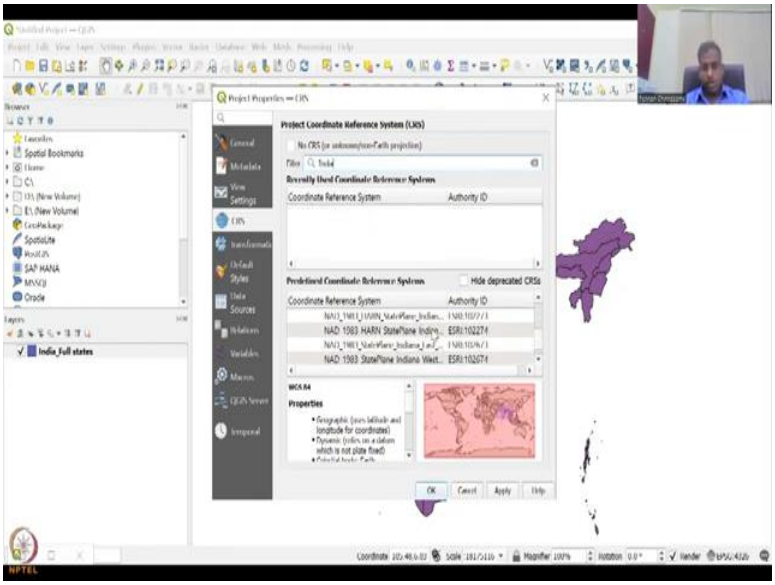

Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Raster Calculator...
Align Rasters...
Georeferencer...
DEM(terrain)
Analysis
Projections
Miscellaneous
Extraction
Conversion
Browser
Favorites
Spatial Bookmarks
Home
C:\
D:\ (New Volume)
E:\ (New Volume)
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
Layers
NPTEL

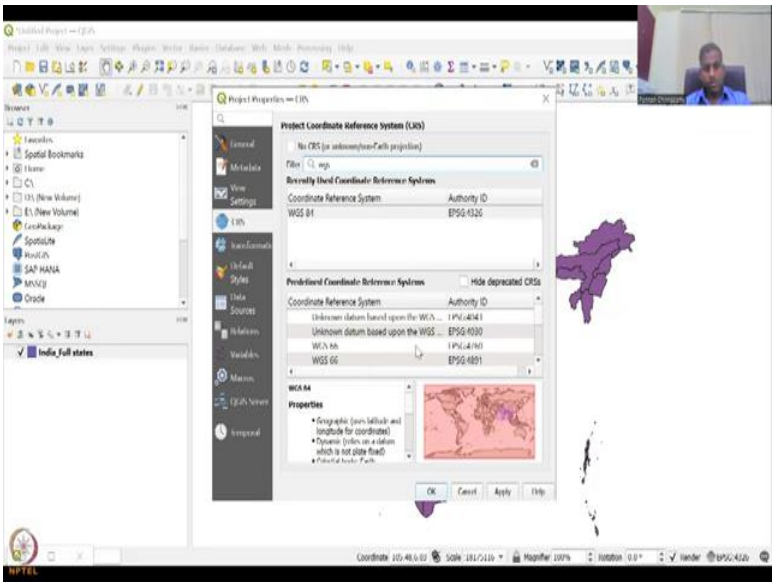

Untitled Project — QGIS
Georeferencer - test Topo.jpg
File Edit View Settings
GCP table
Enabled ID Source X Source Y Dest. X Dest. Y dX (pixels) dY (pixels) Residual (pixels)
Browser
Favorites
Spatial Bookmarks
Home
C:\
D:\ (New Volume)
E:\ (New Volume)
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
Layers
NPTEL


Data Source Manager | Vector
Source Type
Encoding
Automatic
Options
Close
Add
Help


India_Full states


Project Properties — CRS
Project Coordinate Reference System (CRS)
Recently Used Coordinate Reference Systems
Predefined Coordinate Reference Systems
Hide deprecated CRSs
WGS 84
Properties
OK
Cancel
Apply
Help
India_Full states





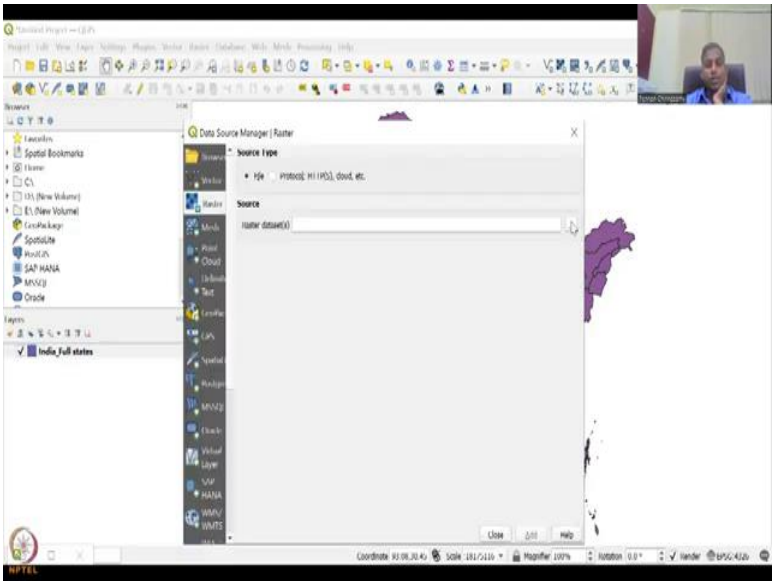
So, we have looked into this georeferencer manual and now we will look into the tool box just to look at, what are the different tools that are available? So, I will show my QGIS part. I am opening my QGIS now, yes now it is open. So, where would you find it? You would find it in the raster tool box, georeferencer tool. If you click georeferencer it will open, sometimes it will open and it will be at the bottom, so just click ‘open’ and it will open.

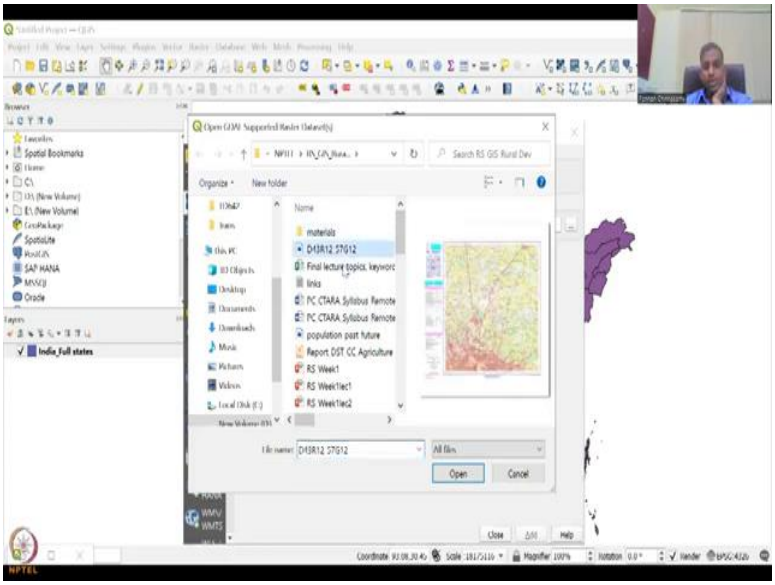
You can do it in two steps, which is basically you can have the map that you want inside in the layers and then bring it here as an image or you could do it without the georeferencing. So, before that we want to give a normal indicator of what this data frame is going to be. So, I am going to click ‘open’ and then I am going to add full states, my database and the EPSG was as per the previous WGS84.

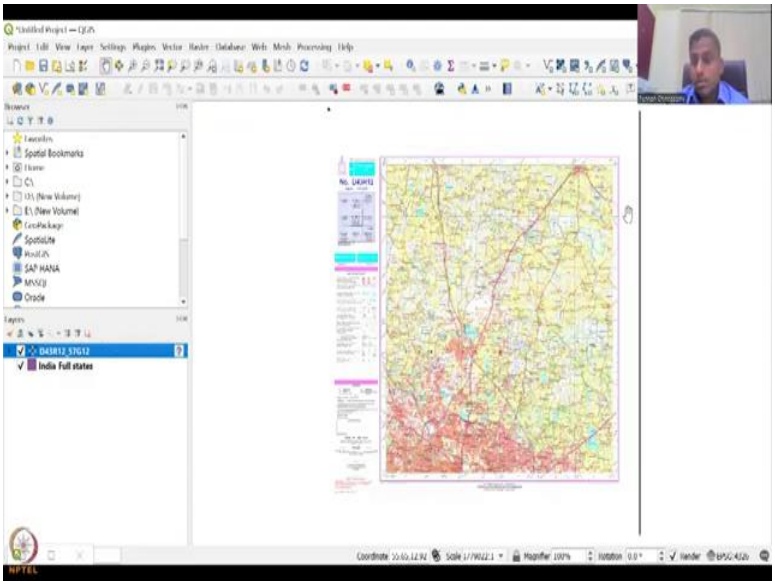
That looks good. So, I will just keep it. So, the datum and the coordinate system is WGS84, EPSG4326. There are multiple coordinate systems you can see here, if you click, you can just filter based on India, so there is multiple zones. State Indian, so just look at how many you have, but mostly people use for 4326EPSG or WGS84 and that is what we will use. There is multiple WGS and then in that you will have different EPSGs.

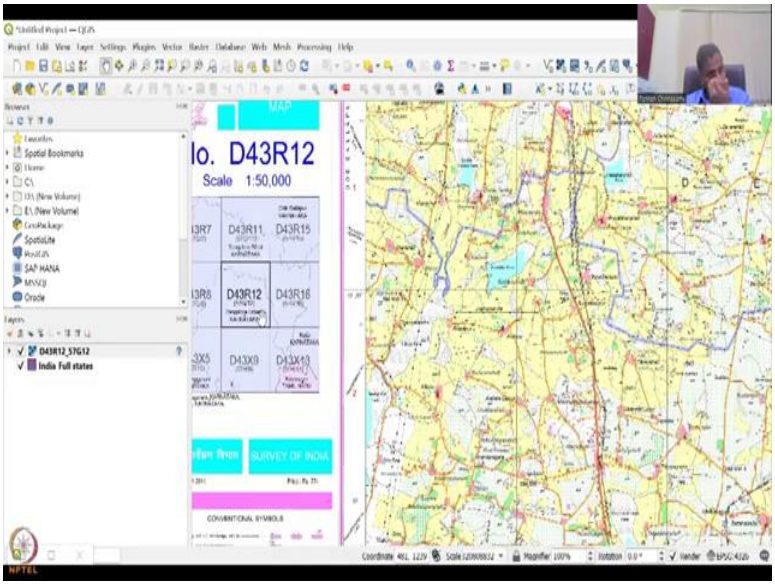
So, we will use one based on the dataset that we already have. So, we have the India full states, so let it be here for some time.

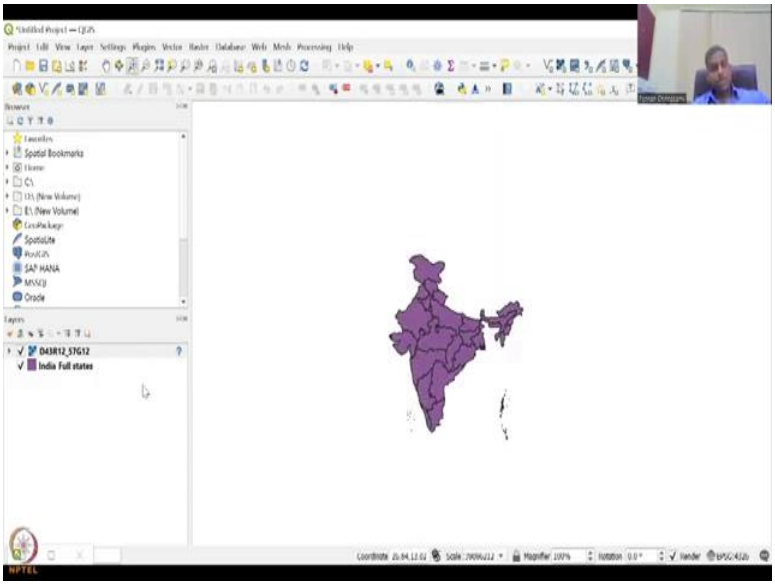
(Refer Slide Time: 14:18)

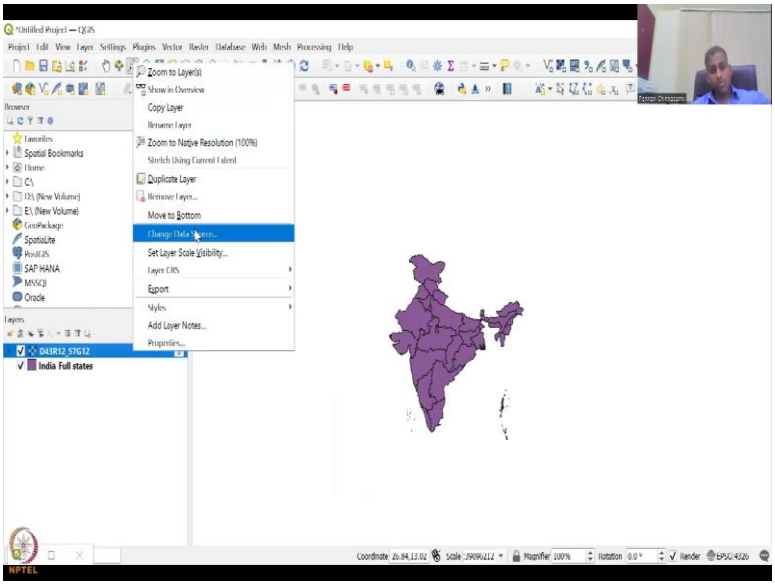







MAP
lo. D43R12
Scale 1:50,000
D43R11
D43R15
D43R12
D43R16
D43X9
D43X13
SURVEY OF INDIA
CONVENTIONAL SYMBOLS

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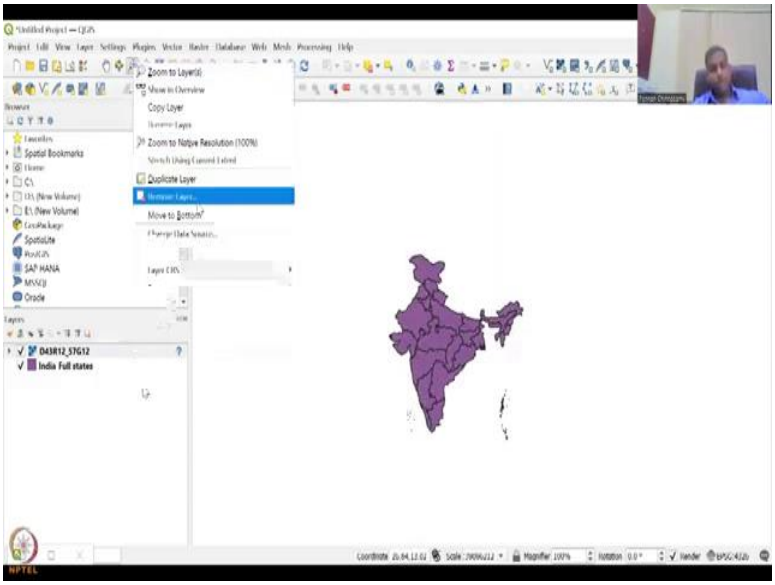
Show in Overview
Copy Layer
Rename Layer
Zoom to Native Resolution (100%)
Stretch Using Current Extent
Duplicate Layer
Remove Layer...
Move to Bottom
Change Data Source...
Set Layer Scale Visibility...
Layer CRS
Export
Styles
Add Layer Notes...
Properties...
D43R12_57G12
India Full states
NPTEL


Zoom to Layer(s)
Show in Overview
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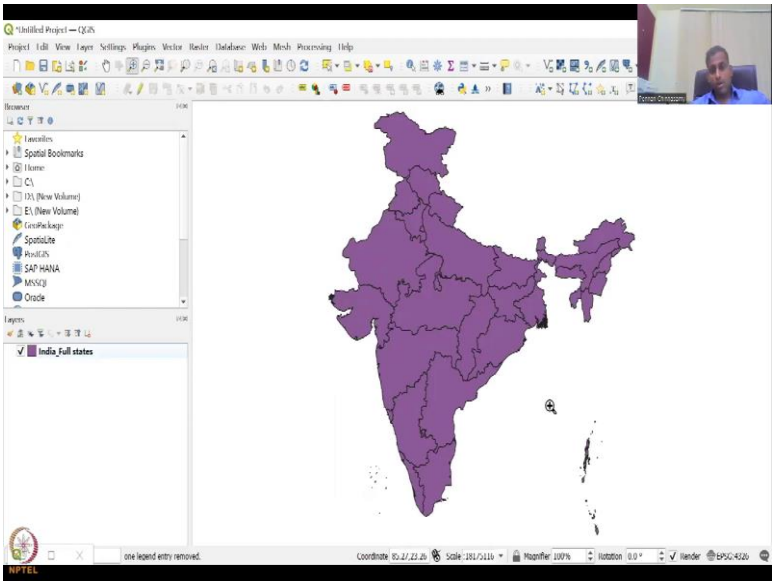
Zoom to Native Resolution (100%)
Duplicate Layer
Remove Layer...
Move to Bottom
Layer CRS
D43R12_57G12
India Full states
NPTEL


Spatial Bookmarks
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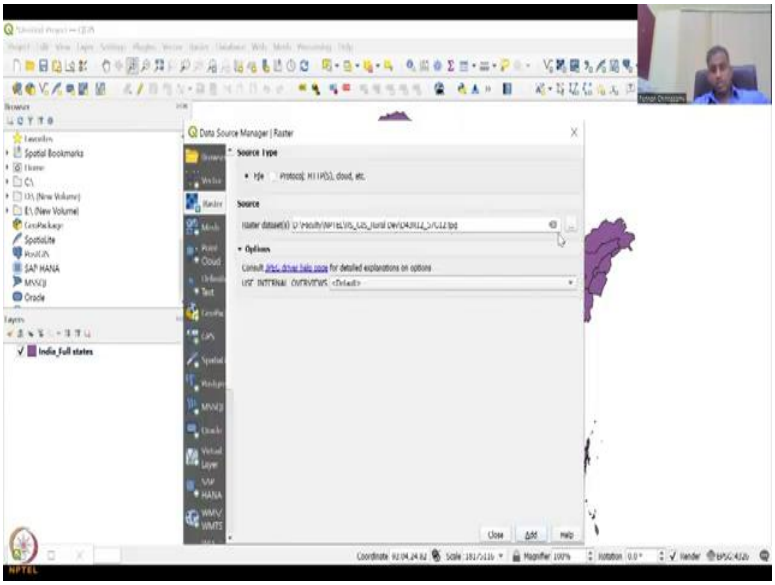
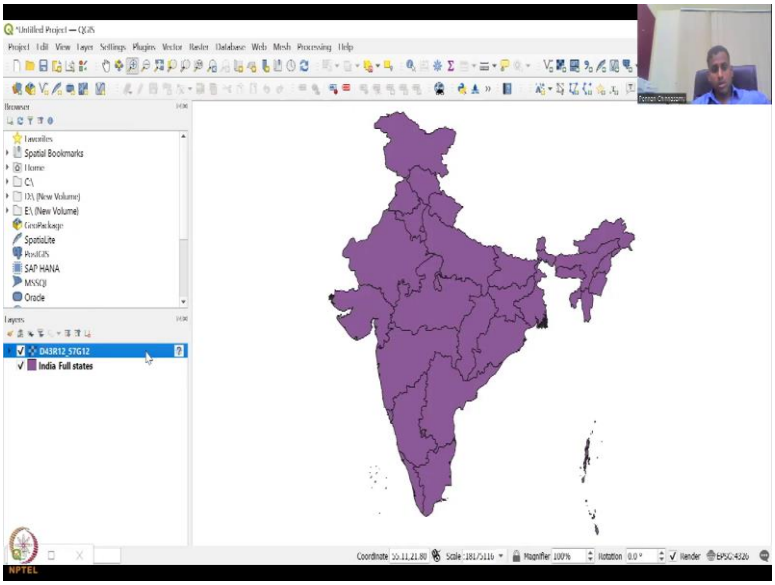
SAP HANA
MSSQL
Oracle
India_Full states
one legend entry removed.
NPTEL


Data Source Manager | Raster
Source Type
Source
Options
India_Full states
NPTEL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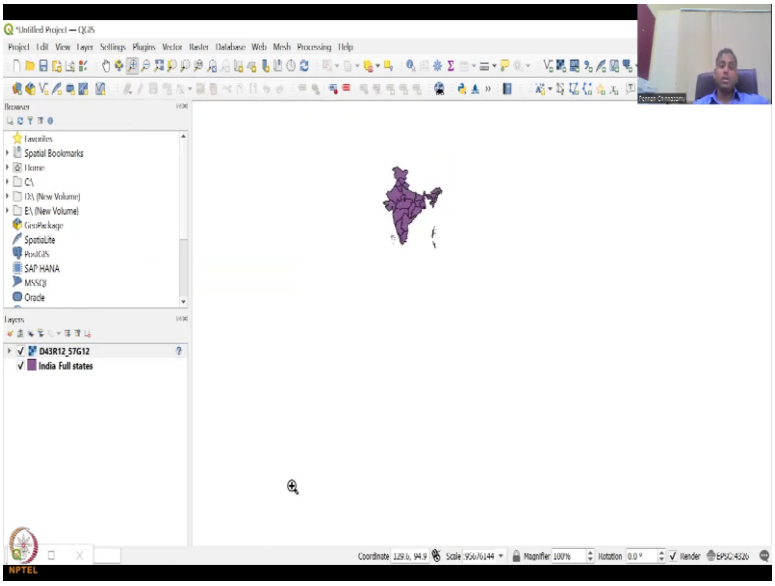
SAP HANA
Oracle
D43R12_57G12
India Full states
NPTEL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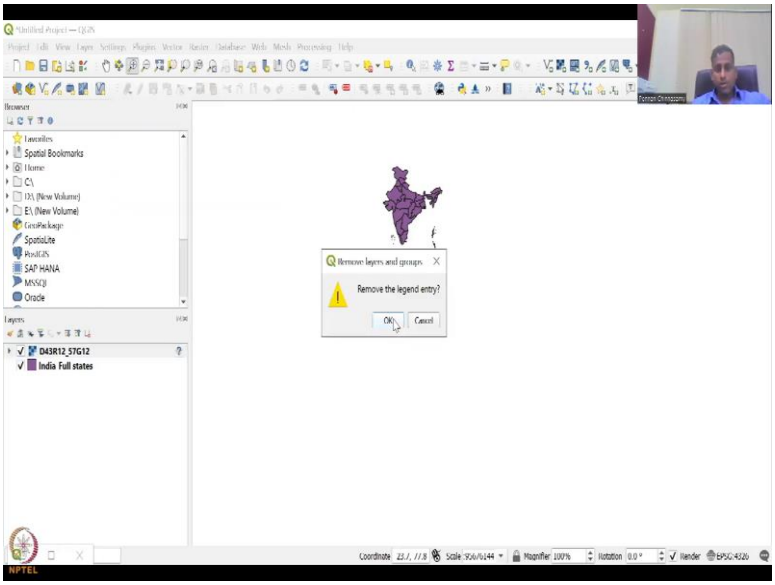
Oracle
D43R12_57G12
India Full states
NPTEL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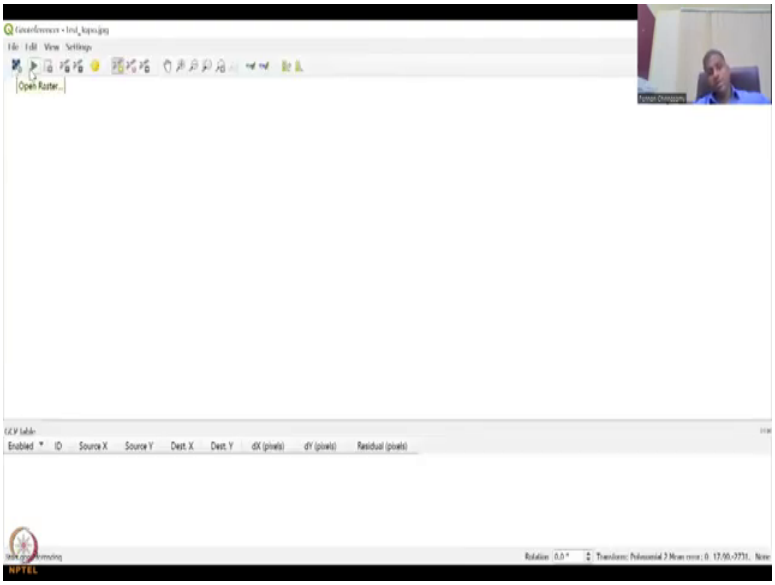
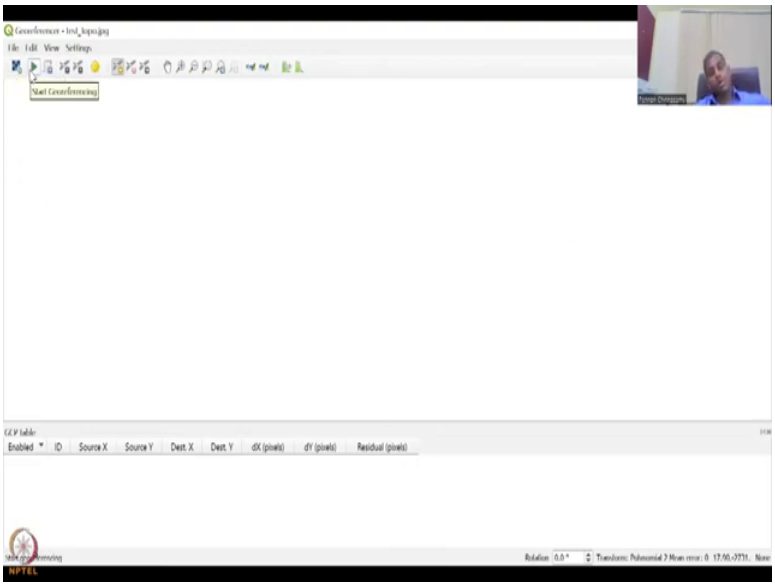
Remove the legend entry?
OK
Cancel
D43R12_57G12
India Full states
NPTEL


Open Raster...
Enabled
ID
Source X
Source Y
Dest. X
Dest. Y
dX (pixels)
dY (pixels)
Residual (pixels)
NPTEL


Start Georeferencing
Enabled
ID
Source X
Source Y
Dest. X
Dest. Y
dX (pixels)
dY (pixels)
Residual (pixels)
NPTEL

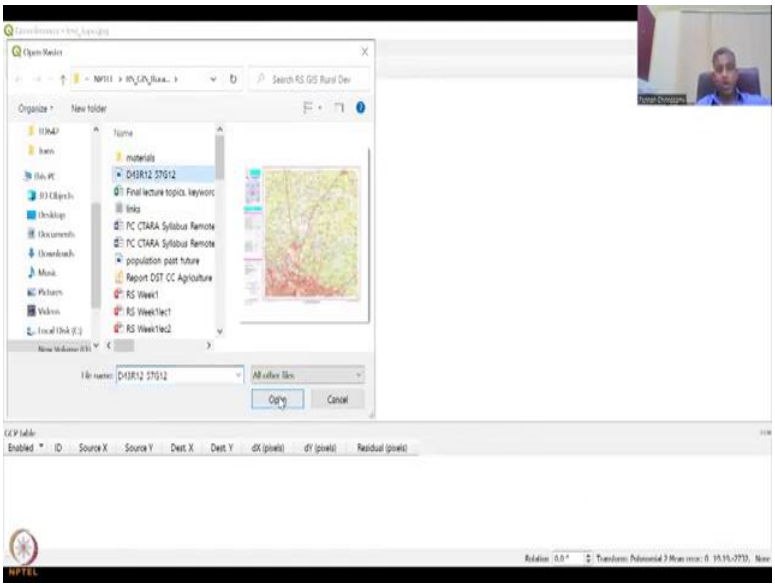
Now what we will do is we are going to input the data that we downloaded from survey of India. I am going to open the raster database. This is the tile that I have done. So, it says open raster data space and then add. So, once we add it, we do not know, it does not link on here. So, what have I downloaded? I have downloaded a map of Karnataka, Bangalore, in three very specific; you could see here we discussed this map in the previous lecture, what are the objects, etcetera. I have downloaded this part which is D43R1257G slash 12.

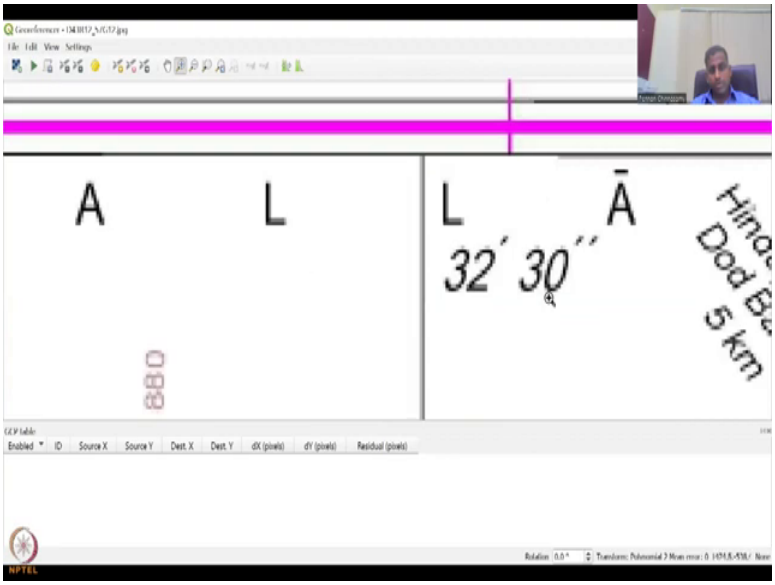
And that is Bangalore urban, but here we have Bangalore rural. So, we want to cover the rural part on the north, So, the north part is where we will focus more. However, we will look into the entire tile. So, we have the entire tile and as I said it is not sitting, it is not anchoring with the location, it is just floating somewhere. You could see here if I do this, India is this and then this is a tile.

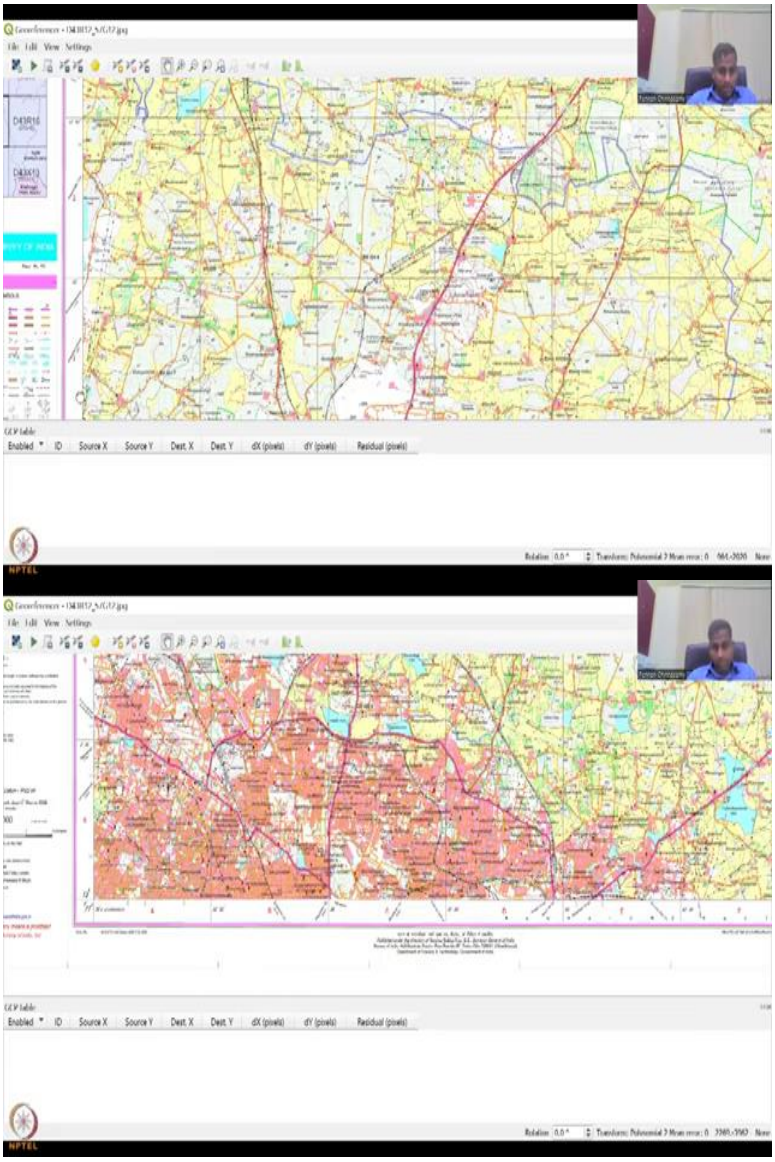
You never, know for sure that India is much, much bigger than the Bengaluru map here, so it is technically wrong. So, for example, I will show you if I zoom in, this is India. So, why does it do it? Because it does not have a location. So, I am going to remove this layer and then zoom in again, now you have only this layer. Let me add the raster again, so it is the rural dot, and then I am going to close and then I am going to zoom back to the layers.

And you can see almost the same effect, India is small and the layer is big. So, I will remove this layer for now. And then zoom to the full layer of India and let us keep it there for now. The georeferencer tool is up, as I said here you can add the raster. This is the open raster button. This is the running georeferencing tool. Right now we will not run it until and otherwise we have put the points and then here are the points GCP points or anchor points that we need to put it.

(Refer Slide Time: 16:38)







So, first step is to add the image. So, I am going to go to my database, add the image, the image has come. So, as I said there are some features in the map that will give you the lat long location. So, let us look at that. So, if you zoom in the top, you could see here it is 77 degrees is this line and then 13 degrees is this line. What is it? 13 degree 15 minutes, whereas, this is 77 degrees 30 minutes.

So, every grid is spaced at 2 degree 30 minute space, so 77 30 degrees, then this is 32 30 degrees, if you can see, 32 30 degrees and then we have 35, so 230 230 230. Again 30 plus 30 is 60, 60 is equals to 1. It is like same like your clock thing, minutes convert, seconds convert to minutes, minutes convert back to your degrees. So, here what you could see is you have 77 degrees 30 minutes, and then 32 minutes 30 seconds.

So in between you have 2 minutes 30 seconds and then at 2 minutes 30 seconds plus, it becomes 35, and then 2 minutes 30 37 degrees, 37 minutes 30 seconds, 40, 42 30 and 45. Same way down we have 13 50, and then you can use a hand tool to pull down, you can see 13 15, down 12 30 and another minus 2 30 will become 10, 7 30 and then 5, 2 30 and then 13 0. So, this line is 13 0 and this line is 77 30.

Because it is the same line, did not change, but this line has decreased from the top, so you have 13 to 30, now 13 0. So, now let us select some points and I will show you how to select.

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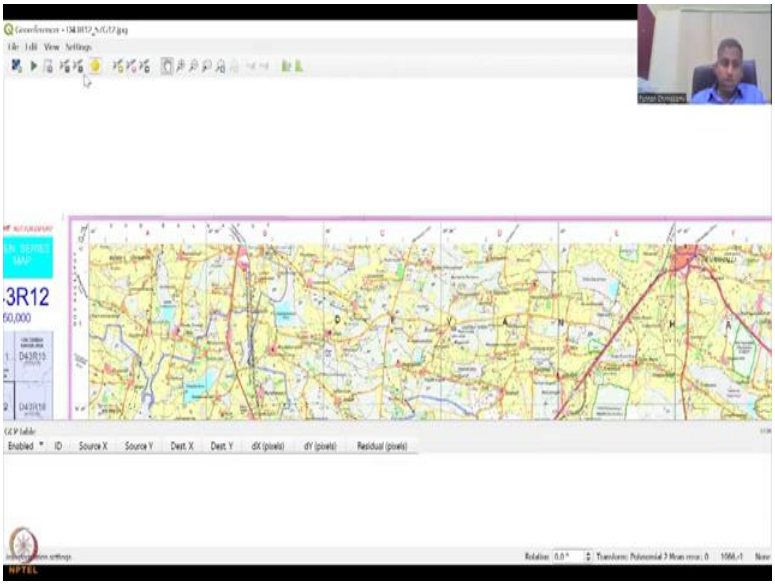
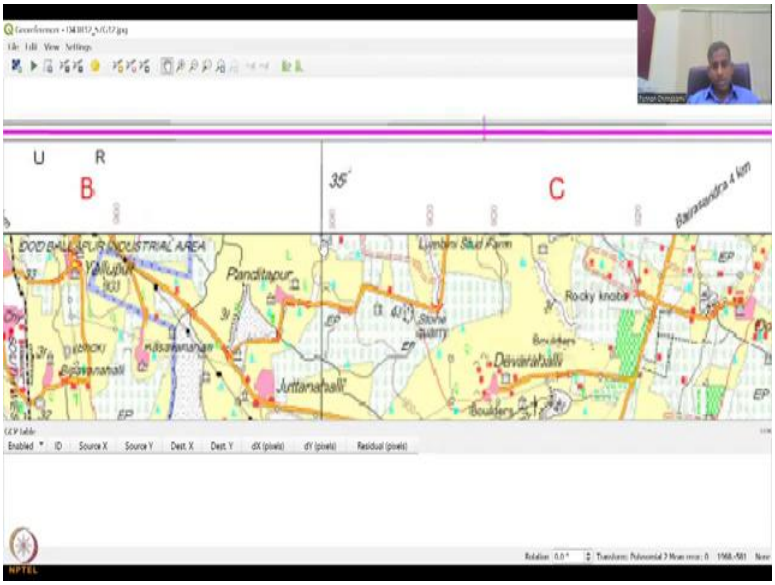
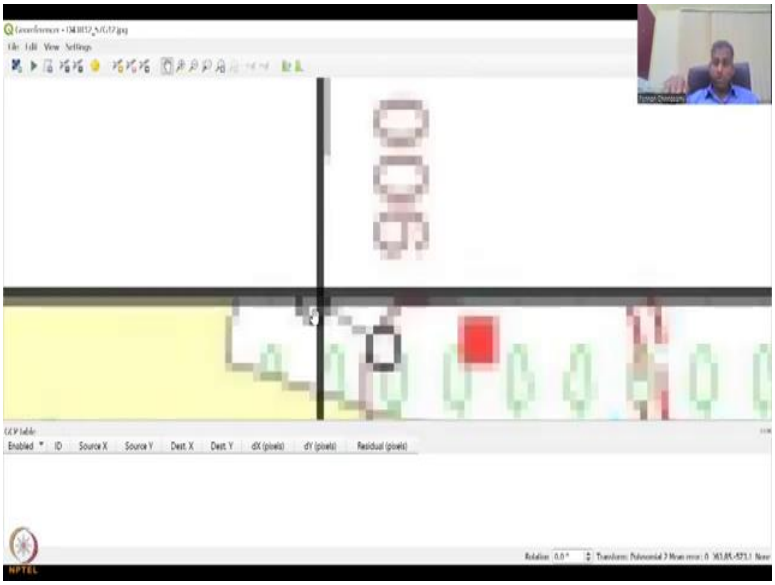
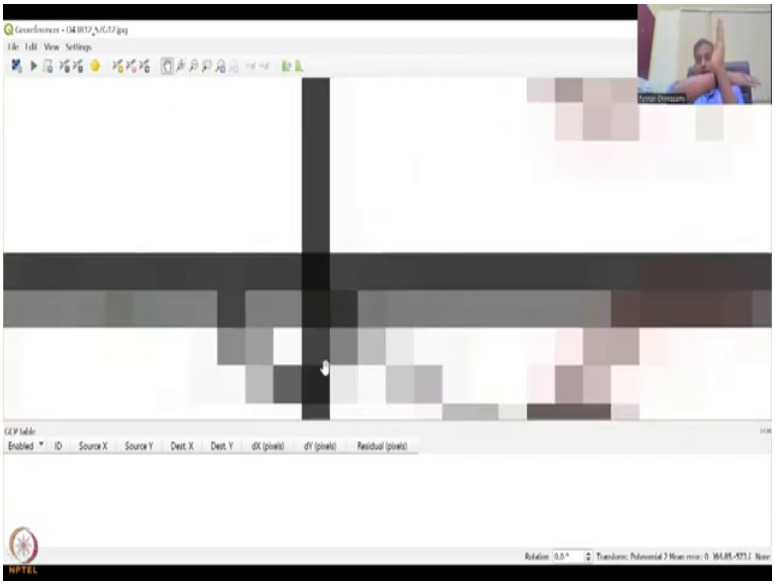








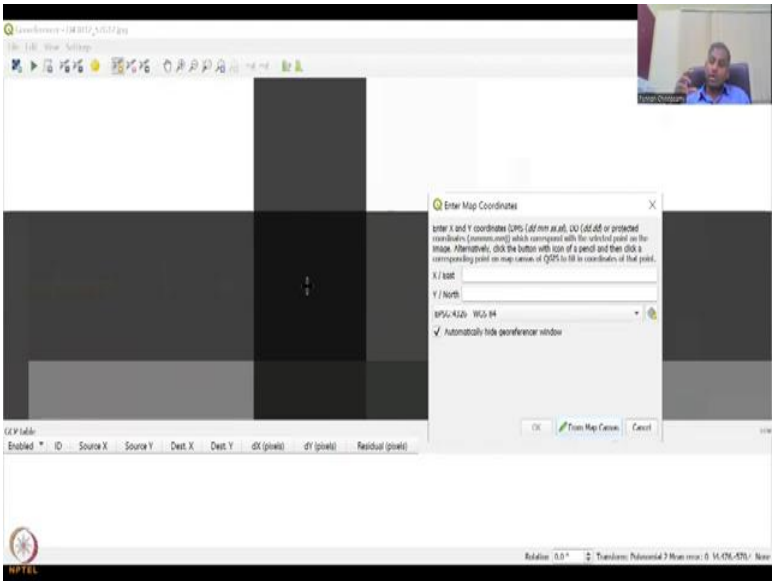
So these are the tools that are there, you can add a point or you can import from other sources, since you are learning how to do this, I am going to just add a GCP point and you can delete it or move it, based on if there is point you put is error. The best I would say is just to delete it and put it again, moving is not correct. So, first step is to identify a point where you want to location where you put a point and then zoom in to put the point.

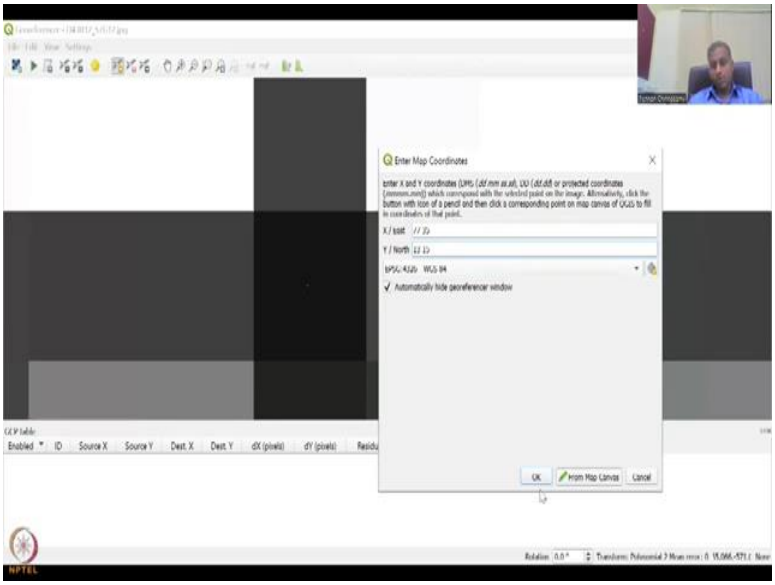
So let us do the easiest one is on the top, so let us take 6 points, 2 on the top, 2 on the bottom and then 2 in between. So, let us go at this point. So, I am going to take 77 30 line, so this is the 77 30 line, and then I am going to use the 13 15. So, this line is going to be 13 15 throughout, but I am going to shift here and take a point. The first point let us take 77 35, so 77 degrees 35 is this, 77 degree 35 minutes.

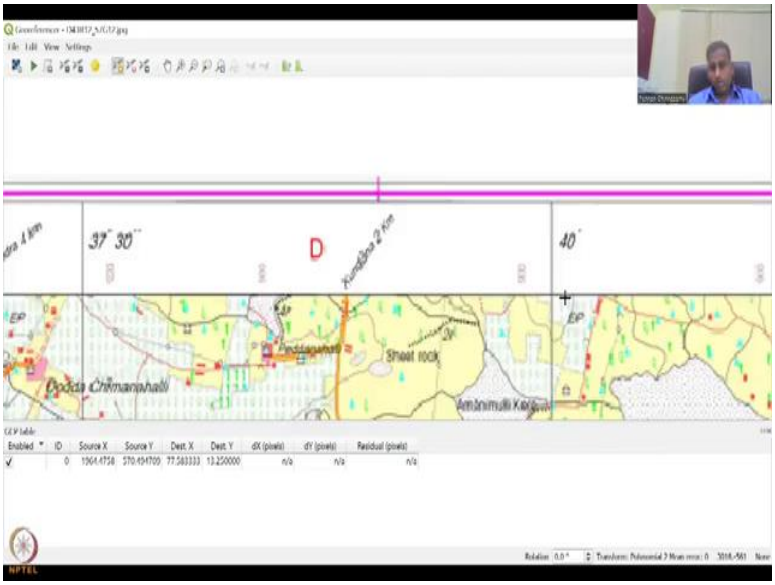
As I said you have to zoom in, you can zoom in using your mouse, you can, or this point. Let us do the mouse first. If you zoom in you see that the black line is kind of smudged because the resolution is getting bad when you zoom in, the black becomes grey, grey becomes white, etcetera, but as you know two lines when it cross it is darker there. So, you see this black pixel is dark, so you have to put a point there.

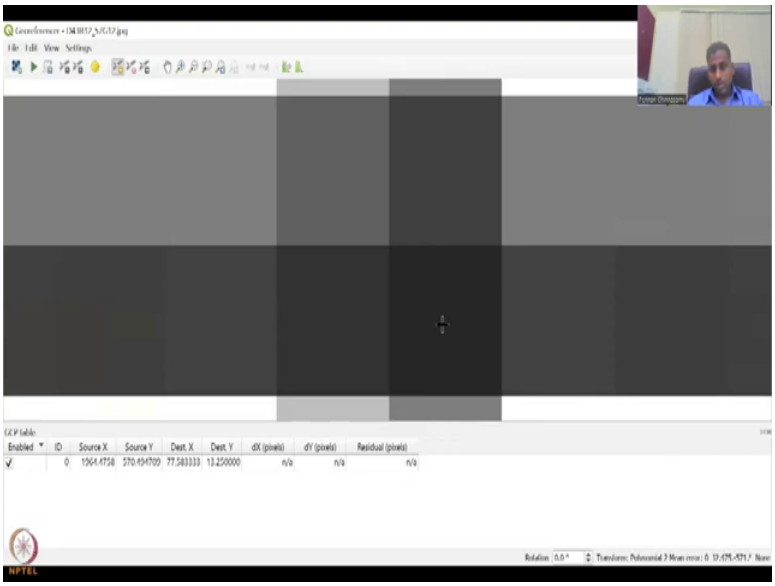
Because this represents your 35 line and then here 77 35 line, 77 degrees 35 minutes and on this side it represents 13 degrees 15 minutes. So, I am going to zoom in to that pixel. You can see the pixel and put the point in the centre. This will add more accuracy to your model. So, you see how… this you can eyeball or if you want you can take your tape and measure and put, but the model will adjust for these kind of small errors.

(Refer Slide Time: 20:28)




Enter Map Coordinates
Automatically hide georeferencer window
OK
From Map Canvas
Cancel
GCP table
Enabled
ID
Source X
Source Y
Dest. X
Dest. Y
dX (pixels)
dY (pixels)
NPTEL


37° 30'
40°
D
Sheet rock
Dodda Chimanahalli
GCP table
Enabled
ID
Source X
Source Y
Dest. X
Dest. Y
dX (pixels)
dY (pixels)
Residual (pixels)
NPTEL


GCP table
Enabled
ID
Source X
Source Y
Dest. X
Dest. Y
dX (pixels)
dY (pixels)
Residual (pixels)
NPTEL

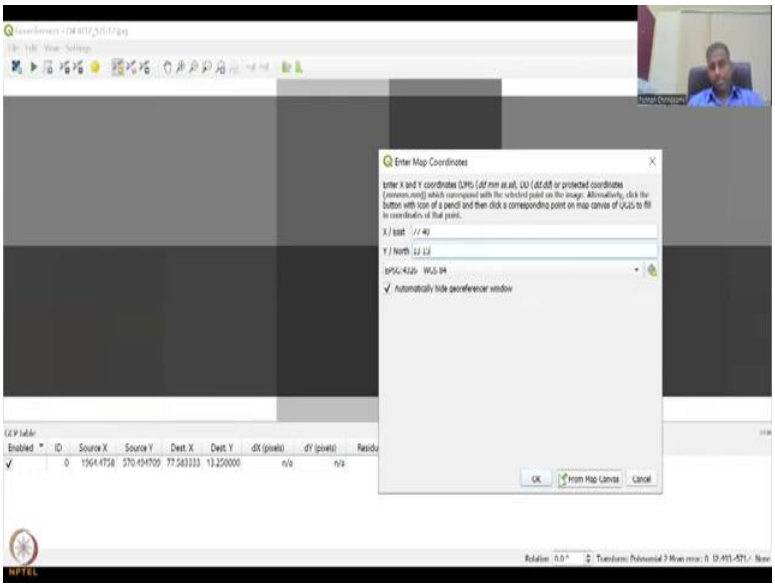
Here the type of the coordinate system is being asked, enter x and y, and all as usual your x is your latitude, which runs from top to bottom, and then north is your longitude which runs horizontal. So, here you have, since we have the degree, minutes and seconds, format on the toposheet, I am going to use that. So, if we say x east is… first point is 77, and then we will put, So, this line is 13 15.

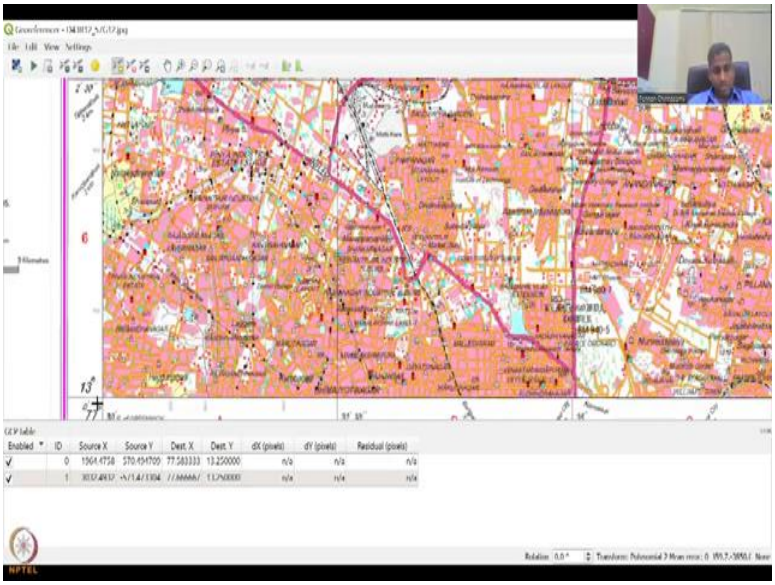
So your latitude is going to be 77 and then you are longitude is on this one, the east west, So, east north, so let us do the east first. The east is going to be your latitude, which is the top down. The top down is 77. So, we are going to put 77 and this one is 35, So, 35 space. So, look at the format, dd, so we have put 77, 35, 3 5 is 35. Suppose you have 0 3, you have to put 0 3, do not put just three, it needs a value.

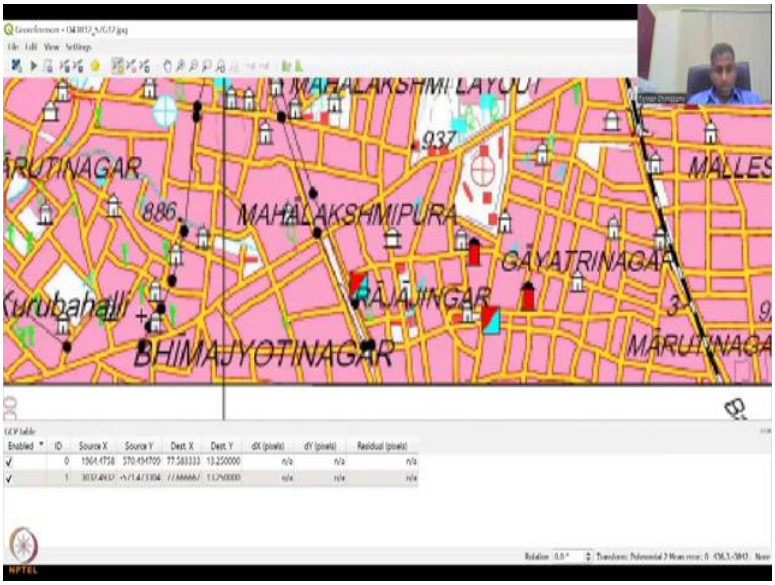
So 35 and then a space and then the seconds is 0, so you can just leave it, because 35 is enough. And then on the bottom, this line, your latitude line is there, we are going to put 1 3, because it was 13 15, so space 15. So, 77 35, 13 15, is what we are going to do, we are going to click ok to add. So, now the point has been added. It is slightly in the centre, but it is okay. Now you can zoom out. The second point, we are going to go with the same line 77 40.

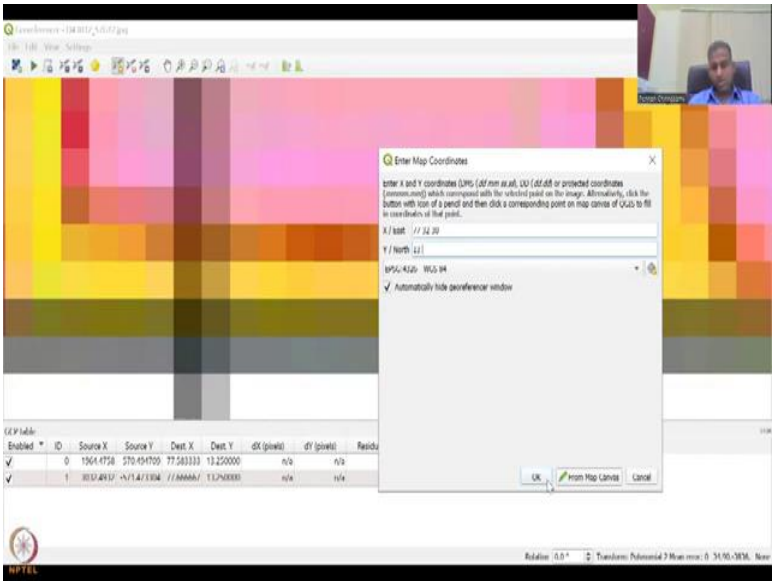
So 77 40 is this one, I am going to zoom in and this is the darkest point. So, I am going to put it in the centre and then this is a 77 40 and then I am going to do 13 15. And then we say okay. See I will use the same coordinate system as the map, So, you can change it here, but do not change it because you want the map to sit in. So, you say okay, now two points are done. So, now 4 more to go.

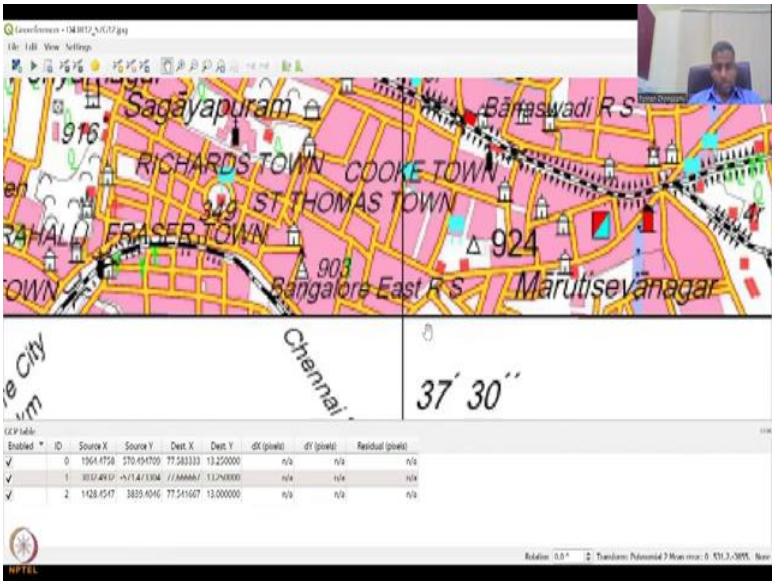
(Refer Slide Time: 23:19)

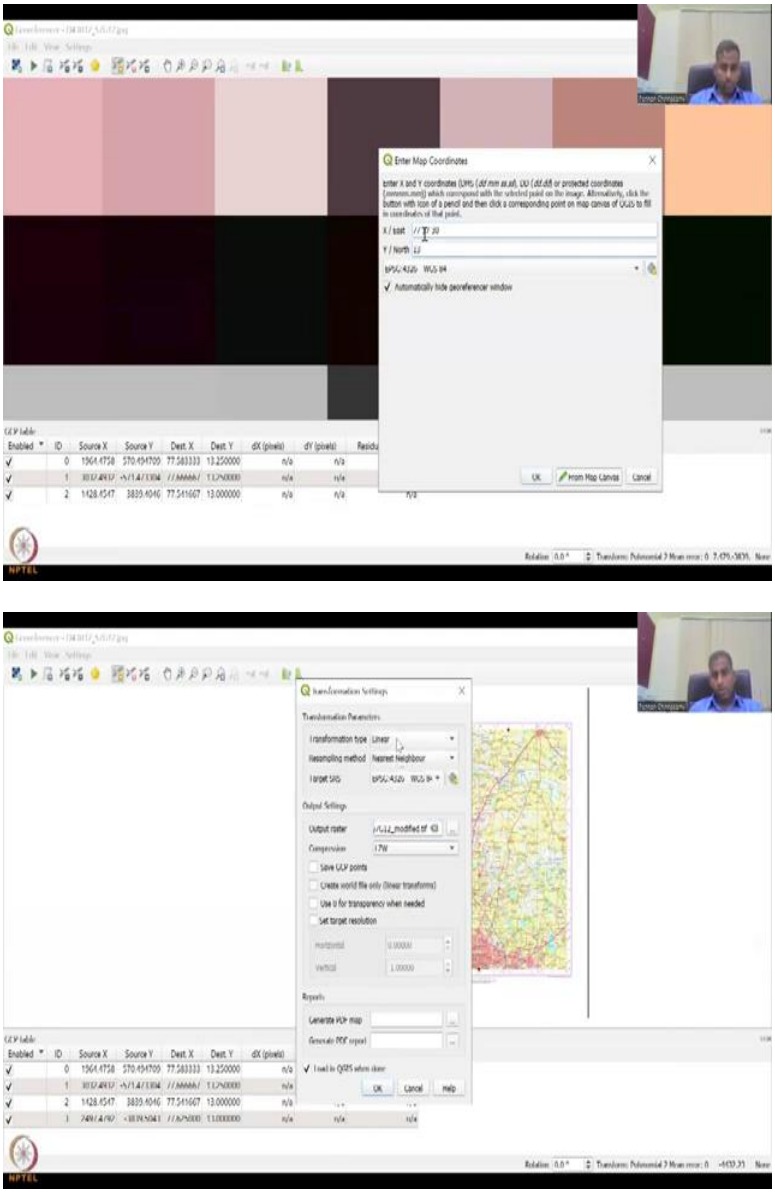





MAHALAKSHMI LAYOUT
937
886
MAHALAKSHMIPURA
GAYATRINAGAR
RAJAJINGAR
BHIMAJYOTINAGAR


Enter Map Coordinates
Automatically hide georeferencer window
OK
From Map Canvas
Cancel


Sagayapuram
916
RICHARDS TOWN
COOKE TOWN
ST. THOMAS TOWN
FRASER TOWN
924
903
Bangalore East R S
Marutisevanagar
37´ 30´´



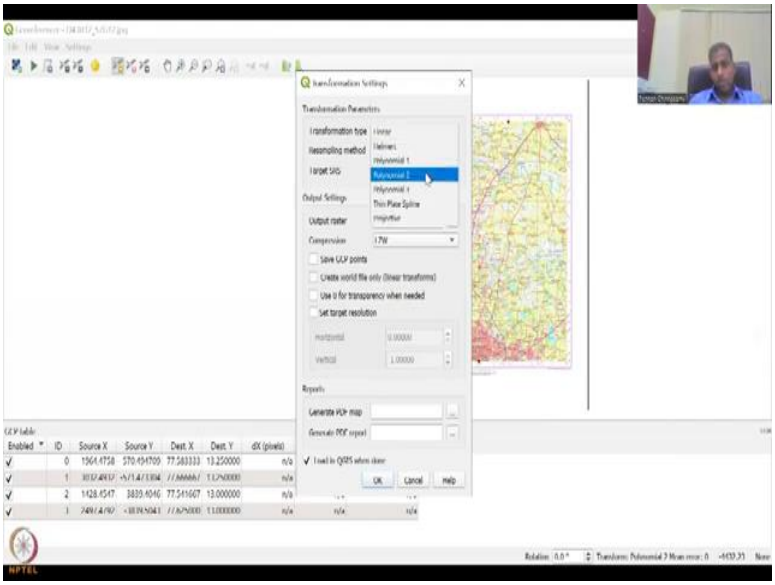
As I said two on the top we want to put, two in the bottom, So, I am going to zoom in. So, how I am zooming in is by moving the mouse in the front. So, if I move the wheel, zooming in the front, you will come down and let us now come down to this location. You can see this line is 30, 13 degrees zero and 77 degrees 30. So, I am going to go on this line, it is going to be 13 0. So, let us pick a line here with some points.

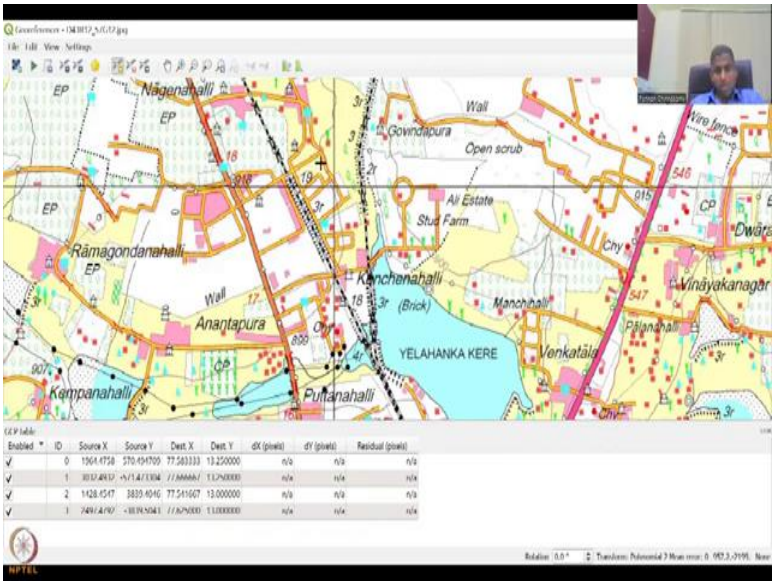
So, let us pick this one, 77 30 30, 32 30, so you see this is the darkest line. So, I am going to click here and then in the centre I am going to put 77 30 to 30 and then this is 13 0. You can just leave 13 that is fine. Then what you do is if you switch the lat and long there will be an error. So, be careful with that part. And I will quickly show you if the, if an error comes how to change it.

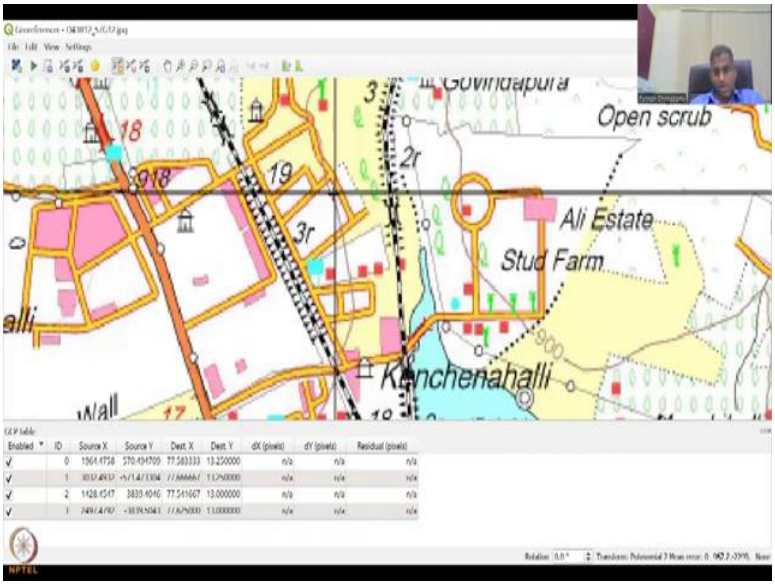
So the next point is 77 30, so I cannot move this side, so I can use the hand tool, so to pull it. And I want to do this 77, 37 30 and 13. So, I am zooming in and I see a big black line, which is good enough for me. I am going to zoom in to the centre and then put 77 37, 30. And then this is 13 0. And then I put okay. So, now if you can see we have the 4 points, the four points have come here and then the dx dy pixels residuals these are errors.

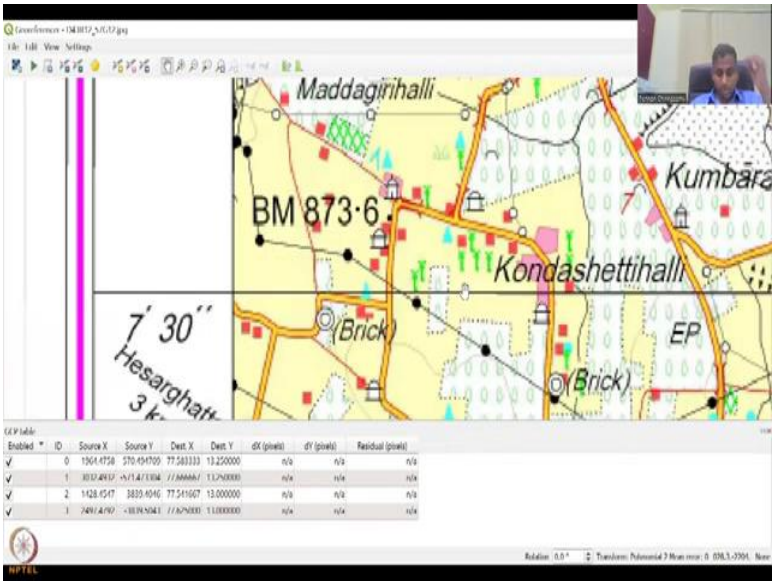
Once you set up the transformation you can find if the errors are there. Now there are multiple linear and other things that can come, but I will tell you which one to use. Polynomial 2 is good, nearest neighbour, the target coordinate system is the same that we want and then the output raster, you can say a name and store it compression method LZW, etcetera. But we will come back to that after we do two more points.

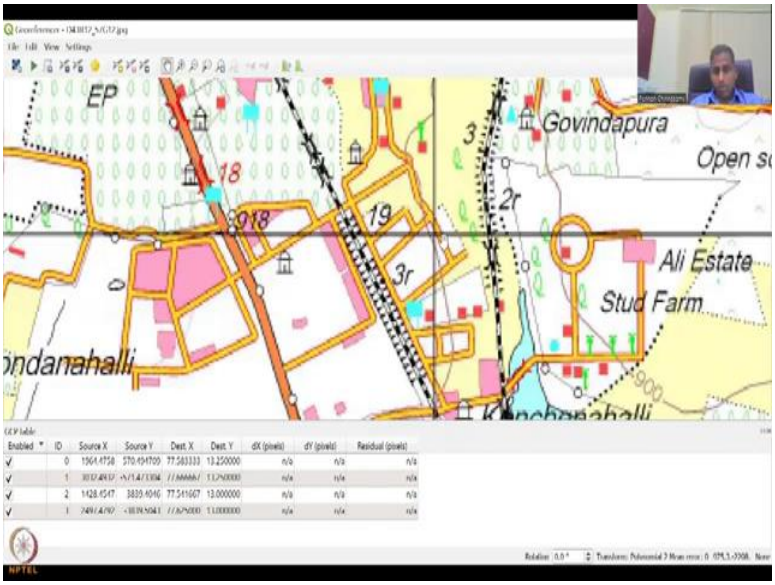
(Refer Slide Time: 25:42)

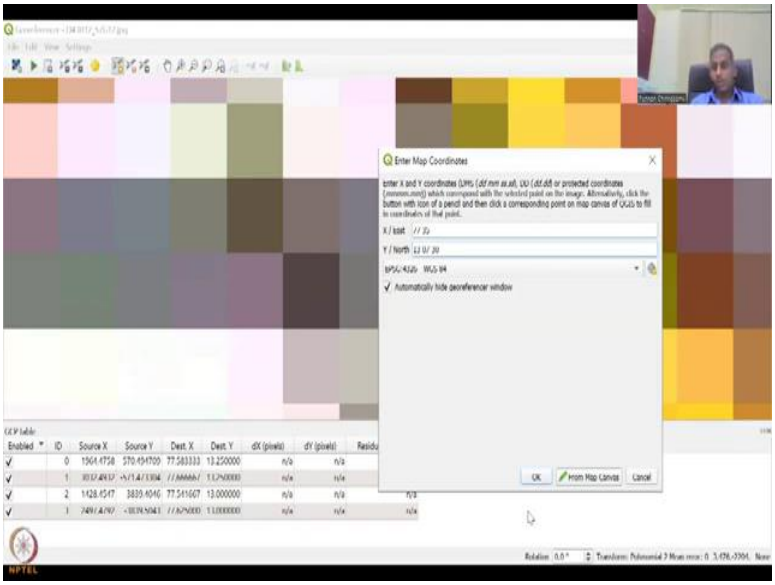



Nāgenahalli
EP
Govindapura
Wall
Open scrub
Ali Estate
Stud Farm
Rāmagondanahalli
Kanchenahalli
(Brick)
Manchenahalli
Anantapura
YELAHANKA KERE
Venkatāla
Vināyakanagar
Kempanahalli
Puttanahalli
Chy
CP
Dwāra


Govindapura
Open scrub
Ali Estate
Stud Farm
Kanchenahalli
Wall


Maddagirihalli
BM 873·6
Kumbara
Kondashettihalli
7′ 30″
(Brick)
EP
(Brick)


EP
18
918
19
3
Govindapura
2r
3r
Ali Estate
Stud Farm
ondanahalli
900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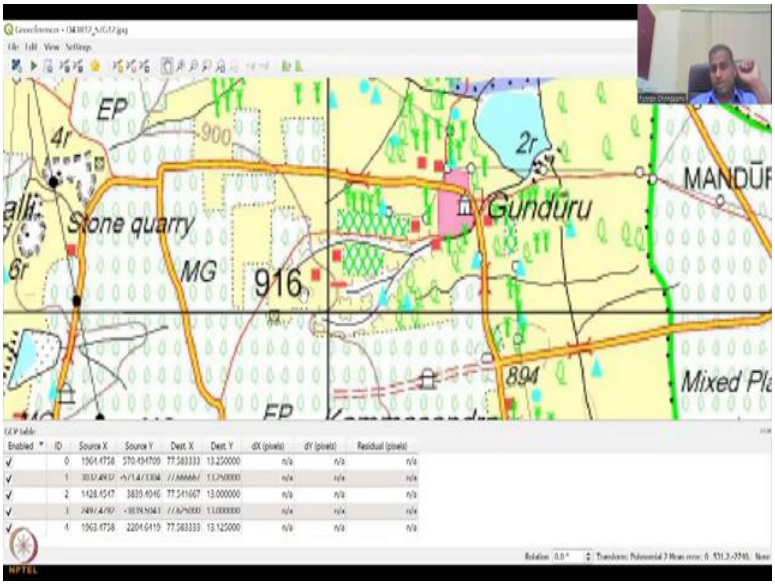
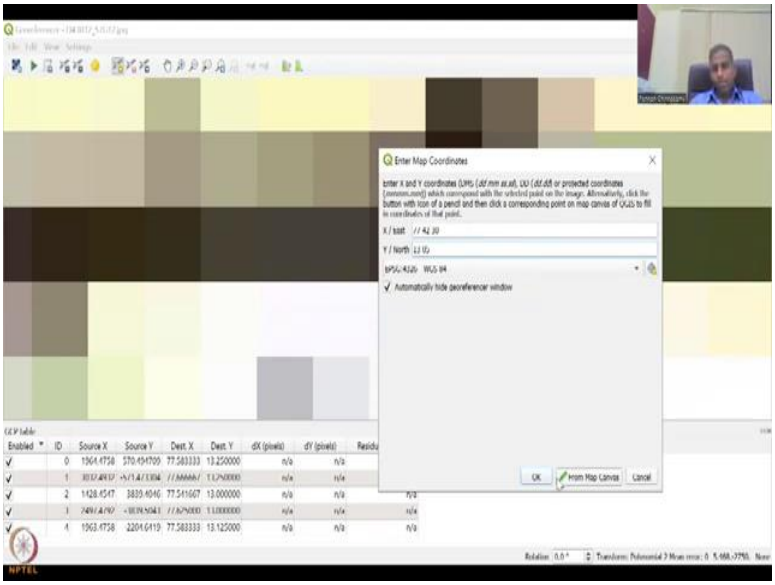
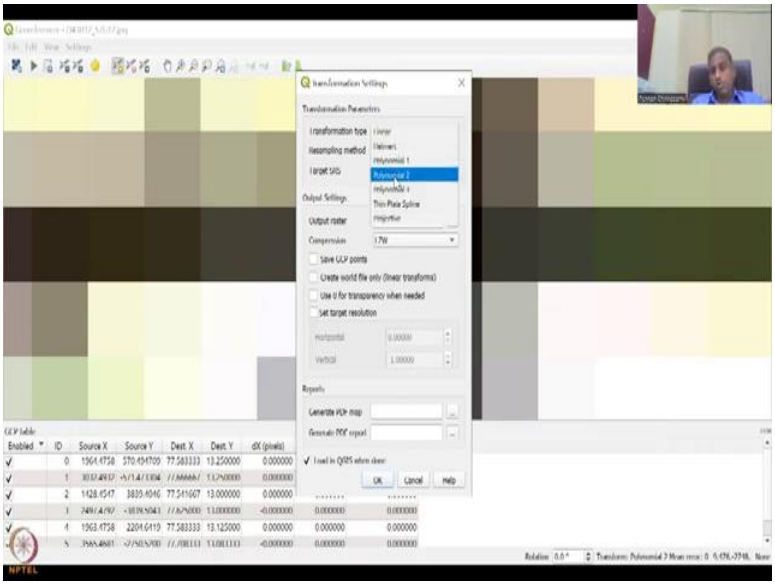
OK
From Map Canvas
Cancel


EP
4r
900
2r
Stone quarry
Gunduru
MG
916
6r
894
Mixed Pla





So I am going to zoom in to this area because this is the area we want to map the water body. So, this is Yelahanka Kere, which is a lake and I am going to go on top of here and find the location. So, this location is what I am going to put, this line is what I am going to put. How do I know what is the coordinates for this line? I will have to hold my pointer on this line, pull on this side first and then I see that it is 7 30.

So 70 13, 7 30, so this line is 13 degrees 7 30. And then I will go back to that again, the lake, make sure you do not pull up and down that mistake you can do it, I missed it here, it is here. We are here, so now we go up to find the line on the top, so we find it to be 35. So, 77 35, so I am going to come down again to that point. I have noted it in my book. Now I go to Yelahanka Kere and this is the location where I want the point of these two.

The more darker one I would say is this line, so I am going to put it right there and call it 77 35. Whereas this is 13 7 and 30. Let me click ‘ok’. Now after you click ‘ok’ what happens is, one more point we will take, for the method that we are going to use we need at least 6. So, another one I am going to look is at 42 30. Why I have taken that line is somewhere here I want another point, which I do not have.

And when you are zooming in you should look at certain points that you could use for your calibration or eyeballing. So, that will be easy for you. For example, on this you can say this is a sheetrock and near sheetrock I can put a point or this one is good. So, 916 is there, near 916 I am going to take this point. So, 916 is my, visually I want to use that point and then from here I am going to look in the left to see what is the longitude.

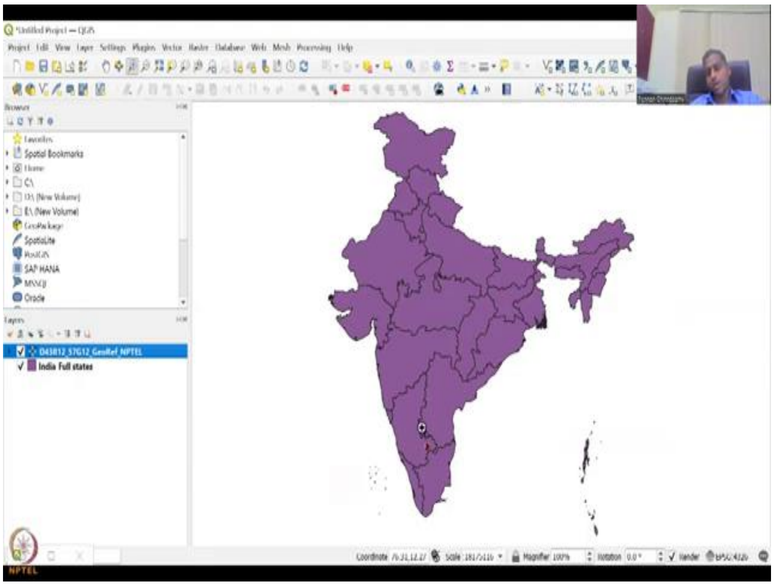
So, it is 13 degrees 5 minutes. So, I am going to put 13 degrees 5 minutes for the 916, and then on the top it is going to be 42 30, So, it is 77 42 30. So, let us put that value. Again I do not know where it is, so I am just going to see 916, there it is. I have made a note of the point. You see it is beautifully dark. So, this is the centre of the pixel. I am going to go here and type 77 37 and 30, and then down it will be 13, oh sorry, it was 77 42.

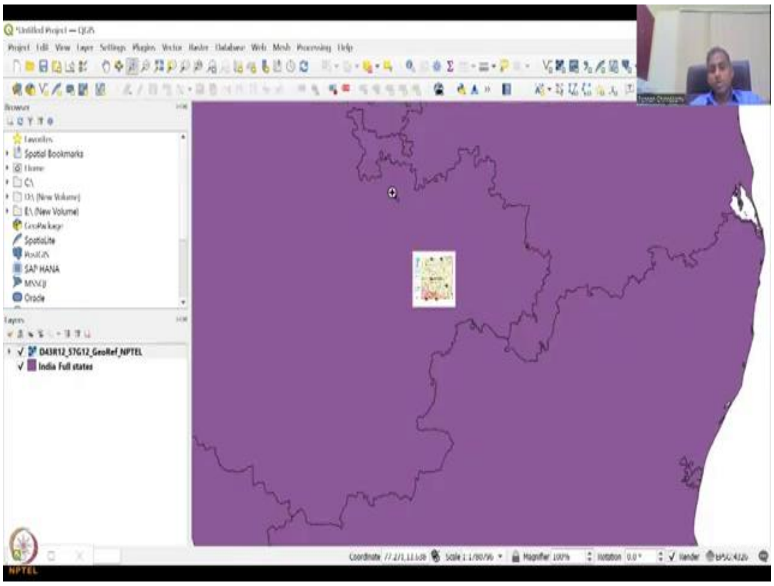
42 30 and then down it was 35. Yes, then you say ‘ok’ and then you could see that these populate. So, 6 is needed, 6 we have. Now we have dx dy residuals. So, now it is all 00. Trying to show that the error is very, very small and you can go to the cycle mark or the gear mark where you have to select which type of transformation you want. As I said for this particular map toposheets polynomial 2 is good.

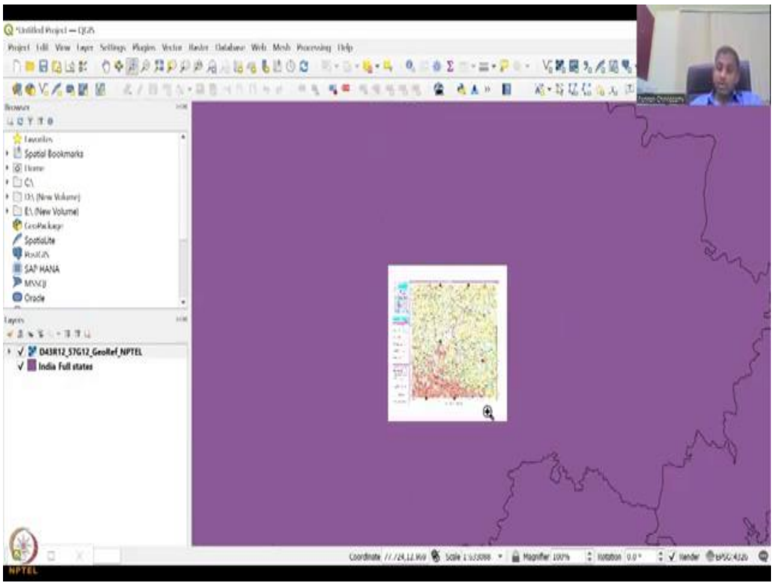
It is a method of transforming and applying the lat longs throughout and then you have the nearest neighbour method or multiple resampling method, we will take the nearest neighbour method and then here is where you want the output raster to be, I am going to call it as the D3412 is fine geotag. So, geotagged or georeferenced and then NPTEL. Do not make it too big, it will not save.

And then there are a lot of compression methods, the best one known is the LCW, so let us keep it and then the others can be a default. Load the map when it is done, you can have it. Do not save with GCP points for now, we have to see how the error is. Once this part is done you will click the play button, which says it is going to run. So, now the progress is going on and beautifully you could see that still is 0 because it is exponentially very, very, very small. Once it loads, now it will load onto the map.

(Refer Slide Time: 30:48)







So now if you see that the whole of India is there, but suddenly something is happening here, something has happened here, you can zoom in to see that beautifully our map is now placed inside of Karnataka. To make sure that it is more accurate, you can open this map in Google Earth Pro or Google Earth Engine, which we will do in the next class, but for now we have successfully downloaded a toposheet and then found where accurately the points can be put.

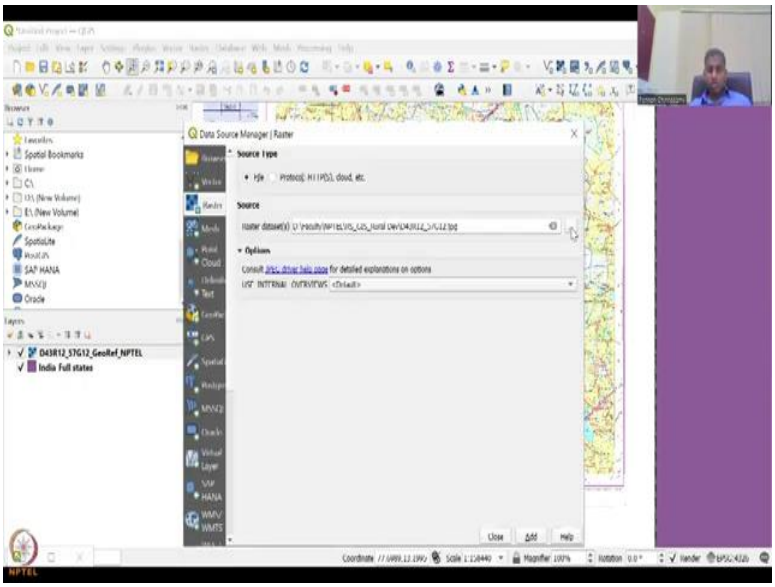
Those are called anchor points or GCPs and then we also look into how many points, 6 points, so you can see how the 6 points have been captured. And now once the points have been captured your map is ready to be used in GIS. So, how this image can be used in GIS? We will see in the next class, until then please try multiple times. Do not switch your lat and long east and longitude, be careful with the naming.

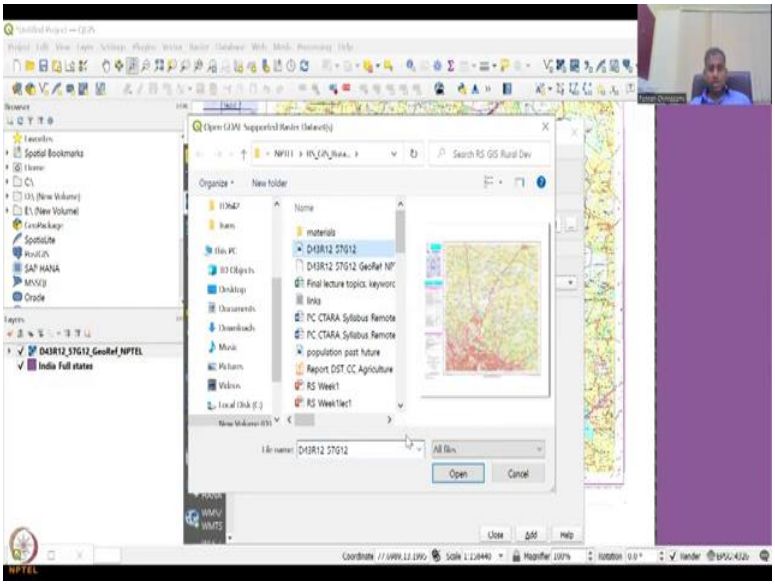
Your east x east which is given in the georeference tool is latitude. It is not x axis runs like this, x can also run like this, so x is your latitude and then your y is your longitude and then you zoom in to that line which intersects and then find your exact centre. So, if you look at this we have put our points very carefully in the centre and then you can move and stop that again the map has come pretty well.

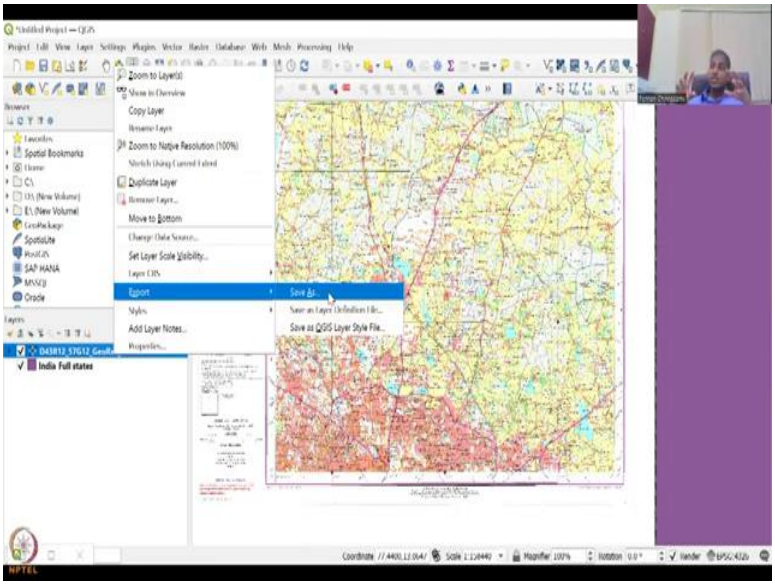
At least it is in Karnataka for now, let us look at it how good it is in the next class. Next class we will look at it in Google Earth Pro. Google Earth Pro is a very easy software to use. It is free, open source, so please download it and then use it. We do not promote any software here other than open source softwares.

So, since it is open source, it is available for public. Please try to use it if needed. For now I have shown you how to download a particular map from government of India's database and look at it in GIS interface. So, initially it was an image, but now it is georeferenced.

(Refer Slide Time: 33:11)






Zoom to Layer(s)
Show in Overview
Copy Layer
Rename Layer
Zoom to Native Resolution (100%)
Stretch Using Current Extent
Duplicate Layer
Remove Layer...
Move to Bottom
Change Data Source...
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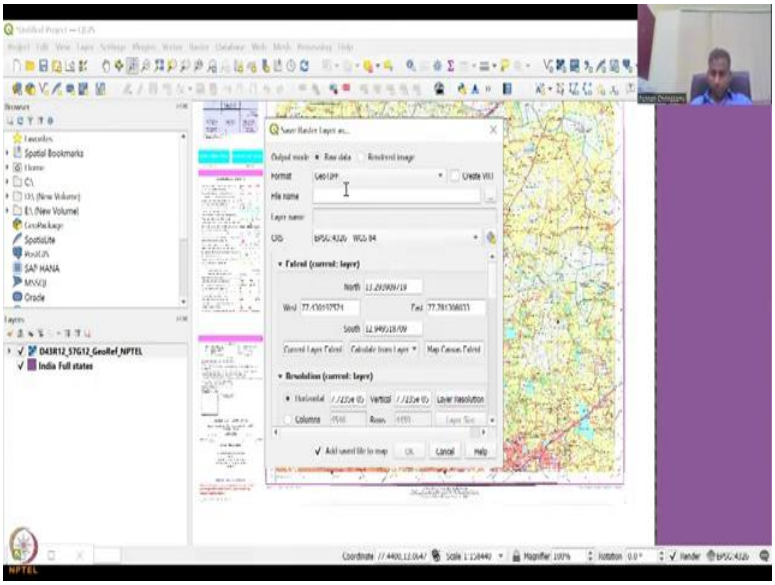
Save As...
Save as Layer Definition File...
Save as QGIS Layer Style File...
India Full states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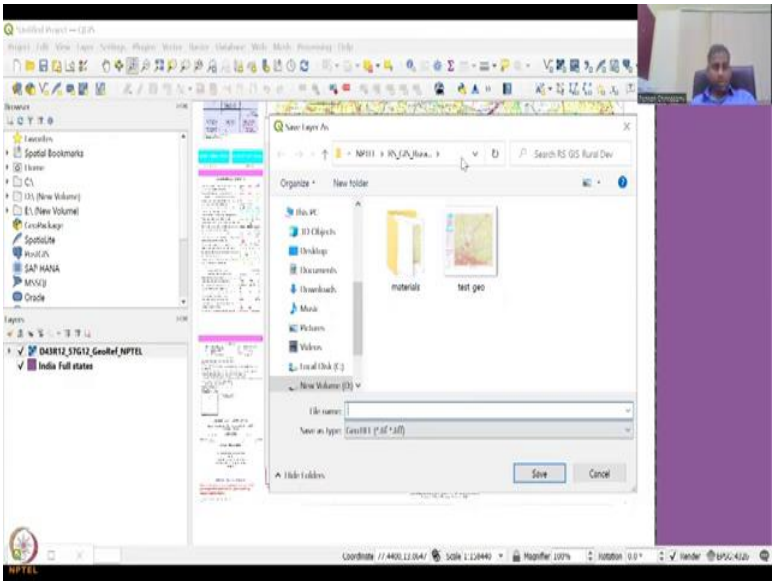
Format
File name
Layer name
CRS
Extent (current: layer)
Resolution (current: layer)
Add saved file to map
OK
Cancel
Help
India Full states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materials
test geo
File name:
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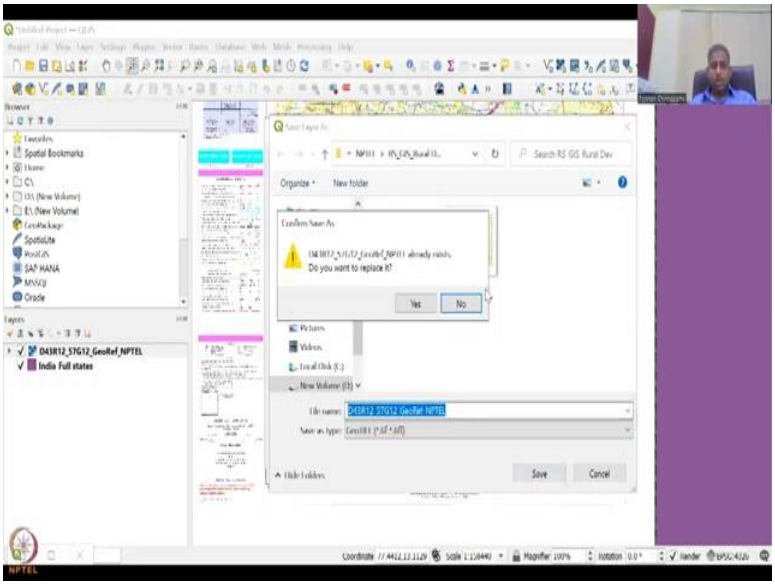
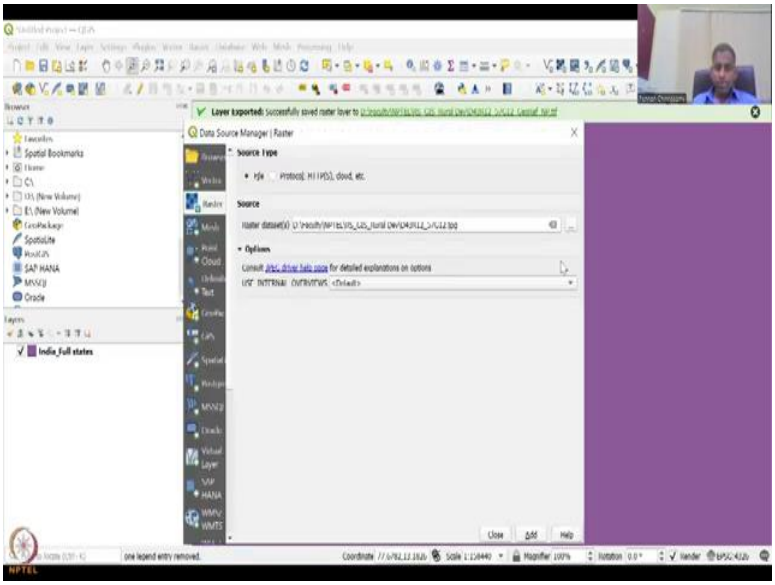
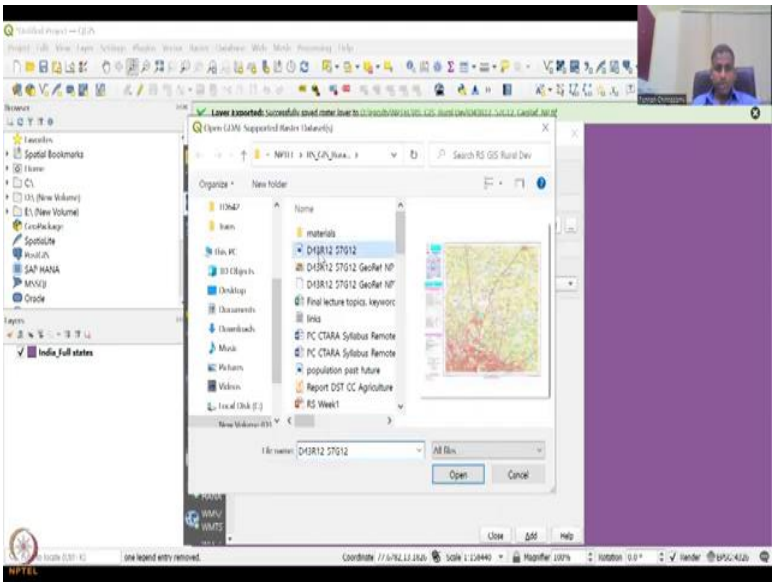
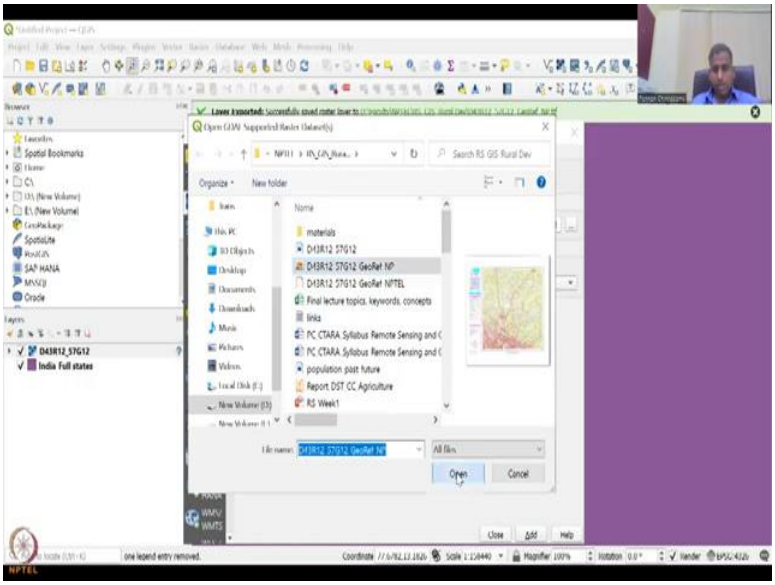
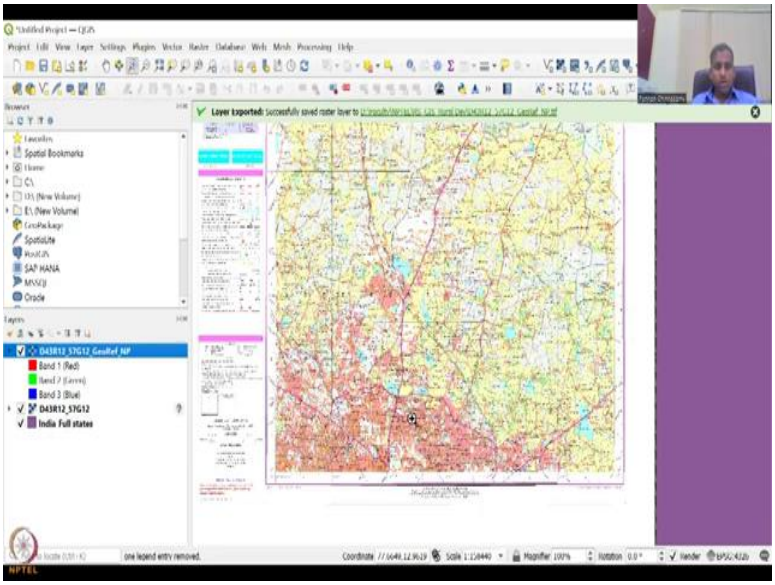
India Full states

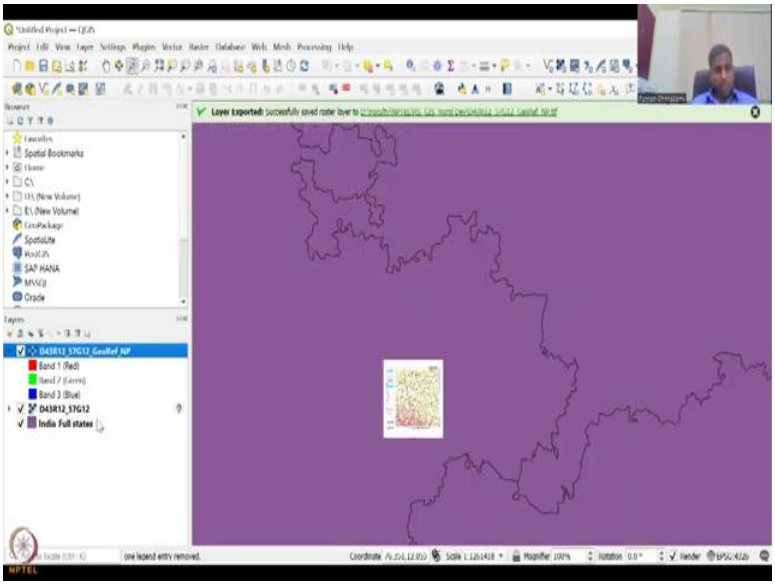

Confirm Save As
Do you want to replace it?
Yes
No
Save
Cancel

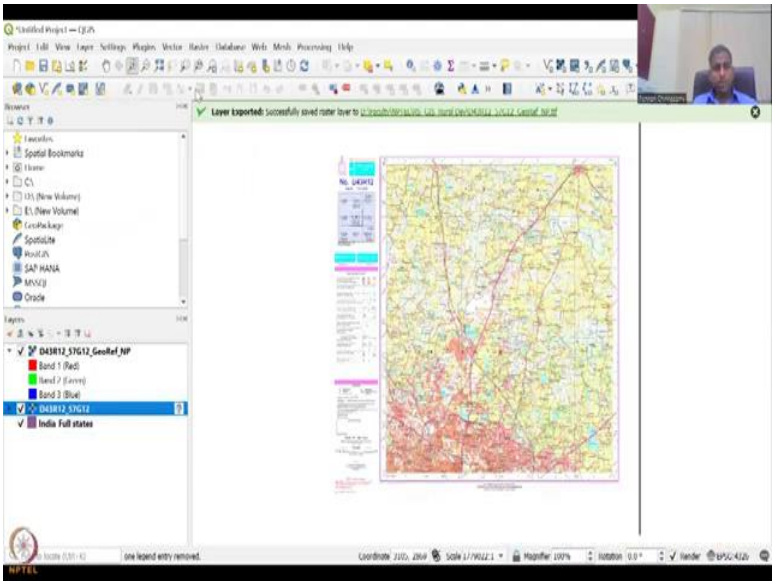

Layer Exported: Successfully saved raster layer to
Data Source Manager | Raster
Source Type
Source
Options
Close
Add
Help

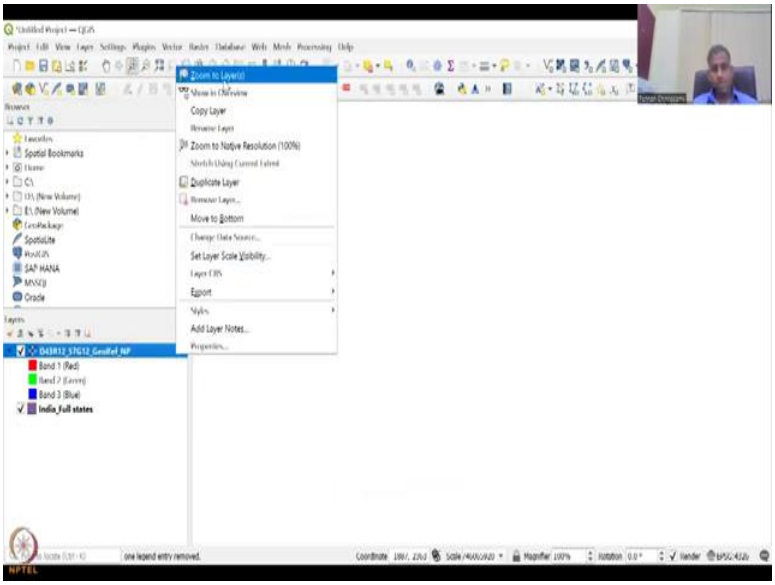

Open GDAL Supported Raster Dataset(s)
Search RS GIS Rural Dev
Organize
New folder
Open
Cancel
Close
Add
Help

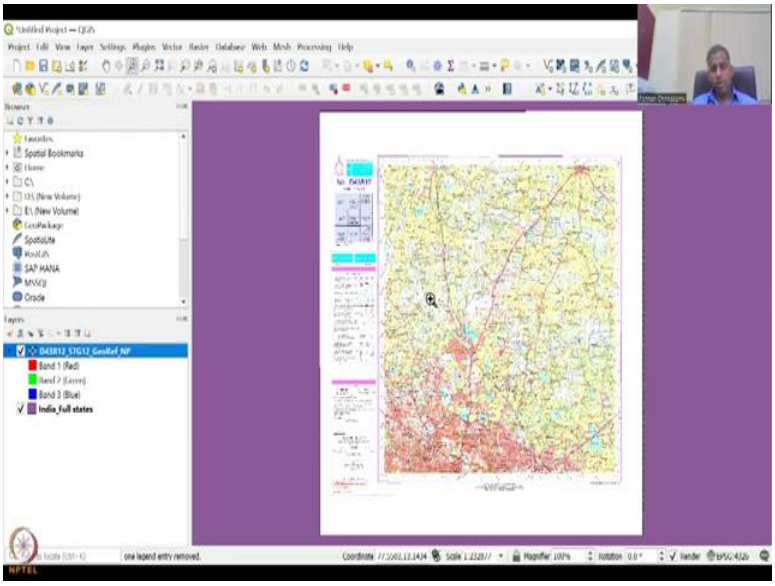

Open GDAL Supported Raster Dataset(s)
Organize
New folder
materials
D43R12 57G12
D43R12 57G12 GeoRef NP
D43R12 57G12 GeoRef NPTEL
Final lecture topics, keywords, concepts
links
PC CTARA Syllabus Remote Sensing and
PC CTARA Syllabus Remote Sensing and
population past future
Report DST CC Agriculture
RS Week1
File name: D43R12 57G12 GeoRef NP
All files
Open
Cancel
Layer exported: Successfully saved raster layer to
D43R12_57G12
India Full states
one legend entry removed.
NPTEL


Layer exported: Successfully saved raster layer to
D43R12_57G12_GeoRef NP
Band 1 (Red)
Band 2 (Green)
Band 3 (Blue)
D43R12_57G12
India Full states
one legend entry removed.
NPTEL


Layer exported: Successfully saved raster layer to
D43R12_57G12_GeoRef NP
Band 1 (Red)
Band 2 (Green)
Band 3 (Blue)
D43R12_57G12
India Full states
one legend entry removed.
NPTEL


Layer exported: Successfully saved raster layer to
Spatial Bookmarks
Home
C:\
D:\ (New Volume)
E:\ (New Volume)
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
D43R12_57G12_GeoRef_NP
Band 1 (Red)
Band 2 (Green)
Band 3 (Blue)
D43R12_57G12
India Full states
one legend entry removed.
NPTEL


Zoom to Layer(s)
Zoom In Overview
Copy Layer
Rename Layer
Zoom to Native Resolution (100%)
Stretch Using Current Extent
Duplicate Layer
Remove Layer...
Move to Bottom
Change Data Source...
Set Layer Scale Visibility...
Layer CRS
Export
Styles
Add Layer Notes...
Properties...
Spatial Bookmarks
Home
C:\
D:\ (New Volume)
E:\ (New Volume)
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
D43R12_57G12_GeoRef_NP
Band 1 (Red)
Band 2 (Green)
Band 3 (Blue)
India_Full states
one legend entry removed.
NPTEL


Spatial Bookmarks
Home
C:\
D:\ (New Volume)
E:\ (New Volume)
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
D43R12_57G12_GeoRef_NP
Band 1 (Red)
Band 2 (Green)
Band 3 (Blue)
India_Full states
one legend entry removed.
NPTEL

To showcase it I am going to open the initial image again, I am going to go to the DSR. So, but before that one more thing you need to do is right click, save or export, export as layer, why, because as I said in 2GIS it saves your memory by running it on the fly and putting it in the cache bin. Cache memory will be deleted once you delete this or close this program. So, please save it, So, I am going to save as, the same name can be used.

And what type of format, geotiff, all these formats are there, all these have geolocations plus data. So, we will keep it with geotiff which is mostly the common method used. The file name you can give is, you have, the same name we can use. So, I am going to copy paste this name again. So, just let us do it again. I am just going to right click to copy the name, and then same name I can use, so right click export, save as, go to the same thing, click your folder.

I am going to click the folder, I am going to save, it says itis already… No, you can save at georeference NP. NP for NPTEL and then geotiff is being same. All the others can be default. You can say add save file to the map, we say 'ok'. Sometimes it does not store it. In this time maybe it has stored it which is also good. And now we have the map. So, I am going to remove this for now. And then this is Karnataka again and you have the GCP points.

If you close the transformation the GCP points will go. If you want you can save it. So, it is asking 'do you want to save the GCP points?' we can discard it because we already have finalized the model. So, now I am going to go to data again, I am going to click here. This is the initial image. I am going to open, add and then I am going to also open the georeference GPNP, So, it is a zip file. Let us open it and close.

So now when I add the zip file it opens here, but where is this file. This is the original file. So, you would see that if I zoom out you can see the zoom to layer, it is here and if I do this full extent, you can see India here. So, India is here, whereas your Karnataka map which was not georeferences here, So, I am going to close this. So, if I know which one it is, by right click or click button here, So, I am going to remove it, we do not want it.

And then I am going to zoom to this layer and you can find it in India now. So, in India this layer is there. How we are going to use it for data collection? We will see in the next class. Until then I hope you try this exercise. I will see you in the next class. Thank you.