Remote Sensing and GIS for Rural Development
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Indian Institute of Technology, Bombay
Week - 4
Lecture no. 05
QGIS tutorials for vector analysis and data searching

Hello, everyone, welcome to Remote Sensing and GIS for Rural Development. This is week 4, lecture 5. In this week, we have been looking at the data types for GIS and we have focused on vector data type in this week's lecture. Most of the data that we get from government resources and observation data is in the form of point, line or polygon. And that data is easily converted into a vector database in GIS.

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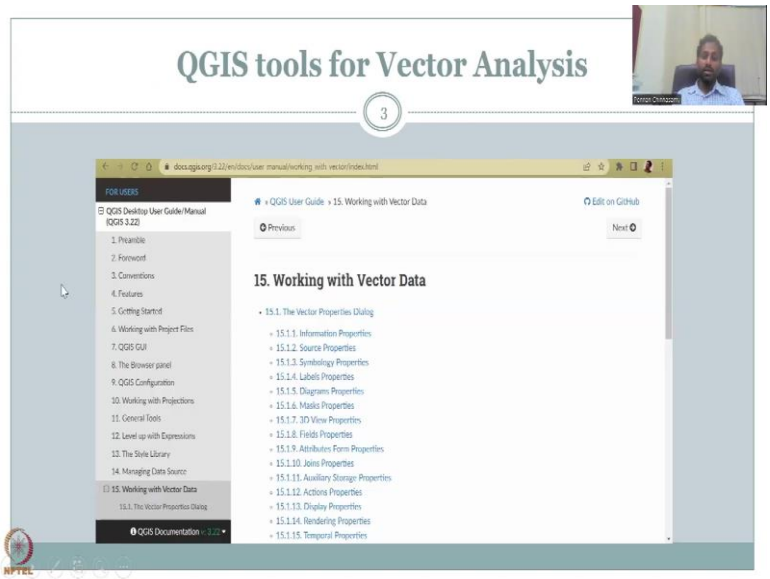

So, moving on, we have seen the panel of QGIS. And we also looked at some major tools that we can use for vector analysis. Some examples were given as in buffer width. And the use of these tools were also discussed. For those who have to get more introduction of QGIS tools, I will share today's lecture time in looking through the documentation of QGIS, especially for vectors.

So, these two links I have already given in the previous day's lectures. And I hope you had time to look at these links. These are the same links that we use to read about QGIS, look at the forum's, log in and create questions, wait for answers etcetera. Now, we will look at specific documentation that we can use for better analysis in QGIS. Once we click this, and through some steps, we will arrive at this web page which talks about working with vector data. So, let us check it out. I am going to click this link. It will open page I will have to share the page.

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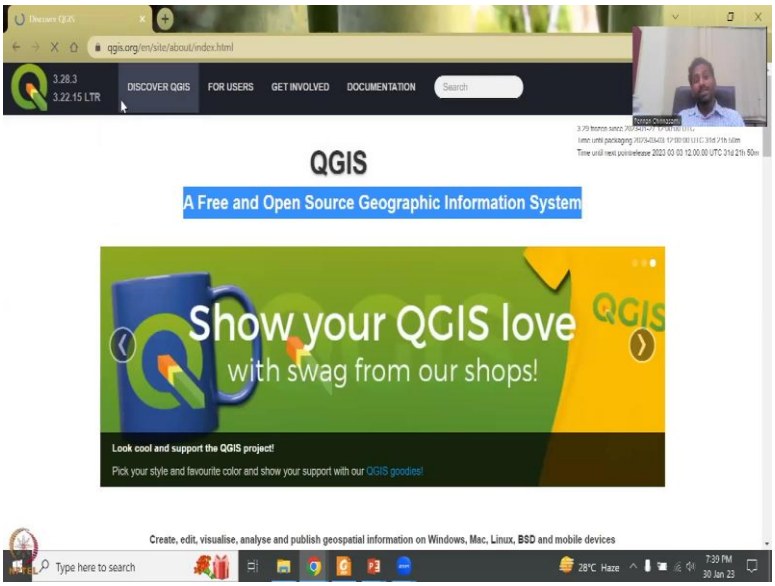

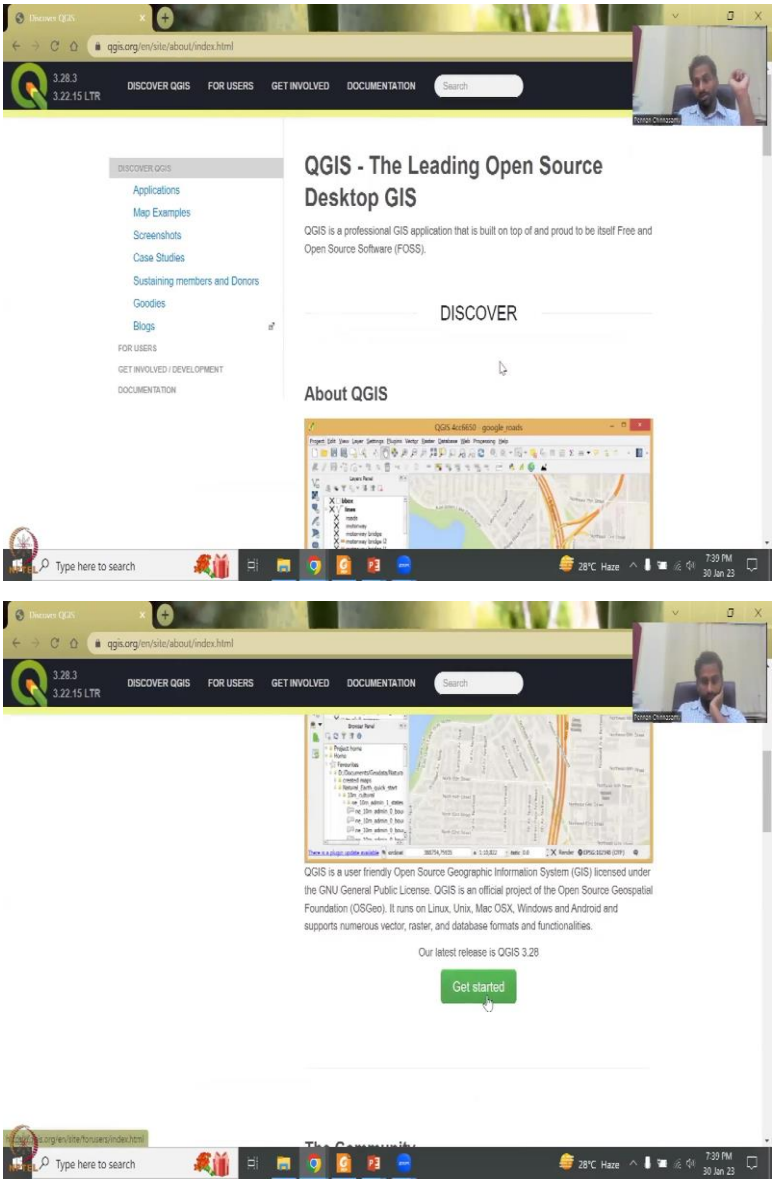

Yes, so in this page, what you see is the in this page is where we went and downloaded GIS because link so you click on Discover QGIS, in the discover you can get a get started, again to remind this is the most recent version 3.28. But we had gone to the stable version, stable version has been checked long enough on the system. And so it is called stable. 3.28 will one day become a stable version when QGIS goes to 3.4 3.5 etcetera. But for now, most users find 3.22 to be more stable.

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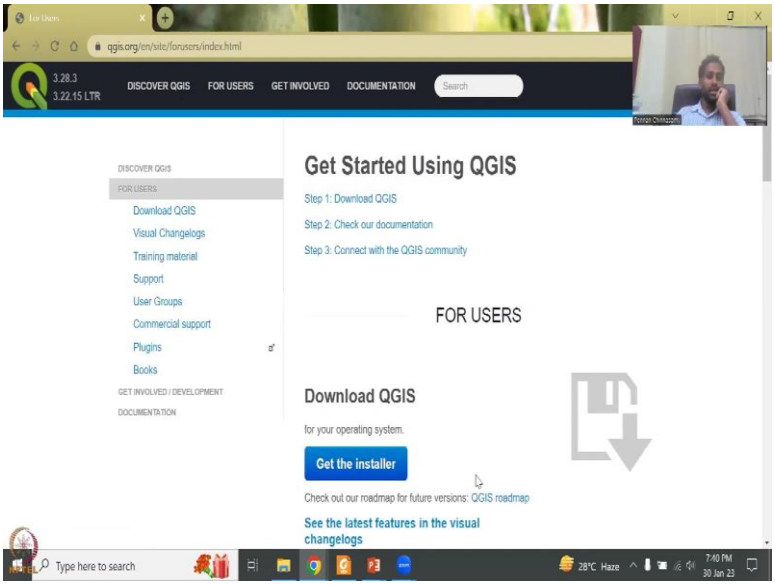

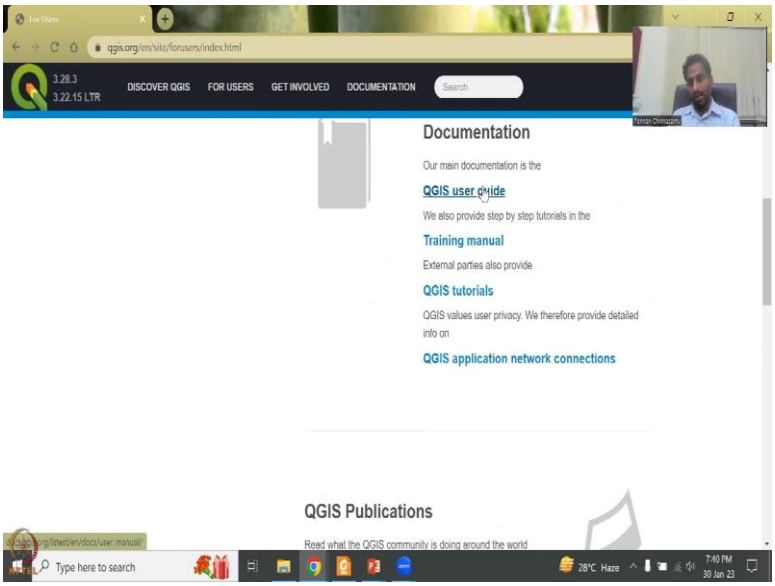

So, they use that you click on the Get Started. And then we have downloaded this checkout documentation connect with the community. So, this is where as I mentioned, you will go and discuss with community on your spatial data issues, tool issues etcetera. And then we'll get support. But we are going to go to the user guide and open it in another tab and then the menu and tutorials.

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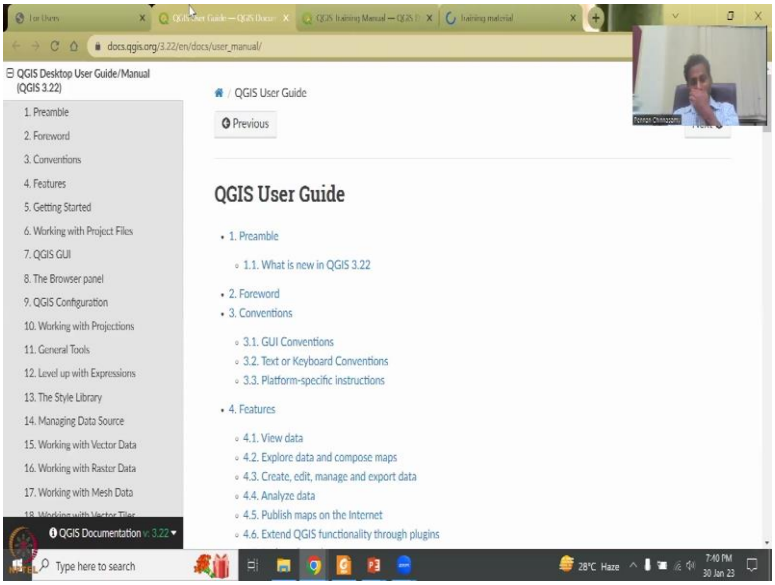
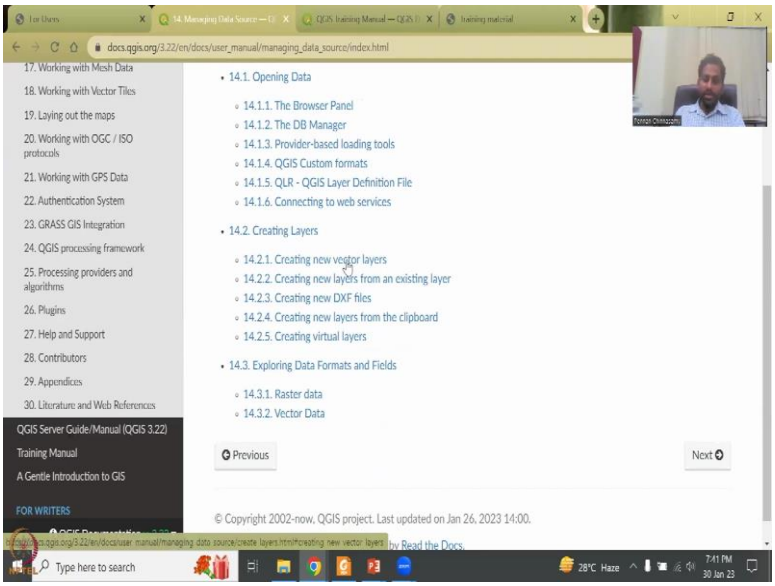
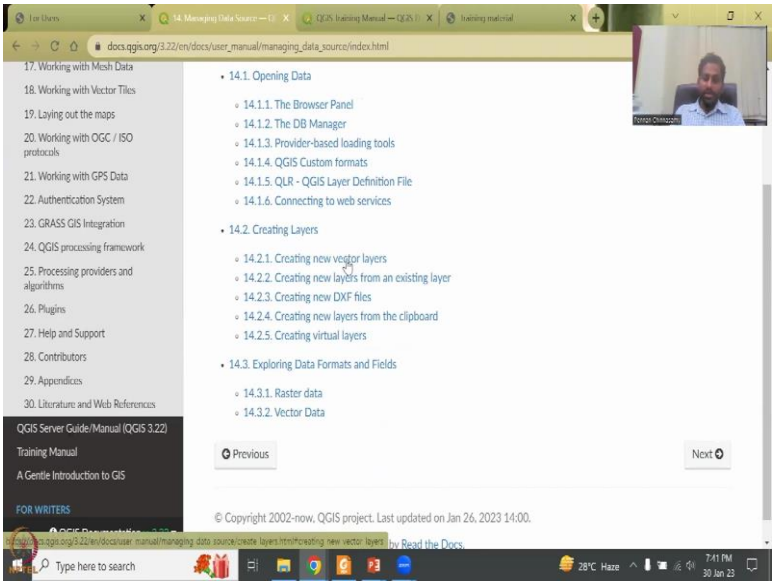
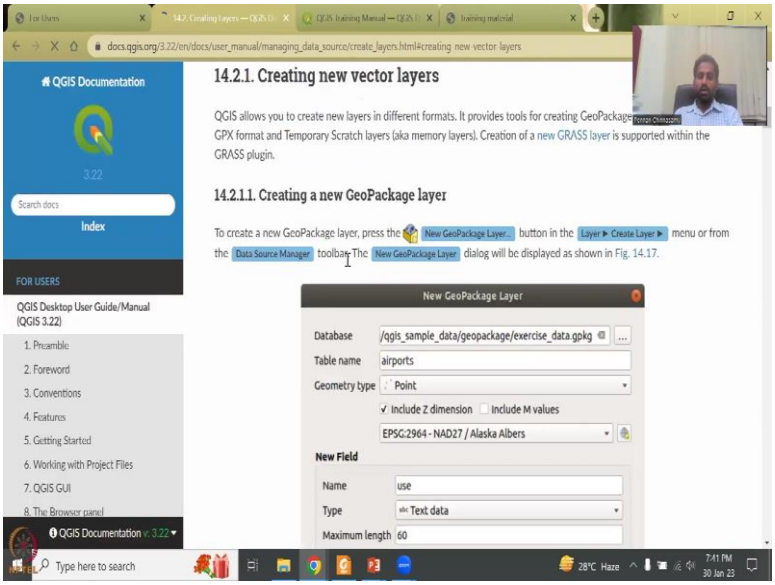


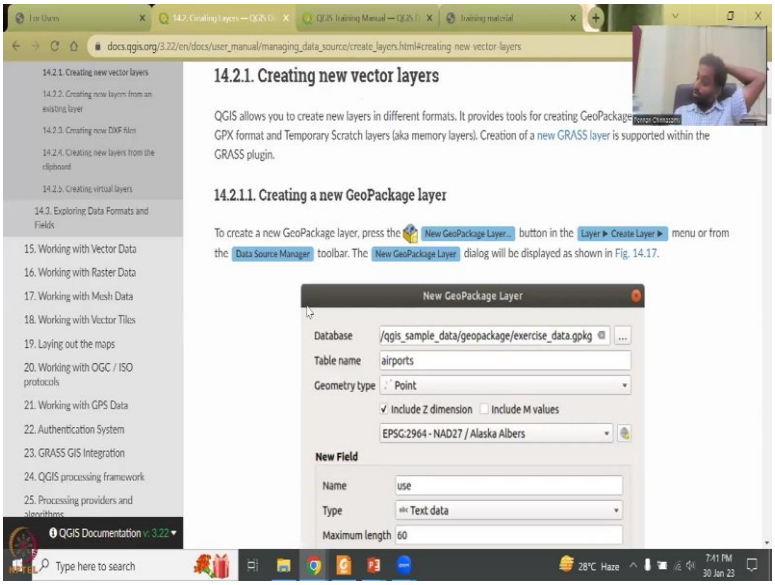


So, the first thing the user guide, the left is the contents. What we are very sure about is the data source that we have discussed. How do you do the data source, creating the data and putting it in the browser panel etcetera etcetera. Creating new vector layers is what I would like to go through here.

(Refer Slide Time: 5:13)







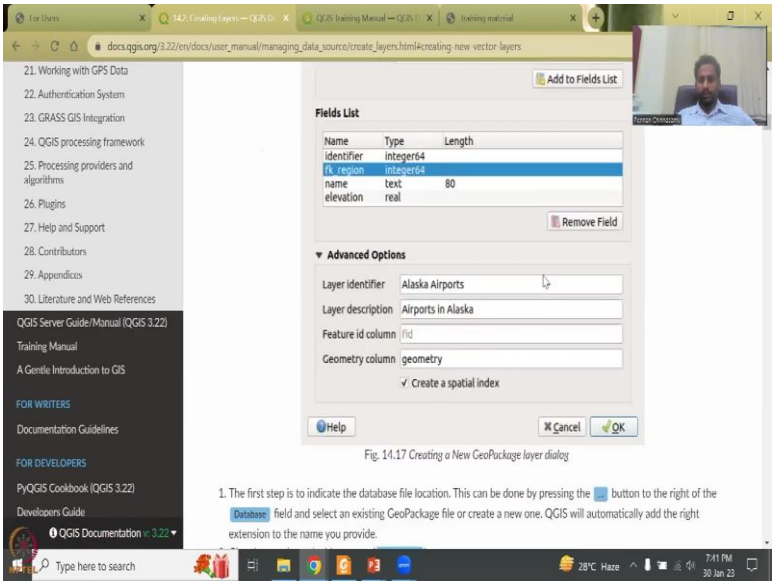


Fig. 14.17 *Creating a New GeoPackage layer dialog*

1. The first step is to indicate the database file location. This can be done by pressing the ... button to the right of the Database field and select an existing GeoPackage file or create a new one. QGIS will automatically add the right extension to the name you provide.

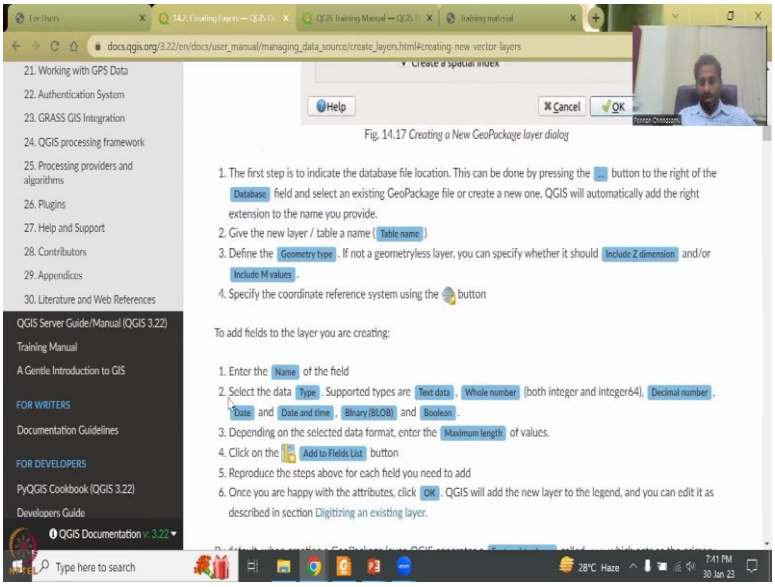
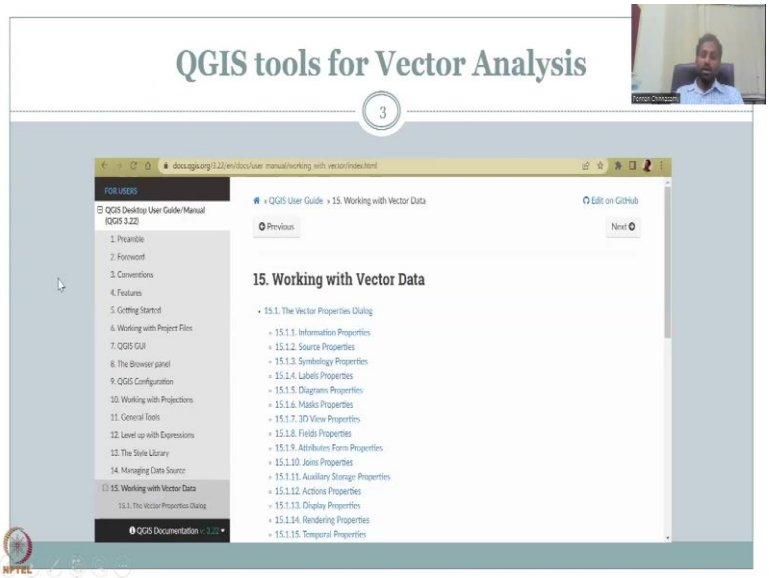


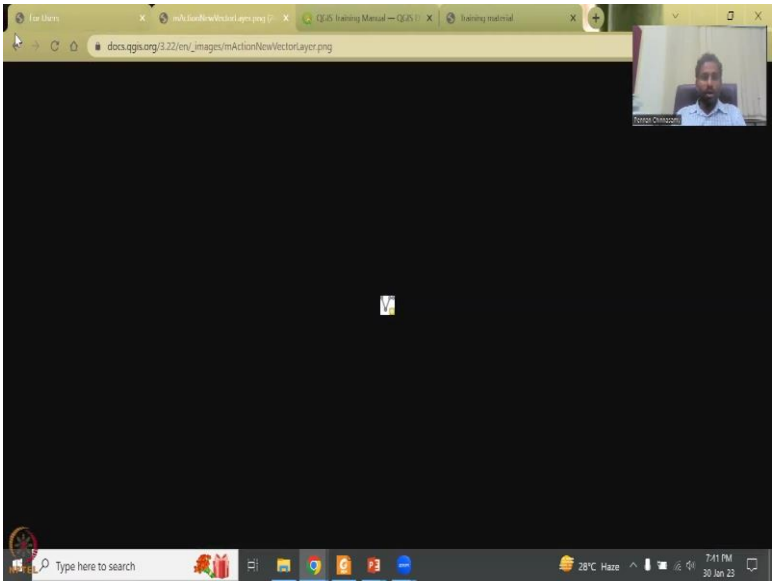
Fig. 14.17 *Creating a New GeoPackage layer dialog*

1. The first step is to indicate the database file location. This can be done by pressing the ... button to the right of the Database field and select an existing GeoPackage file or create a new one. QGIS will automatically add the right extension to the name you provide.
2. Give the new layer / table a name (Table name)
3. Define the Geometry type . If not a geometryless layer, you can specify whether it should Include Z dimension and/or Include M values .
4. Specify the coordinate reference system using the button

To add fields to the layer you are creating:

1. Enter the Name of the field
2. Select the data Type . Supported types are Text data , Whole number (both integer and integer64), Decimal number , Date and Date and time , Binary (BLOB) and Boolean .
3. Depending on the selected data format, enter the Maximum length of values.
4. Click on the Add to Fields List button
5. Reproduce the steps above for each field you need to add
6. Once you are happy with the attributes, click OK . QGIS will add the new layer to the legend, and you can edit it as described in section Digitizing an existing layer.





So, here there has been a tutorial given step by step and with a image of creating a point shape file with some data they have given, so you can see that they have used airports in Alaska as a tool and then they go Step, enter the name enter the field and then create a new shapefile by using the plus symbol create a shapefile button. If you do not know this, you can click and it will also open the image to zoom in and then you will do the projections and coordinate system you put in what is needed etcetera etcetera.

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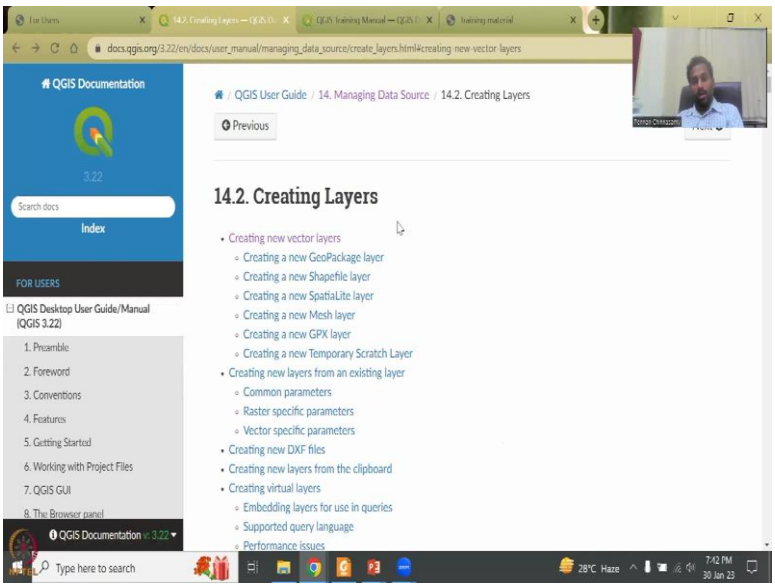
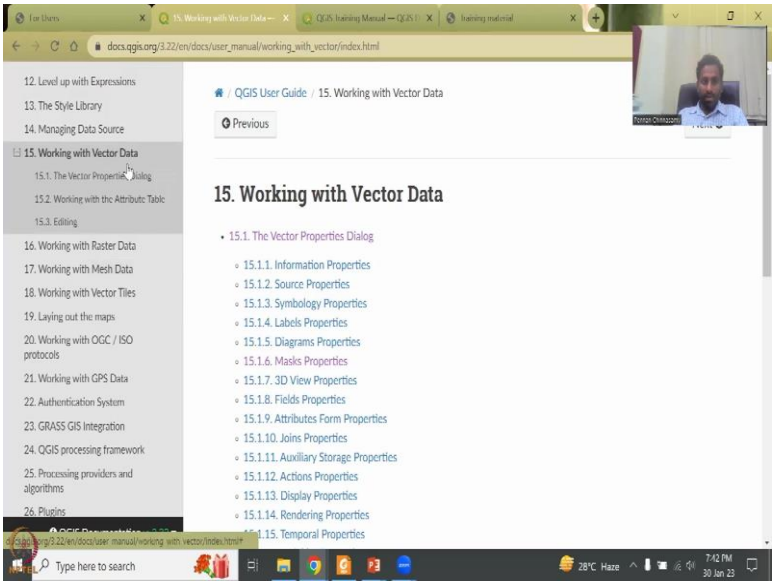
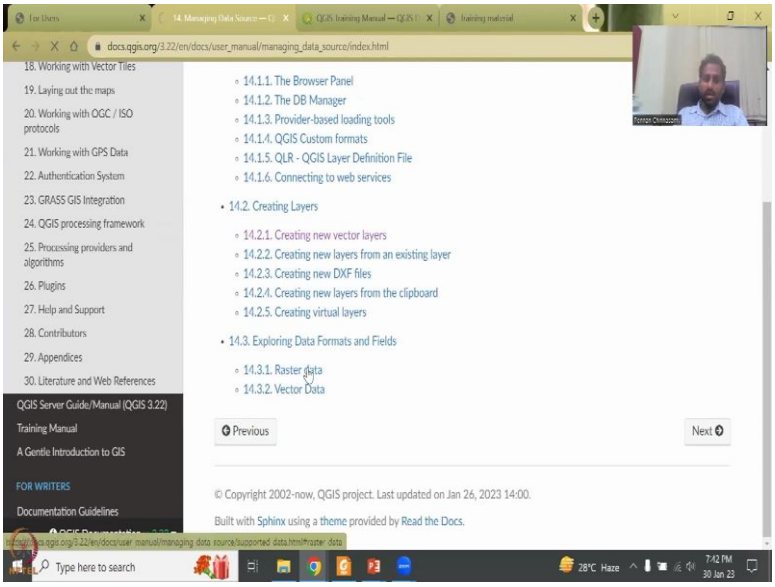
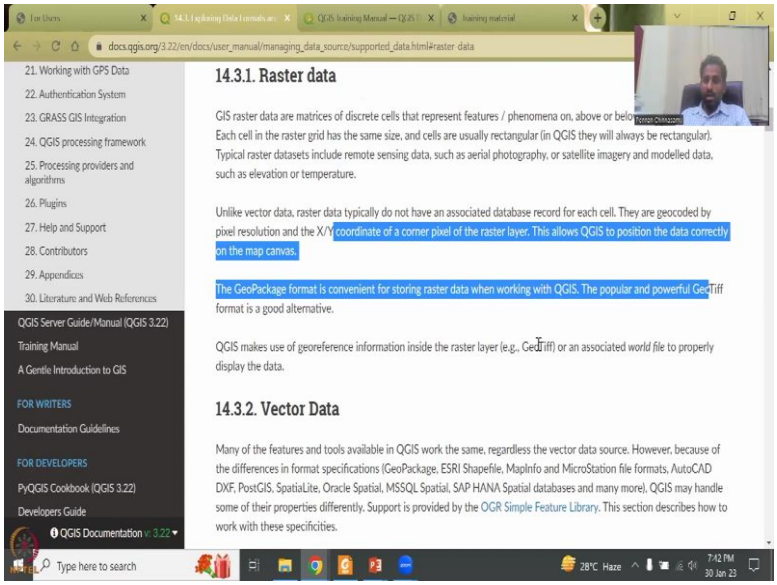


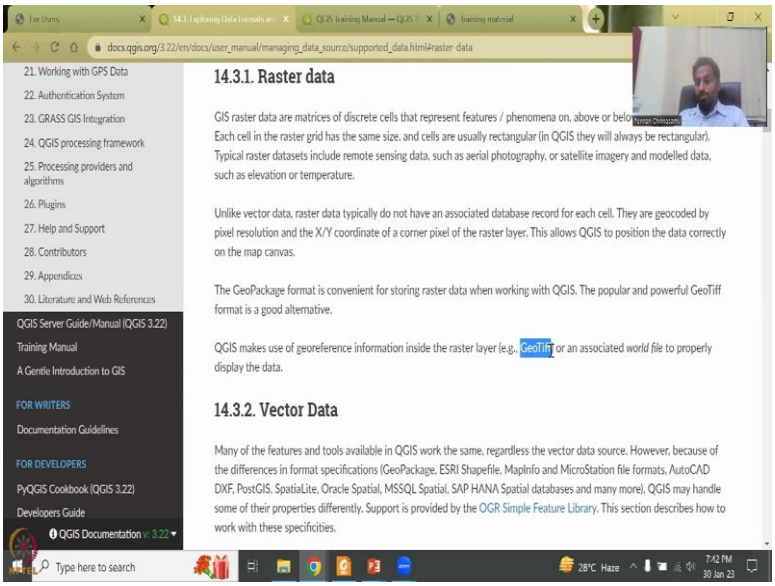


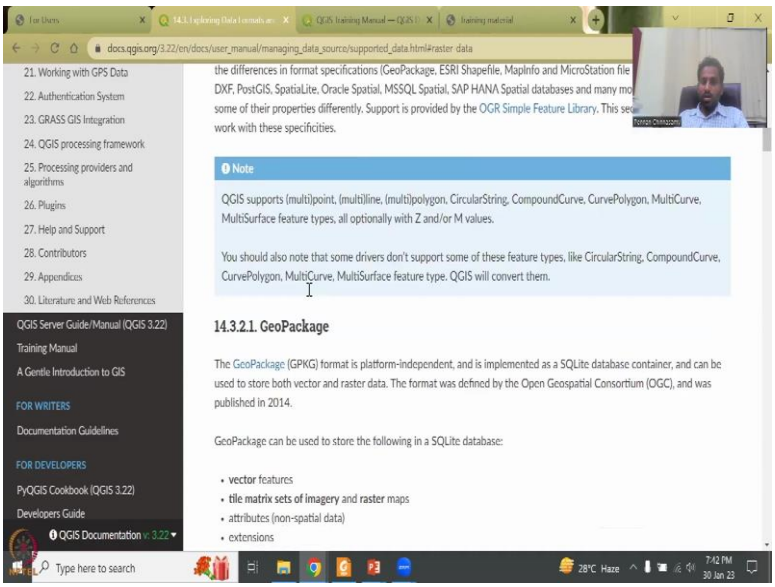


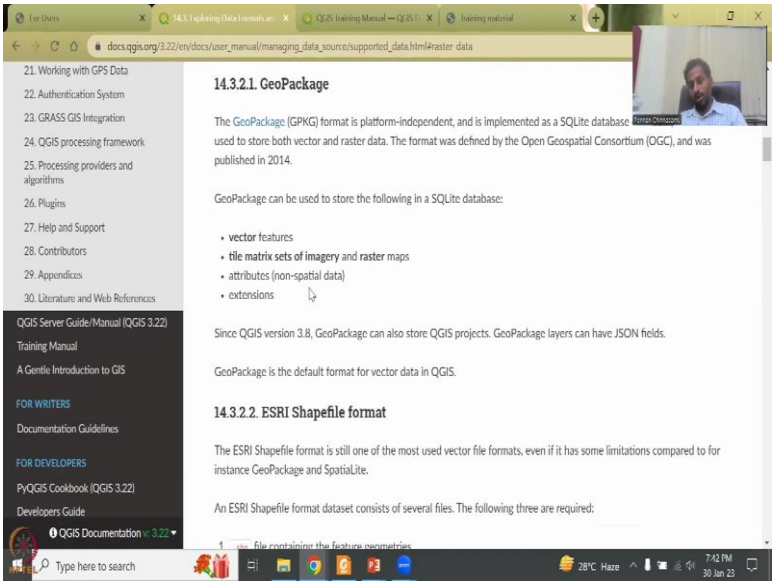
As I said, this is not a QGIS or GIS specific course it will be introducing that so I am going to go to the data sources that this software looks at. So, there are two data sources working with raster data, working with vector data. In the bottom you can see the 14.3.1. They discuss the raster data.

(Refer Slide Time: 6:40)



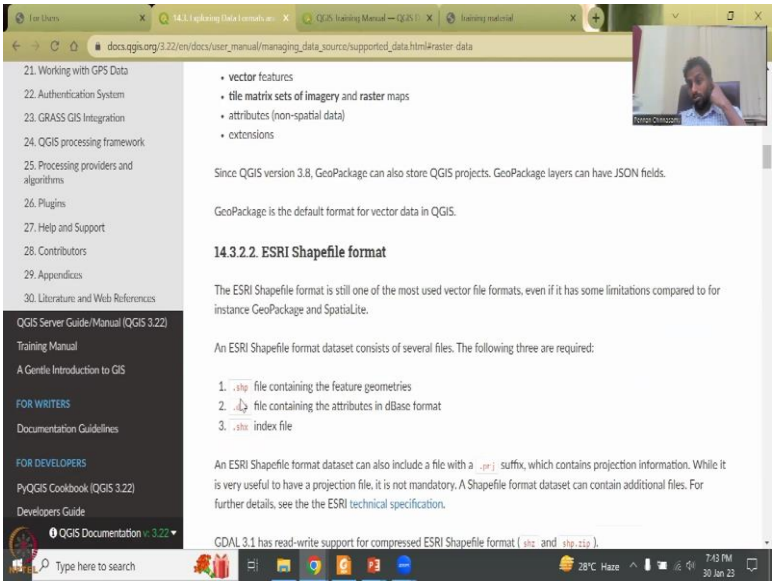


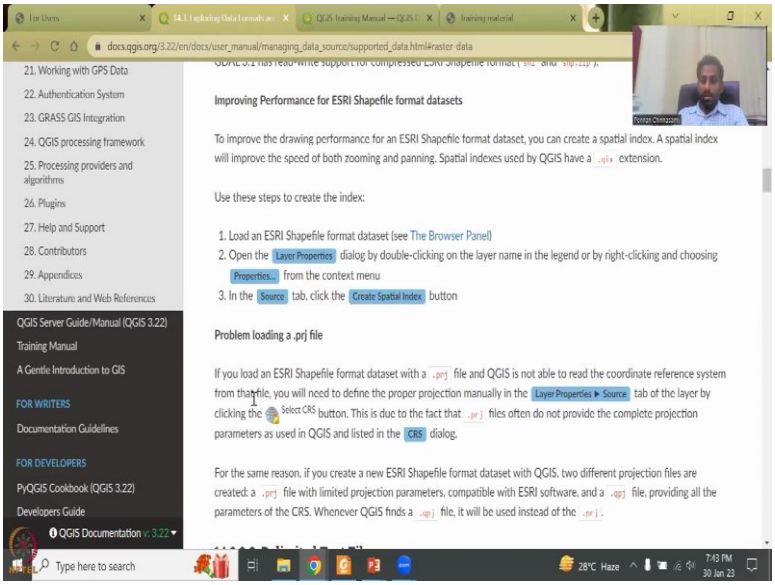


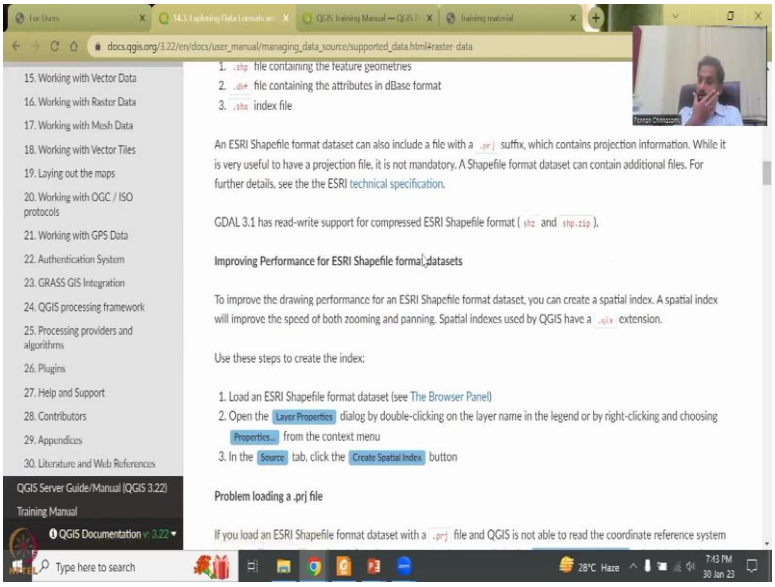


Let us click the raster data, what is the difference between the raster and then how it is continuous data, what kind of format it is stored etcetera. Whereas the vector data has is point, line and polygon and they talk about exceptions that are given.

(Refer Slide Time: 7:00)




docs.qgis.org/3.22/en/docs/user_manual/managing_data_source/supported_data.html#raster-data
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
Improving Performance for ESRI Shapefile format datasets
To improve the drawing performance for an ESRI Shapefile format dataset, you can create a spatial index. A spatial index will improve the speed of both zooming and panning. Spatial indexes used by QGIS have a .qix extension.
Use these steps to create the index:
1. Load an ESRI Shapefile format dataset (see The Browser Panel)
2. Open the Layer Properties dialog by double-clicking on the layer name in the legend or by right-clicking and choosing Properties... from the context menu
3. In the Source tab, click the Create Spatial Index button
Problem loading a .prj file
If you load an ESRI Shapefile format dataset with a .prj file and QGIS is not able to read the coordinate reference system from that file, you will need to define the proper projection manually in the Layer Properties ▶ Source tab of the layer by clicking the Select CRS button. This is due to the fact that .prj files often do not provide the complete projection parameters as used in QGIS and listed in the CRS dialog.
For the same reason, if you create a new ESRI Shapefile format dataset with QGIS, two different projection files are created: a .prj file with limited projection parameters, compatible with ESRI software, and a .qpj file, providing all the parameters of the CRS. Whenever QGIS finds a .qpj file, it will be used instead of the .prj .
Type here to search
28°C Haze
7:43 PM
30 Jan 23


docs.qgis.org/3.22/en/docs/user_manual/managing_data_source/supported_data.html#raster-data
15. Working with Vector Data
16. Working with Raster Data
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
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QGIS Server Guide/Manual (QGIS 3.22)
Training Manual
QGIS Documentation v: 3.22
1. .shp file containing the feature geometries
2. .dbf file containing the attributes in dBase format
3. .shx index file
An ESRI Shapefile format dataset can also include a file with a .prj suffix, which contains projection information. While it is very useful to have a projection file, it is not mandatory. A Shapefile format dataset can contain additional files. For further details, see the the ESRI technical specification.
GDAL 3.1 has read-write support for compressed ESRI Shapefile format (shz and shp.zip).
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Type here to search
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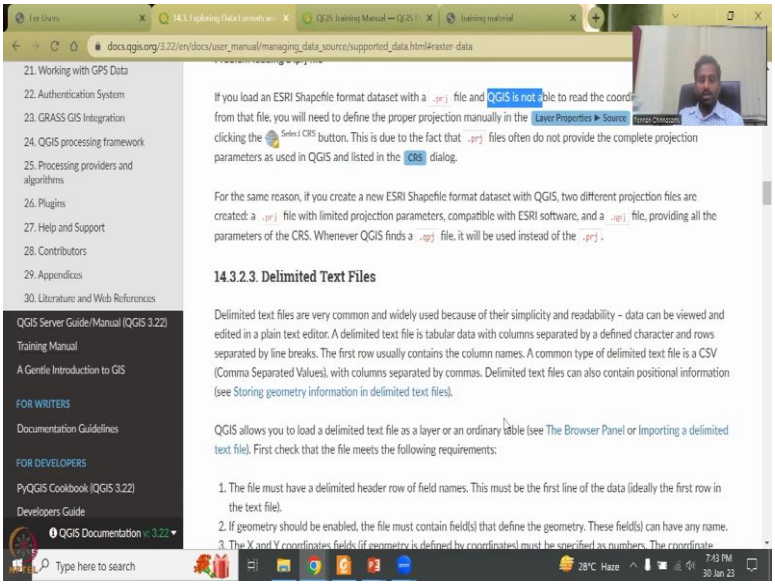
docs.qgis.org/3.22/en/docs/user_manual/managing_data_source/supported_data.html#raster-data
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Developers Guide
QGIS Documentation v: 3.22
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created: a .prj file with limited projection parameters, compatible with ESRI software, and a .qpj file, providing all the
parameters of the CRS. Whenever QGIS finds a .qpj file, it will be used instead of the .prj .
14.3.2.3. Delimited Text Files
Delimited text files are very common and widely used because of their simplicity and readability – data can be viewed and edited in a plain text editor. A delimited text file is tabular data with columns separated by a defined character and rows separated by line breaks. The first row usually contains the column names. A common type of delimited text file is a CSV (Comma Separated Values), with columns separated by commas. Delimited text files can also contain positional information (see Storing geometry information in delimited text files).
QGIS allows you to load a delimited text file as a layer or an ordinary table (see The Browser Panel or Importing a delimited text file). First check that the file meets the following requirements:
1. The file must have a delimited header row of field names. This must be the first line of the data (ideally the first row in the text file).
2. If geometry should be enabled, the file must contain field(s) that define the geometry. These field(s) can have any name.
3. The X and Y coordinates fields (if geometry is defined by coordinates) must be specified as numbers. The coordinate
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30 Jan 23

So, this tutorial can also be reading material for you and they do look at the ESRI shape format. So, ESRI is a proprietary software for mapping like QGIS there is an ESRI. It came before QGIS and hence, it has more features, tools, user community et cetera. But it is very expensive for a lot of people. So, that is why open source has been created. So, we promote a lot of open source in IIT Bombay through the FOSSEE program, which is free open source software for science and education and engineering. So, it is very, very widely accepted across the globe this program. And so I would like to also follow that and take QGIS in this NPTEL lecture.

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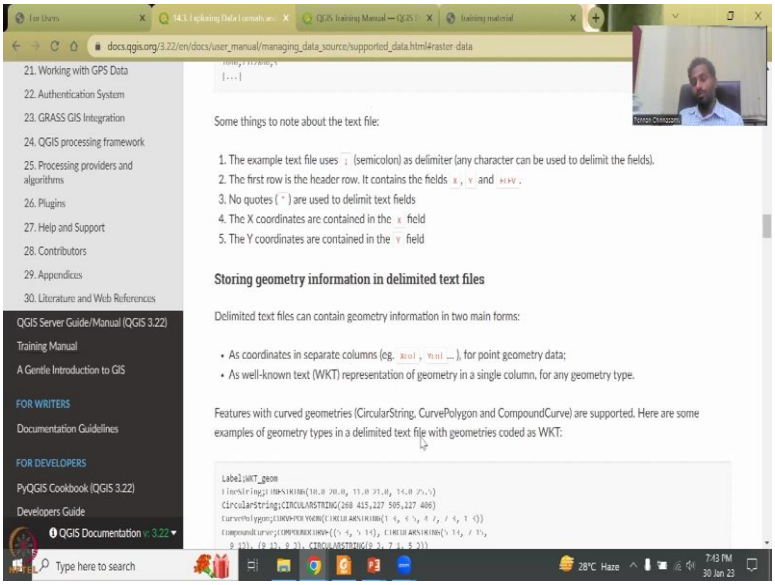
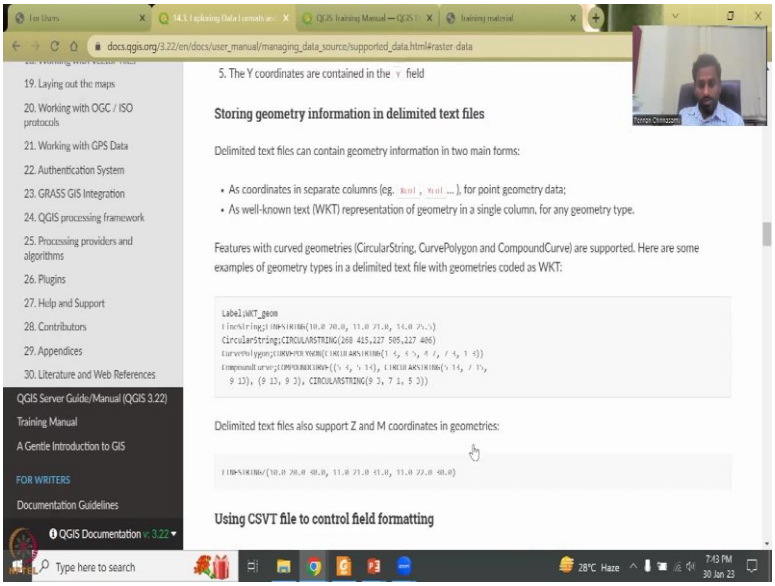
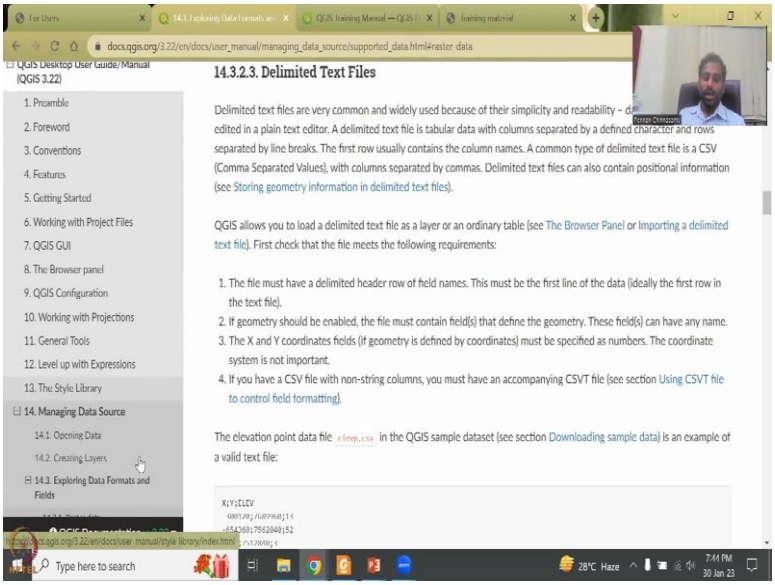
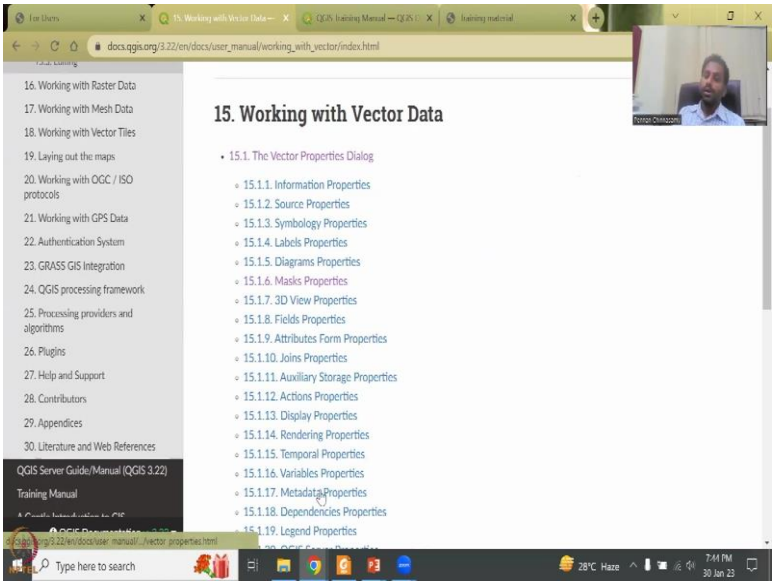


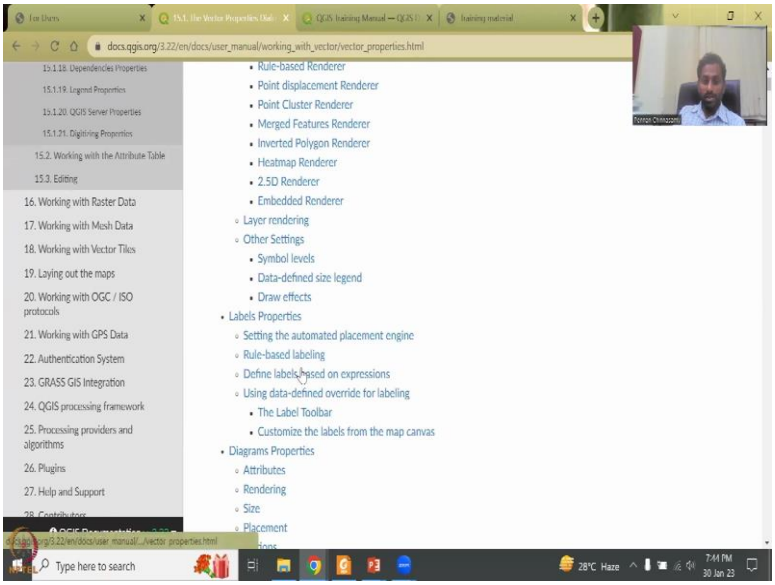


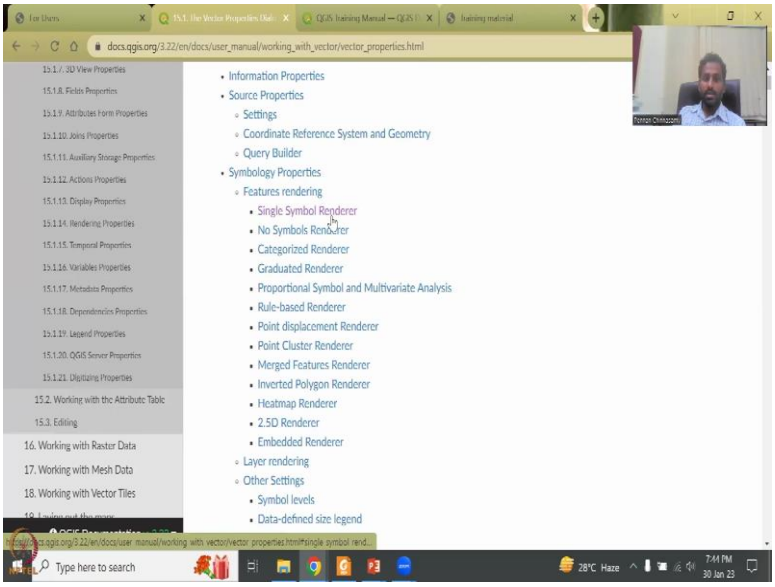


So, you could see some other formats and how it is being stored et cetera. As I said, those who would like to brush up on the basics, the materials here, you could go ahead and read through it.

(Refer Slide Time: 8:07)







So, we will go to working with vector data, so you will have multiple multiple points to discuss the vector properties dialog what it means. Then it will go through each and every point that you would like to discuss in using vector data.

(Refer Slide Time: 8:32)

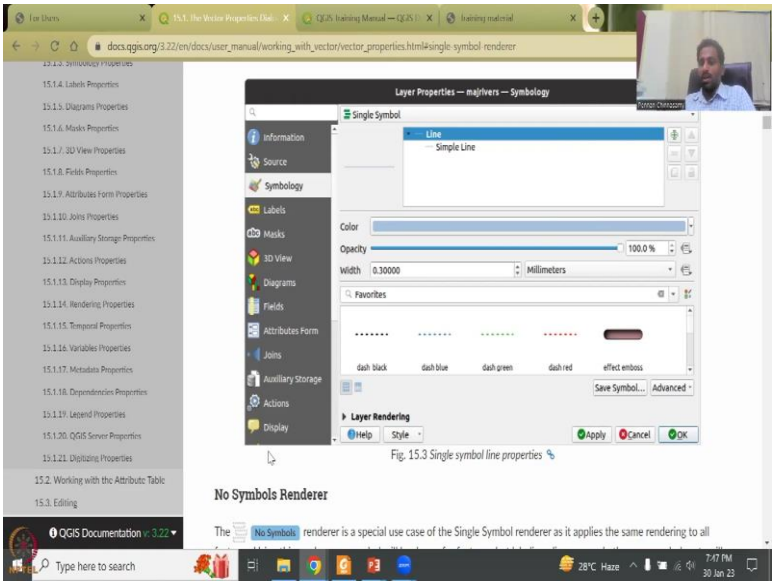


Fig. 15.3 Single symbol line properties

Let us say see, single simple render. If I click the single sample render, you could see that how you style your vector data in the database can be done. For example, sometimes the data may come in a particular style and format. It will not look that appealing in a map. So, here is where if you right click on the data and then go to properties you will get into this layer property data for data visualization tool and dashboard.

In the dashboard you can see source, symbology, labels, masks, 3D view diagrams, fields, attributes, etcetera, etcetera. The most key I would say is source where you find information about the data, which is called the meta data. Whereas, the other important aspect in this properties is the symbology. Please understand that maps you can do to analyze and get data out or analyze the data that is fine. But at the end of the day, you are also creating a visualization tool. So, you are going to visualize the results maps.

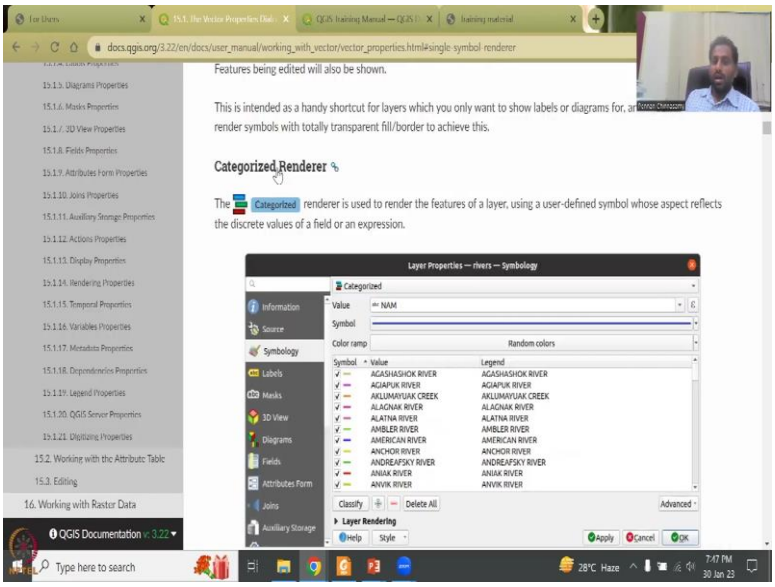
So, the maps have to be well observed by the viewer and stakeholder for which the styling is very important. In some software is called styling. Here is called symbology. And it gives you about, for example, here, the line is a simple line, it is not dash dash line or a star star line, it is a simple solid line. And the color of the line is given. Opacity is when you place it on the top of a map is it blocking the data below it because maps are in layers.

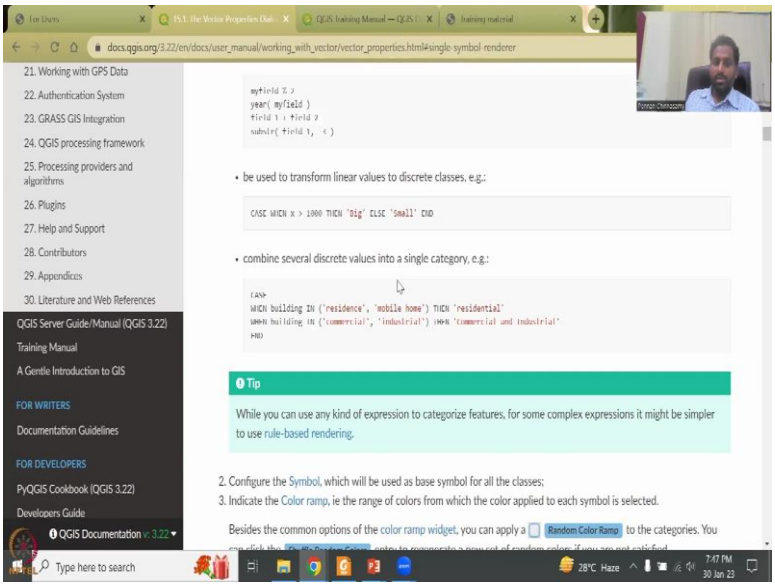
So, these kinds of very, very important aspects are given, the thickness of the line, what you get is the thickness. If you would like to have a template of design, you have dashed black, dashed blue, dashed green, and effect emboss. These kind of things are there. These are saved styles that you can quickly use without changing color, obesity with unit etcetera. Again, if

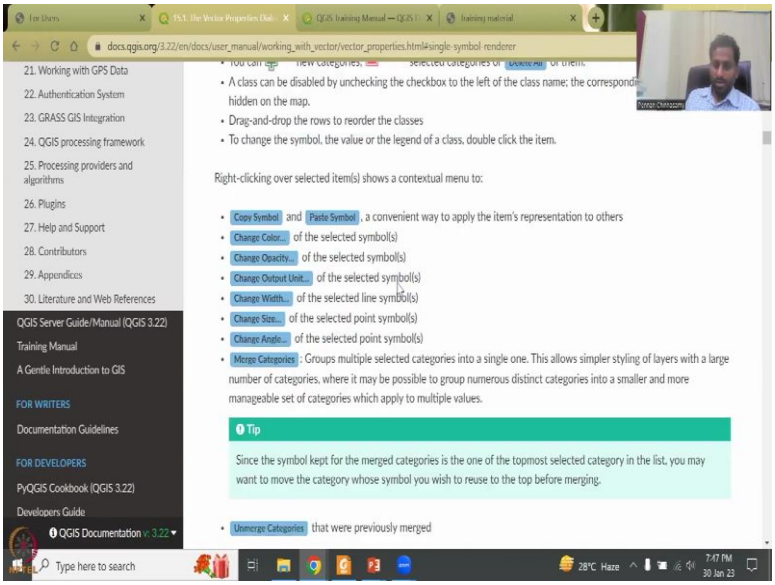
you do not know all this, we can always go with the default setting. Some of the data here are default. So, you can just click and then say accept, apply, and then it will come up.

The other thing I would like you to notice, sometimes the dashboard visualized here on the page will not be the same as your software. This is because the software would have updated, the bullets, the points on the left hand side would have changed. However, most of it will be there. So, do not worry that the system, the way you use, it will change it that will not change. Only thing is there will be addition and some tools will be removed or some bullets on the left would be removed.

(Refer Slide Time: 11:51)






docs.qgis.org/3.22/en/docs/user_manual/working_with_vector/vector_properties.html#single-symbol-renderer
21. Working with GPS Data
22. Authentication System
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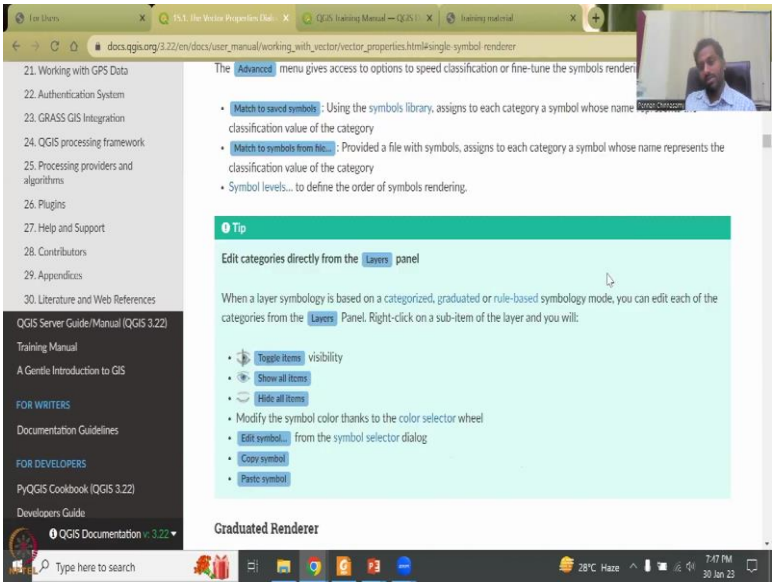
A class can be disabled by unchecking the checkbox to the left of the class name; the correspond
hidden on the map.
Drag-and-drop the rows to reorder the classes
To change the symbol, the value or the legend of a class, double click the item.
Right-clicking over selected item(s) shows a contextual menu to:
Copy Symbol and Paste Symbol, a convenient way to apply the item's representation to others
Change Color... of the selected symbol(s)
Change Opacity... of the selected symbol(s)
Change Output Unit... of the selected symbol(s)
Change Width... of the selected line symbol(s)
Change Size... of the selected point symbol(s)
Change Angle... of the selected point symbol(s)
Merge Categories : Groups multiple selected categories into a single one. This allows simpler styling of layers with a large number of categories, where it may be possible to group numerous distinct categories into a smaller and more manageable set of categories which apply to multiple values.
Tip
Since the symbol kept for the merged categories is the one of the topmost selected category in the list, you may want to move the category whose symbol you wish to reuse to the top before merging.
Unmerge Categories that were previously merged
Type here to search
28°C Haze
7:47 PM
30 Jan 23


docs.qgis.org/3.22/en/docs/user_manual/working_with_vector/vector_properties.html#single-symbol-renderer
21. Working with GPS Data
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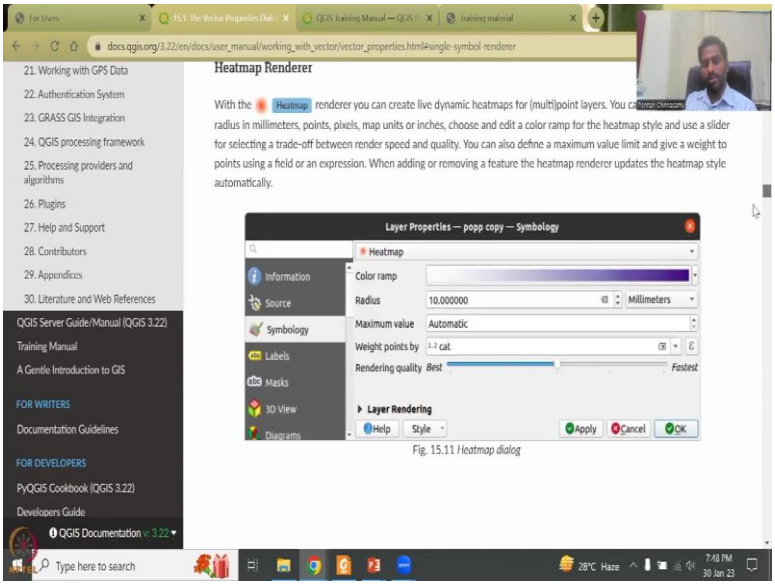
The Advanced menu gives access to options to speed classification or fine-tune the symbols renderi
Match to saved symbols : Using the symbols library, assigns to each category a symbol whose name
classification value of the category
Match to symbols from file... : Provided a file with symbols, assigns to each category a symbol whose name represents the classification value of the category
Symbol levels... to define the order of symbols rendering.
Tip
Edit categories directly from the Layers panel
When a layer symbology is based on a categorized, graduated or rule-based symbology mode, you can edit each of the categories from the Layers Panel. Right-click on a sub-item of the layer and you will:
Toggle items visibility
Show all items
Hide all items
Modify the symbol color thanks to the color selector wheel
Edit symbol... from the symbol selector dialog
Copy symbol
Paste symbol
Graduated Renderer
Type here to search
28°C Haze
7:47 PM
30 Jan 23


docs.qgis.org/3.22/en/docs/user_manual/working_with_vector/vector_properties.html#single-symbol-renderer
21. Working with GPS Data
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Heatmap Renderer
With the Heatmap renderer you can create live dynamic heatmaps for (multi)point layers. You c
radius in millimeters, points, pixels, map units or inches, choose and edit a color ramp for the heatmap style and use a slider for selecting a trade-off between render speed and quality. You can also define a maximum value limit and give a weight to points using a field or an expression. When adding or removing a feature the heatmap renderer updates the heatmap style automatically.
Layer Properties — popp copy — Symbology
Heatmap
Information
Source
Symbology
Labels
Masks
3D View
Diagrams
Color ramp
Radius
10.000000
Millimeters
Maximum value
Automatic
Weight points by
cat
Rendering quality
Best
Fastest
Layer Rendering
Help
Style
Apply
Cancel
OK
Fig. 15.11 Heatmap dialog
Type here to search
28°C Haze
7:48 PM
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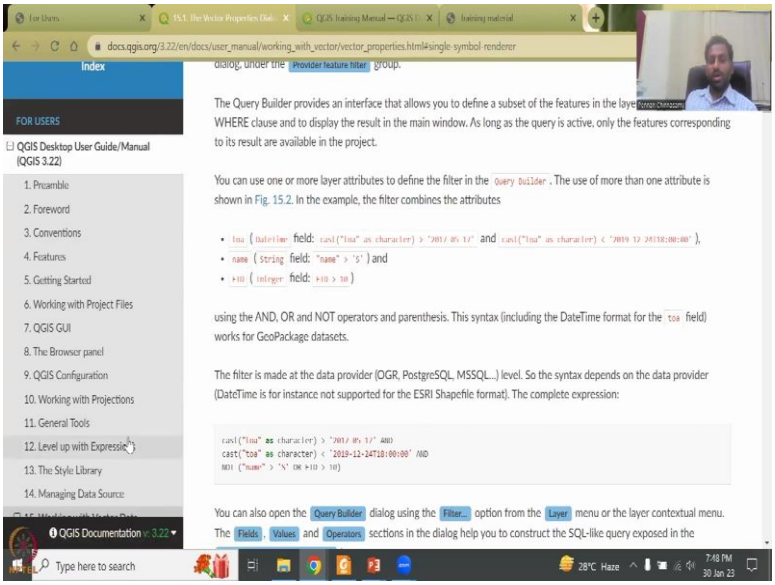
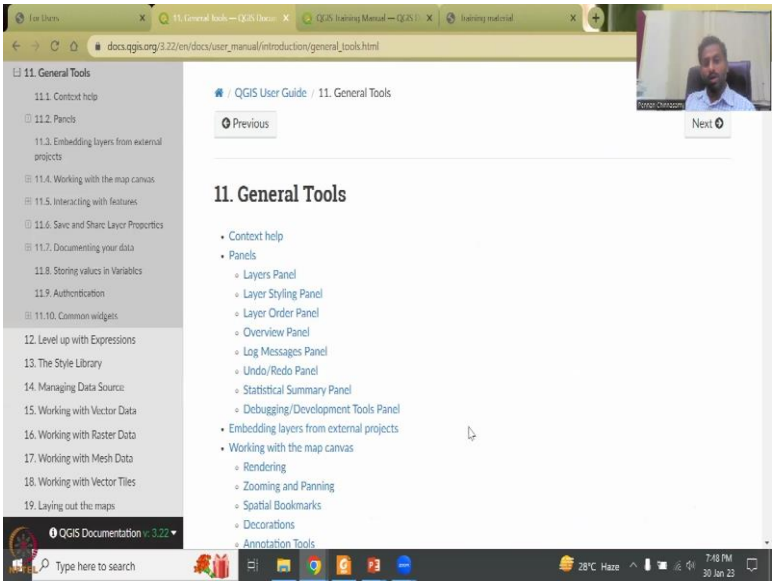
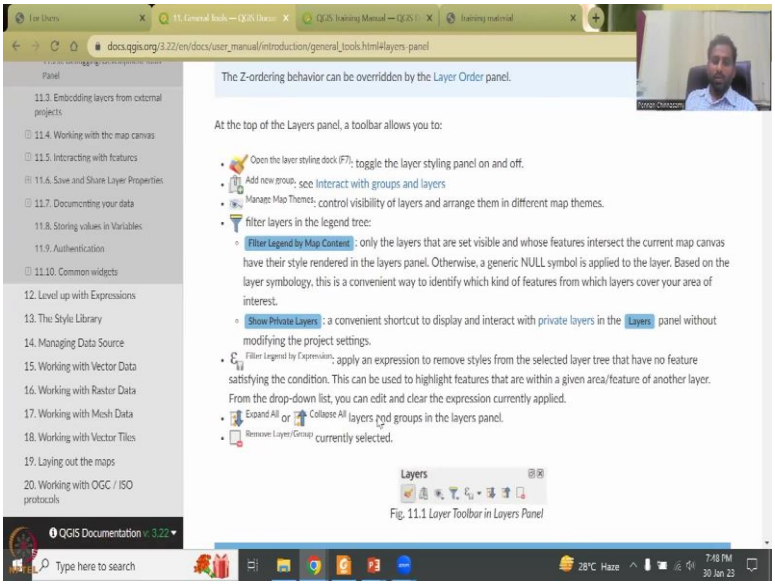
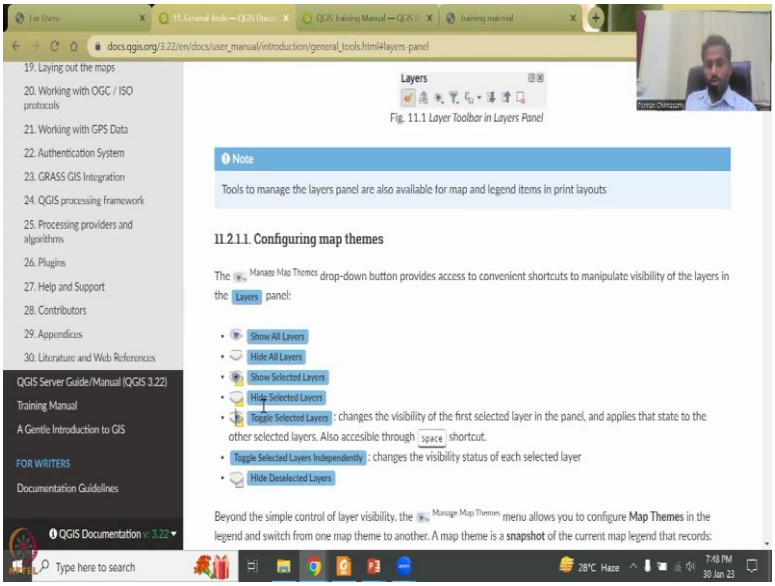


So, you could see how you could do CAD categorization, and then rendering it with names, labels, etcetera, etcetera. It is very extensive. It runs through multiple pages. I will not again cover all this. But it will be good for those who have limited basics to look at this.

(Refer Slide Time: 12:14)




docs.qgis.org/3.22/en/docs/user_manual/introduction/general_tools.html#layers-panel
11.3. Embedding layers from external projects
11.4. Working with the map canvas
11.5. Interacting with features
11.6. Save and Share Layer Properties
11.7. Documenting your data
11.8. Storing values in Variables
11.9. Authentication
11.10. Common widgets
12. Level up with Expressions
13. The Style Library
14. Managing Data Source
15. Working with Vector Data
16. Working with Raster Data
17. Working with Mesh Data
18. Working with Vector Tiles
19. Laying out the maps
20. Working with OGC / ISO protocols
QGIS Documentation v: 3.22
The Z-ordering behavior can be overridden by the Layer Order panel.
At the top of the Layers panel, a toolbar allows you to:
Open the layer styling dock (F7): toggle the layer styling panel on and off.
Add new group: see Interact with groups and layers
Manage Map Themes: control visibility of layers and arrange them in different map themes.
filter layers in the legend tree:
Filter Legend by Map Content : only the layers that are set visible and whose features intersect the current map canvas have their style rendered in the layers panel. Otherwise, a generic NULL symbol is applied to the layer. Based on the layer symbology, this is a convenient way to identify which kind of features from which layers cover your area of interest.
Show Private Layers : a convenient shortcut to display and interact with private layers in the Layers panel without modifying the project settings.
Filter Legend by Expression: apply an expression to remove styles from the selected layer tree that have no feature satisfying the condition. This can be used to highlight features that are within a given area/feature of another layer. From the drop-down list, you can edit and clear the expression currently applied.
Expand All or Collapse All layers and groups in the layers panel.
Remove Layer/Group currently selected.
Layers
Fig. 11.1 Layer Toolbar in Layers Panel
Type here to search
28°C Haze
7:48 PM
30 Jan 23


docs.qgis.org/3.22/en/docs/user_manual/introduction/general_tools.html#layers-panel
19. Laying out the maps
20. Working with OGC / ISO protocols
21. Working with GPS Data
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Layers
Fig. 11.1 Layer Toolbar in Layers Panel
Note
Tools to manage the layers panel are also available for map and legend items in print layouts
11.2.1.1. Configuring map themes
The Manage Map Themes drop-down button provides access to convenient shortcuts to manipulate visibility of the layers in the Layers panel:
Show All Layers
Hide All Layers
Show Selected Layers
Hide Selected Layers
Toggle Selected Layers : changes the visibility of the first selected layer in the panel, and applies that state to the other selected layers. Also accesible through space shortcut.
Toggle Selected Layers Independently : changes the visibility status of each selected layer
Hide Deselected Layers
Beyond the simple control of layer visibility, the Manage Map Themes menu allows you to configure Map Themes in the legend and switch from one map theme to another. A map theme is a snapshot of the current map legend that records:
Type here to search
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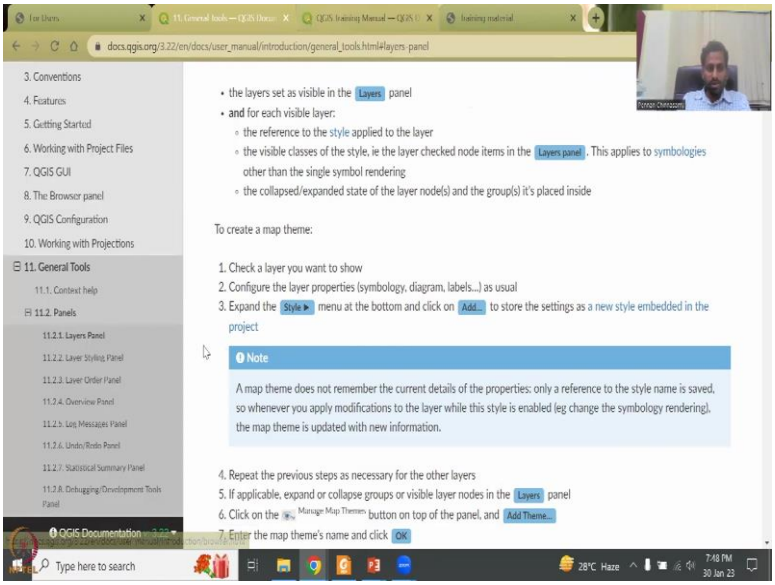
docs.qgis.org/3.22/en/docs/user_manual/introduction/general_tools.html#layers-panel
3. Conventions
4. Features
5. Getting Started
6. Working with Project Files
7. QGIS GUI
8. The Browser panel
9. QGIS Configuration
10. Working with Projections
11. General Tools
11.1. Context help
11.2. Panels
11.2.1. Layers Panel
11.2.2. Layer Styling Panel
11.2.3. Layer Order Panel
11.2.4. Overview Panel
11.2.5. Log Messages Panel
11.2.6. Undo/Redo Panel
11.2.7. Statistical Summary Panel
11.2.8. Debugging/Development Tools Panel
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the layers set as visible in the Layers panel
and for each visible layer:
the reference to the style applied to the layer
the visible classes of the style, ie the layer checked node items in the Layers panel. This applies to symbologies other than the single symbol rendering
the collapsed/expanded state of the layer node(s) and the group(s) it's placed inside
To create a map theme:
1. Check a layer you want to show
2. Configure the layer properties (symbology, diagram, labels...) as usual
3. Expand the Style ▸ menu at the bottom and click on Add... to store the settings as a new style embedded in the project
Note
A map theme does not remember the current details of the properties: only a reference to the style name is saved, so whenever you apply modifications to the layer while this style is enabled (eg change the symbology rendering), the map theme is updated with new information.
4. Repeat the previous steps as necessary for the other layers
5. If applicable, expand or collapse groups or visible layer nodes in the Layers panel
6. Click on the Manage Map Themes button on top of the panel, and Add Theme...
7. Enter the map theme's name and click OK
Type here to search
28°C Haze
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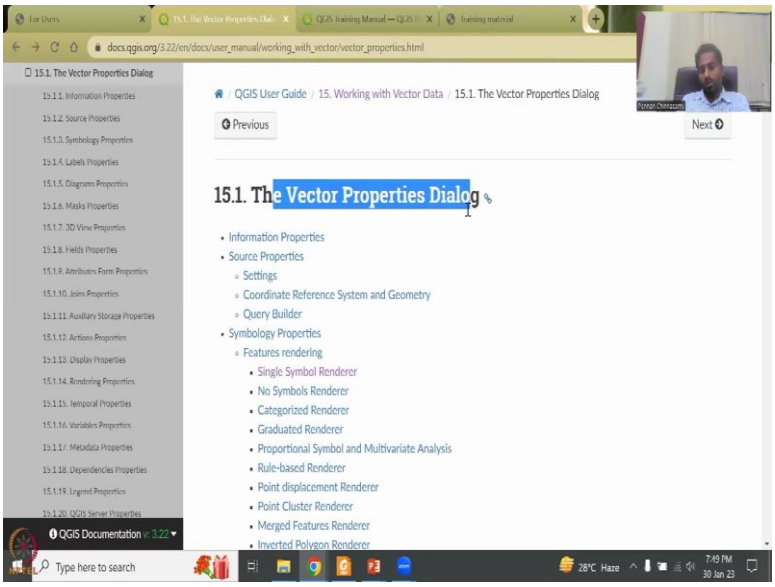
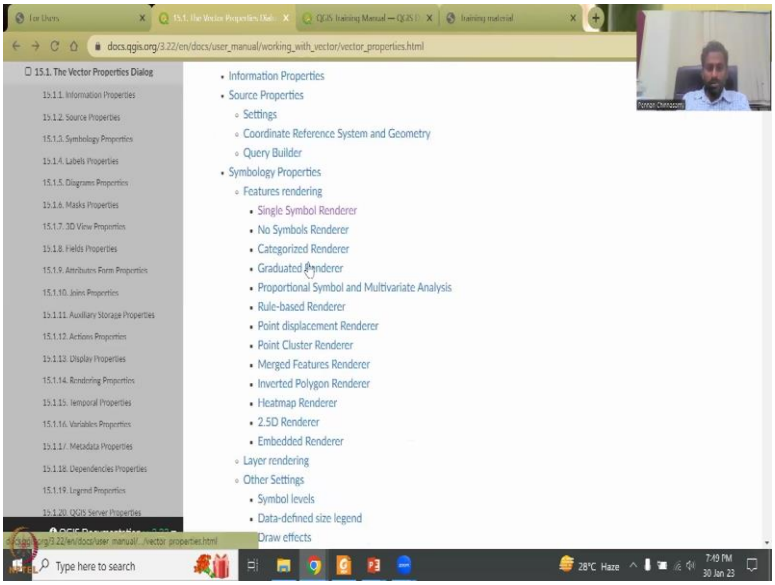
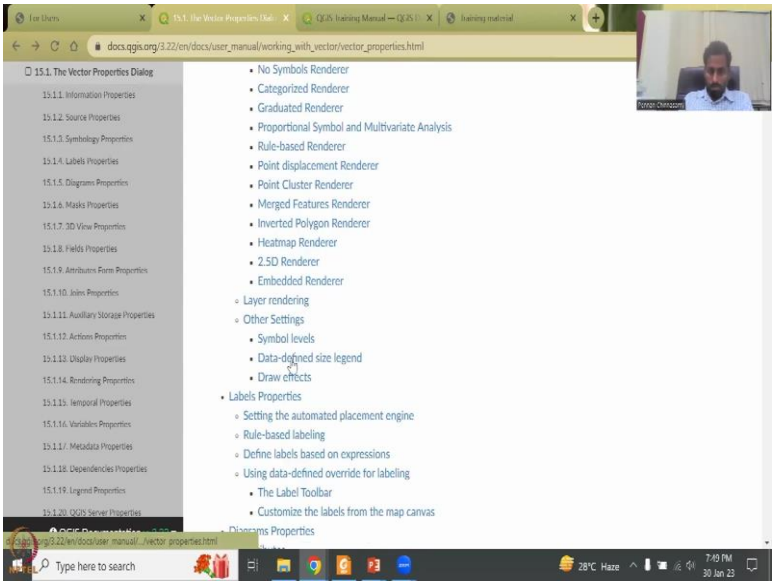
So, then what you do is you can also come to the general tools, where you have layer panels, what does it mean? Like it gives you the styling tog, new group, filters the legends tree, and then configuring a map themes, show all layers, hide all layers, select layers, all these things, because you will be layering your data, it is good to have only those data that are needed for your map to be visualized. You can have it in your stack on the background, but make sure that you do not have to show all the data upfront. It is not needed. So, this is about your general tools about in QGIS.

(Refer Slide Time: 13:09)






docs.qgis.org/3.22/en/docs/user_manual/working_with_vector/vector_properties.html
15.1. The Vector Properties Dialog
15.1.1. Information Properties
15.1.2. Source Properties
15.1.3. Symbology Properties
15.1.4. Labels Properties
15.1.5. Diagrams Properties
15.1.6. Masks Properties
15.1.7. 3D View Properties
15.1.8. Fields Properties
15.1.9. Attributes Form Properties
15.1.10. Joins Properties
15.1.11. Auxiliary Storage Properties
15.1.12. Actions Properties
15.1.13. Display Properties
15.1.14. Rendering Properties
15.1.15. Temporal Properties
15.1.16. Variables Properties
15.1.17. Metadata Properties
15.1.18. Dependencies Properties
15.1.19. Legend Properties
15.1.20. QGIS Server Properties
No Symbols Renderer
Categorized Renderer
Graduated Renderer
Proportional Symbol and Multivariate Analysis
Rule-based Renderer
Point displacement Renderer
Point Cluster Renderer
Merged Features Renderer
Inverted Polygon Renderer
Heatmap Renderer
2.5D Renderer
Embedded Renderer
Layer rendering
Other Settings
Symbol levels
Data-defined size legend
Draw effects
Labels Properties
Setting the automated placement engine
Rule-based labeling
Define labels based on expressions
Using data-defined override for labeling
The Label Toolbar
Customize the labels from the map canvas
Diagrams Properties
Type here to search
28°C Haze
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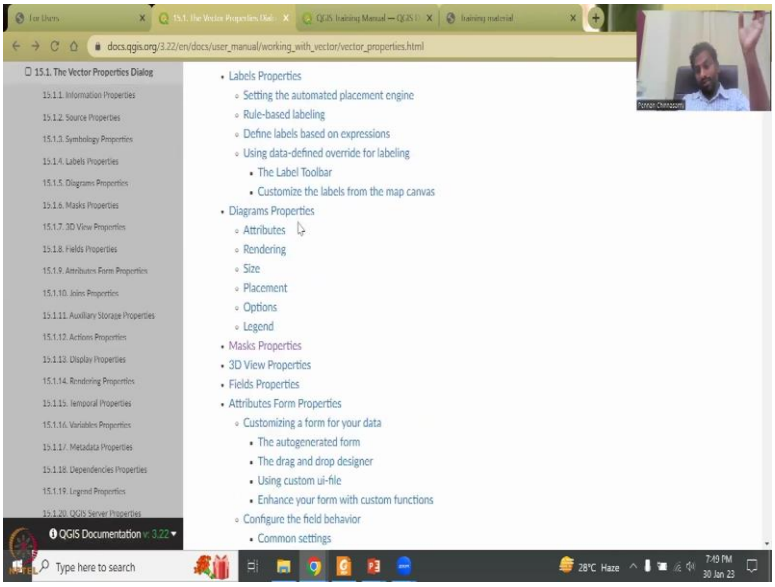
docs.qgis.org/3.22/en/docs/user_manual/working_with_vector/vector_properties.html
15.1. The Vector Properties Dialog
Labels Properties
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Rule-based labeling
Define labels based on expressions
Using data-defined override for labeling
The Label Toolbar
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Options
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Masks Properties
3D View Properties
Fields Properties
Attributes Form Properties
Customizing a form for your data
The autogenerated form
The drag and drop designer
Using custom ui-file
Enhance your form with custom functions
Configure the field behavior
Common settings
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Type here to search
28°C Haze
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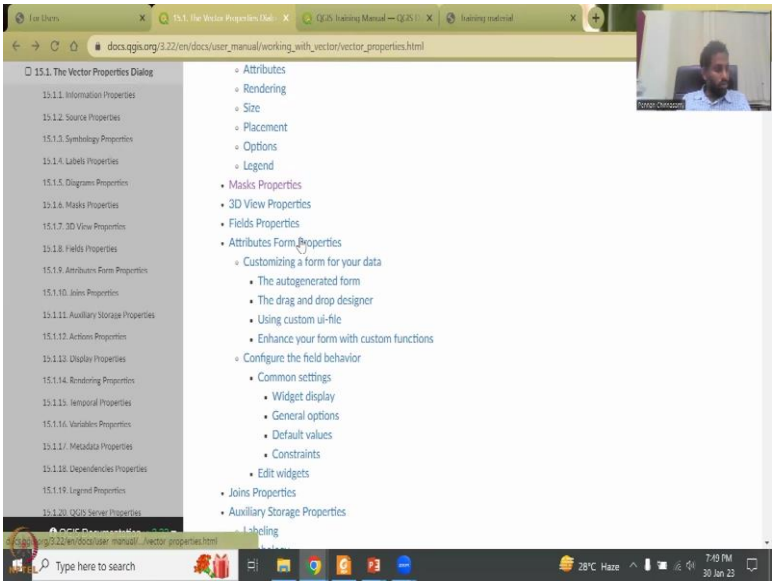
docs.qgis.org/3.22/en/docs/user_manual/working_with_vector/vector_properties.html
15.1. The Vector Properties Dialog
Attributes
Rendering
Size
Placement
Options
Legend
Masks Properties
3D View Properties
Fields Properties
Attributes Form Properties
Customizing a form for your data
The autogenerated form
The drag and drop designer
Using custom ui-file
Enhance your form with custom functions
Configure the field behavior
Common settings
Widget display
General options
Default values
Constraints
Edit widgets
Joins Properties
Auxiliary Storage Properties
Labeling
Type here to search
28°C Haze
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And more importantly, your user guide gives you how to work with vectors, symbols and then all the symbols styling, different symbols, drawing effects, label properties, et cetera. And then all the left hand side that you saw masks, label, join attributes, everything are given here.

(Refer Slide Time: 13:32)

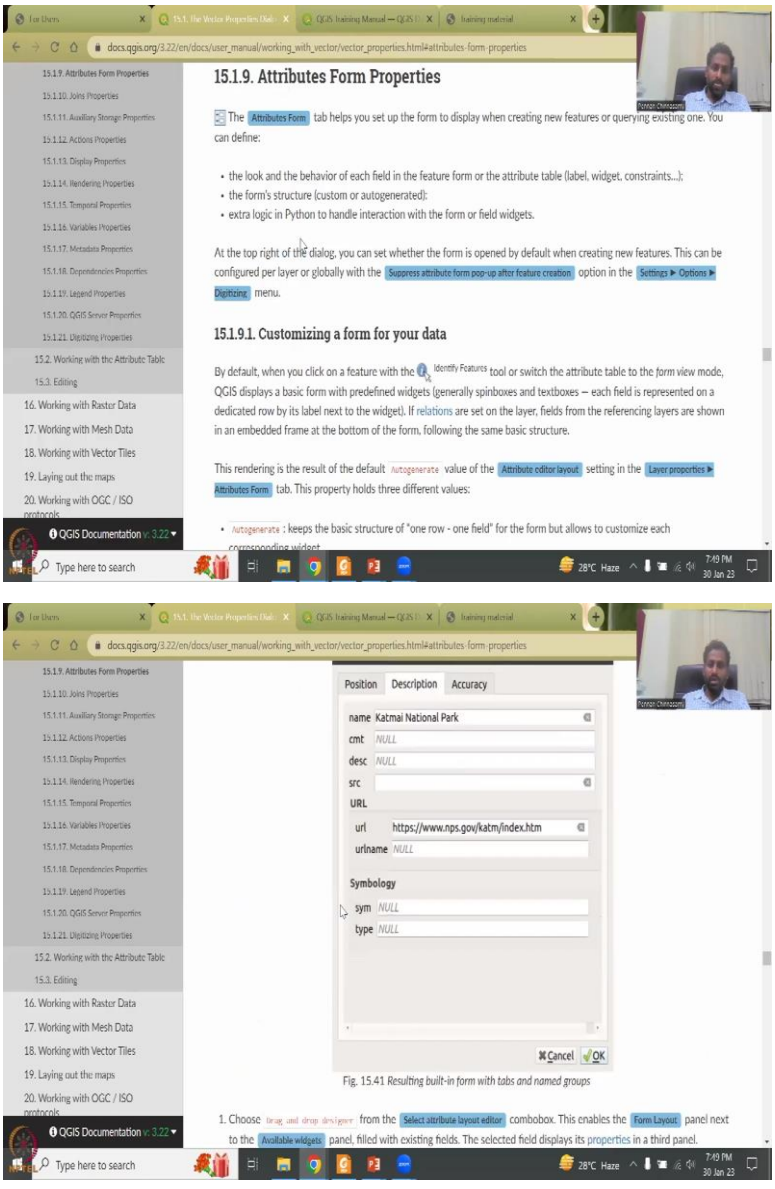
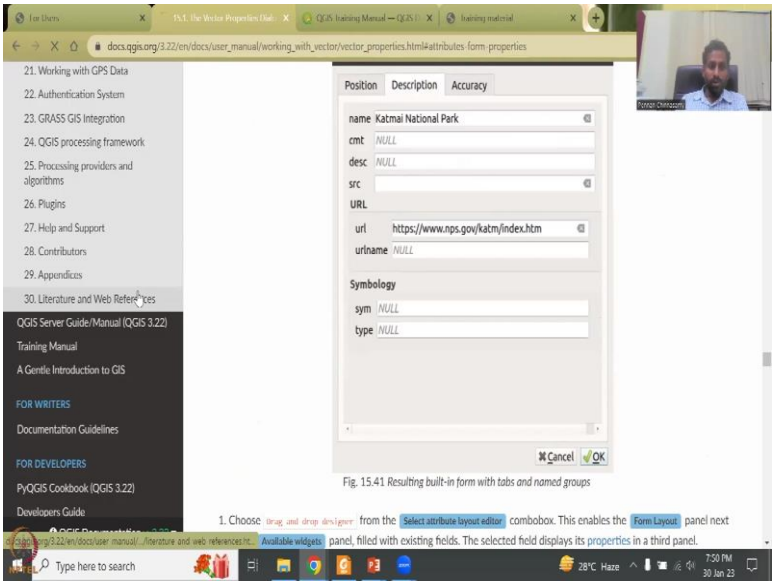
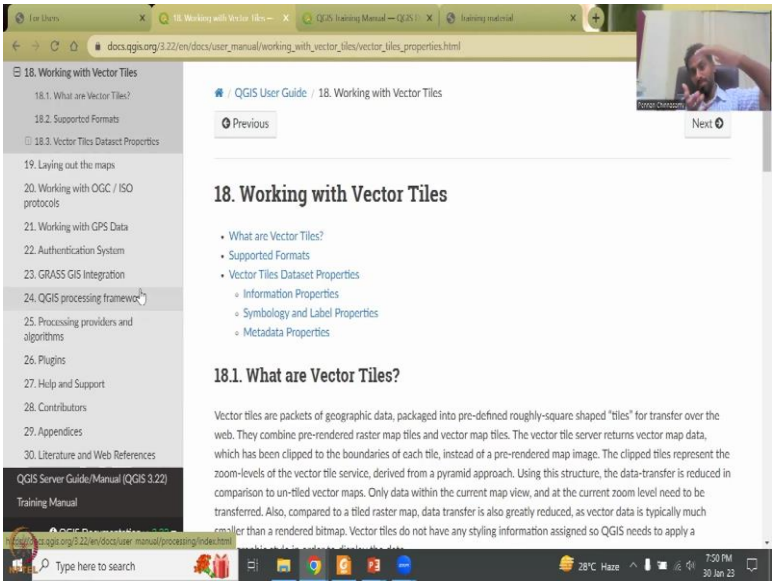


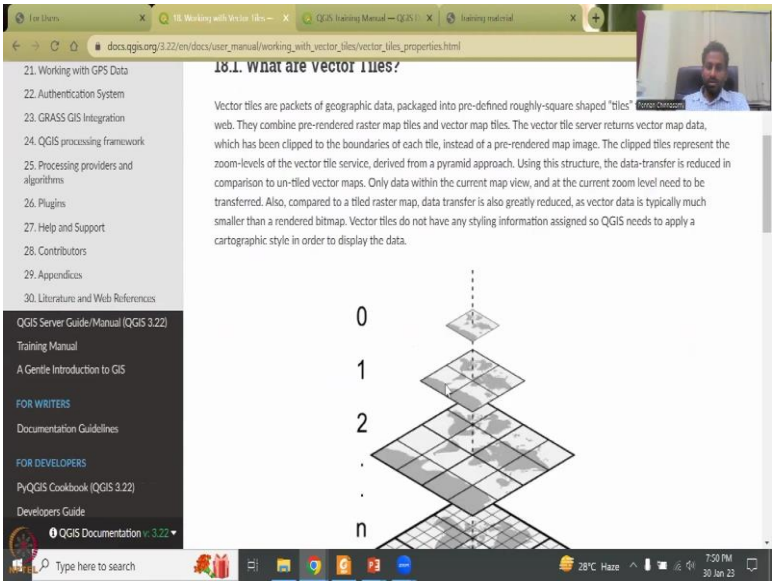
Fig. 15.41 *Resulting built-in form with tabs and named groups*

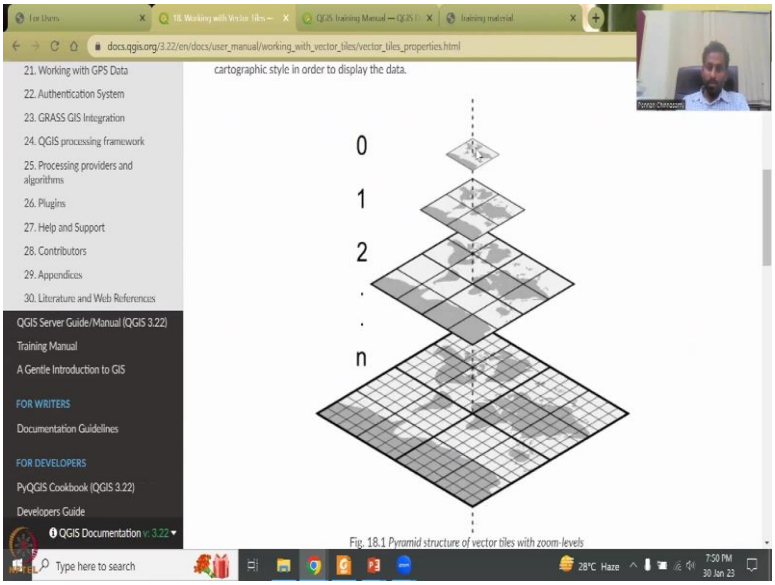
So, you do have attributes from properties, where you can collect data, and then added in the Attributes section. So, you can customize your data, you can auto generate your data all these kinds of things can be done. Again, we will be working mostly with data that is taken from government resources, and then applied here as a tool. So, we have already seen Bhuvan, NASA Data etcetera. Most of them are raster data, but we can also look at how to collect data from observation data and then added as attributes here.

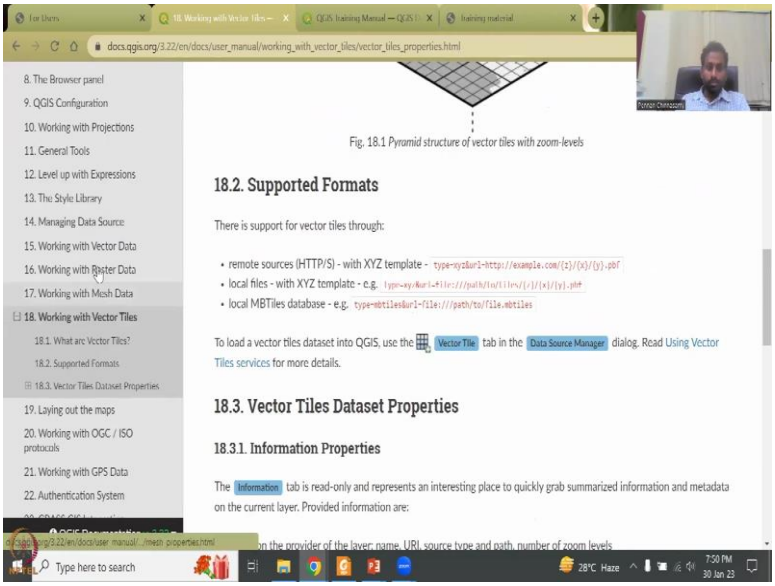
(Refer Slide Time: 14:15)





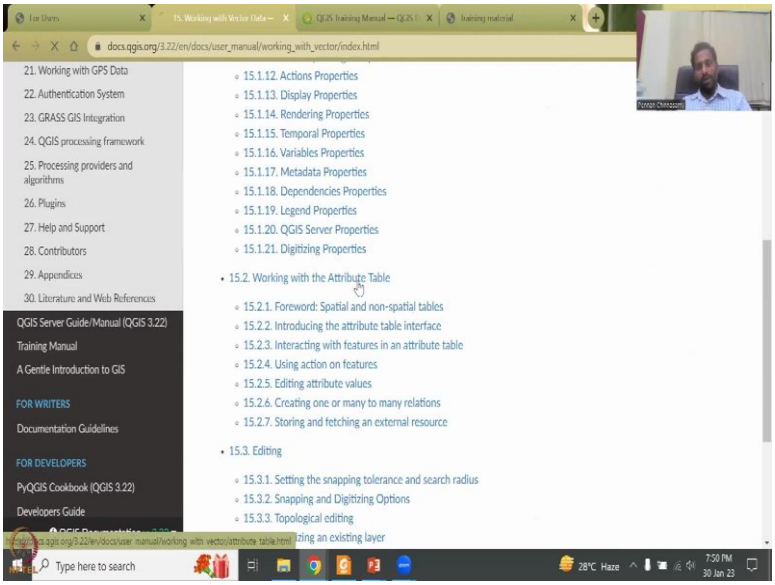


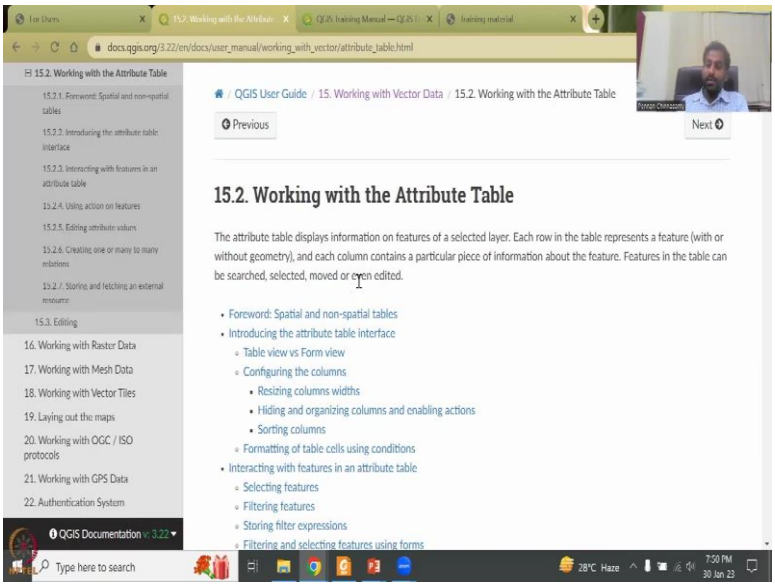


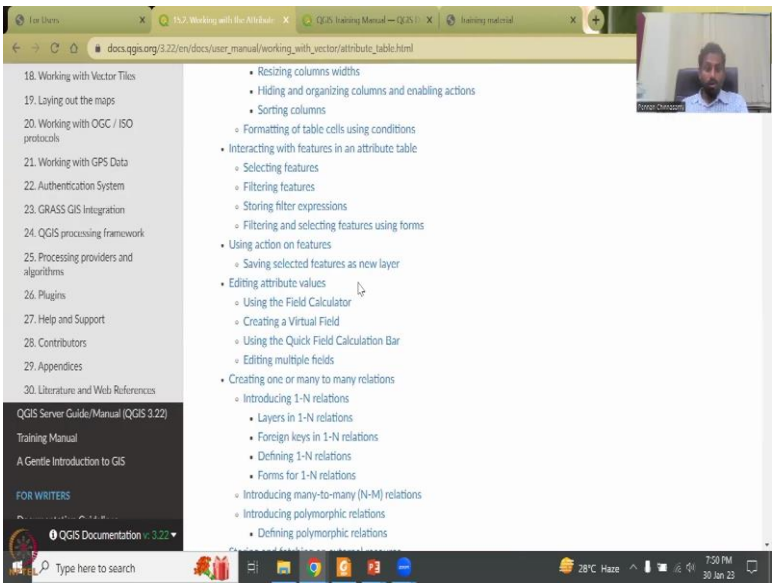


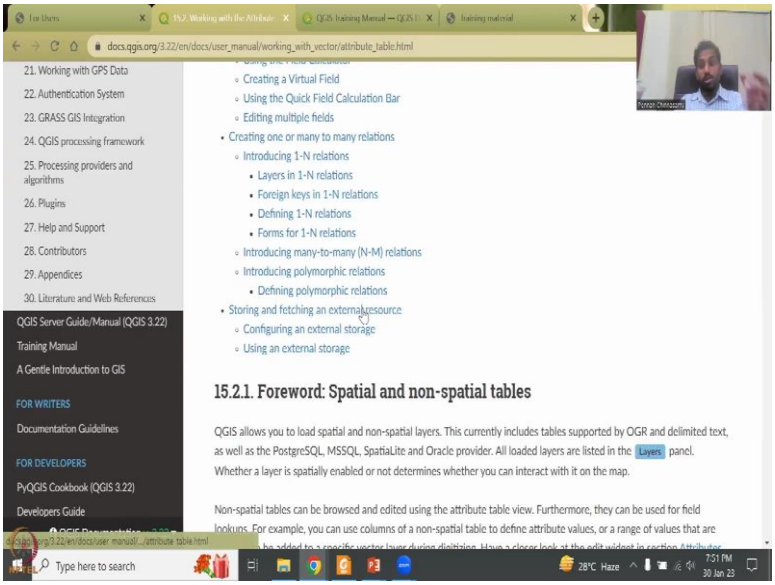
Then we also have vector tiles, which tiles are packets of geographic data packed together. because as I said, when you send data or when you share data, sometimes it is better to share as a pack as a database. That can also be done here, where multiple data are added, and then given us a vector tile.

(Refer Slide Time: 14:43)









I will go back to the vector data working with the vector data, working with the attribute table. You have multiple table columns and rows. The columns define the objects whereas rows or attributes, how many entries are there. And then you could do some spatial joining of tables, because in one table there will be location like city name, whereas the other table will not have it. But you know that the ordering is linked to the city.

So, you can merge the tables. This is very important while working with vector data. Because sometimes government and non-government data has the city name and the district name implied, which means they will have a code. City 1, city 2, like as a PIN code, the PIN code tells you where the location is, for example, you have 400076 for IIT, Bombay, and Hawaii is linked to that PIN code.

But if you do not want to label it as Hawaii, you can always leave it as a number, if at all the government is collecting like that. So, my point is, if you have a data with shapefiles of districts, cities and towns, you can merge these two together by joining tables or a join tables function.

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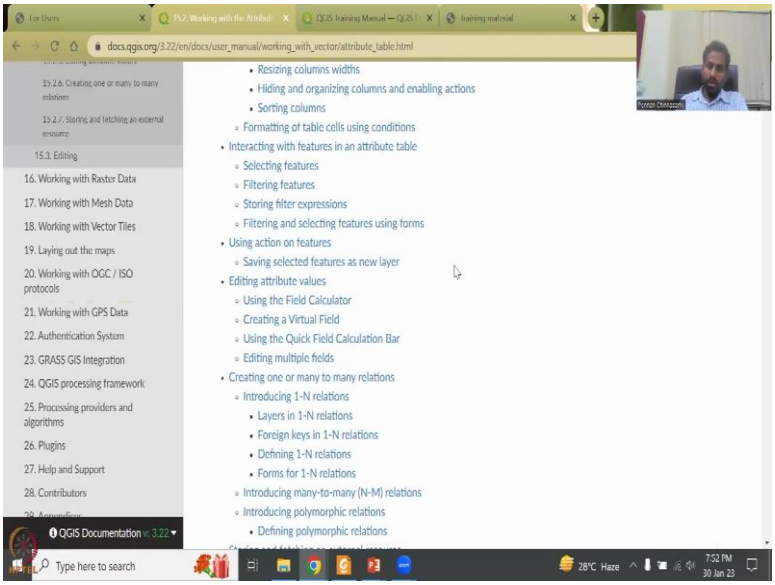

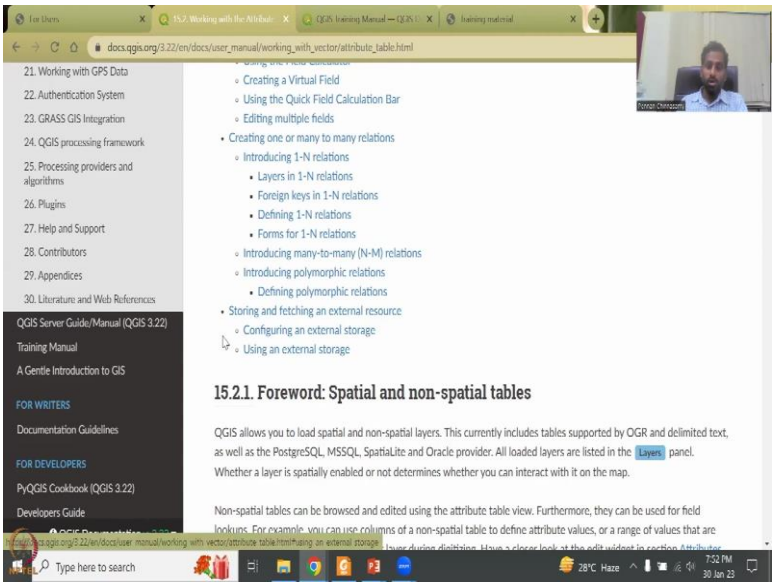

These are kind of advanced, but again, sometimes your data requires you to join and merge the data. So, that is what we are discussing here. So, that is all about this function working with vector data function. Again, as I said, there are multiple ways you could label your data, there are multiple ways you can access the data. And there are multiple ways you can store the data. So, all these have been given here, please go through it.

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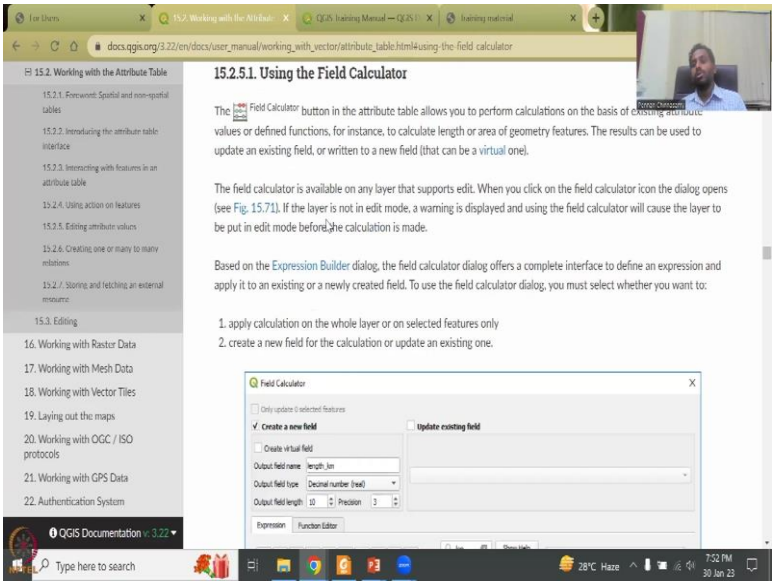

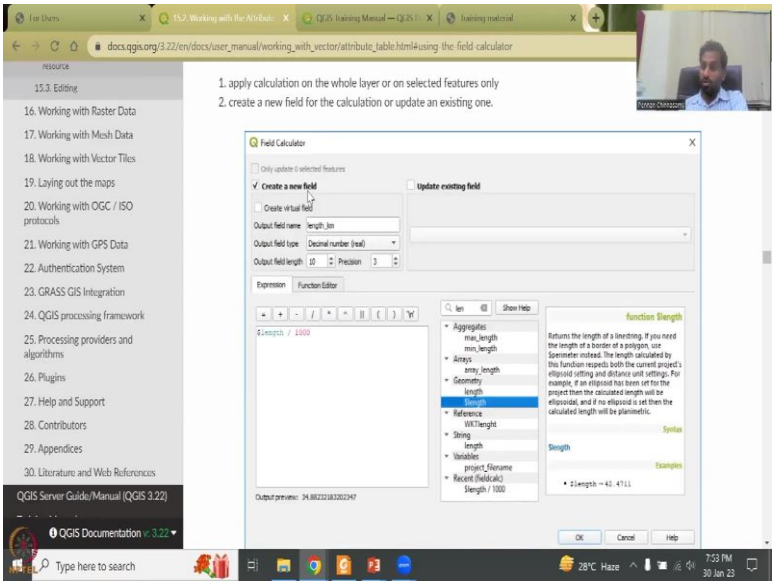

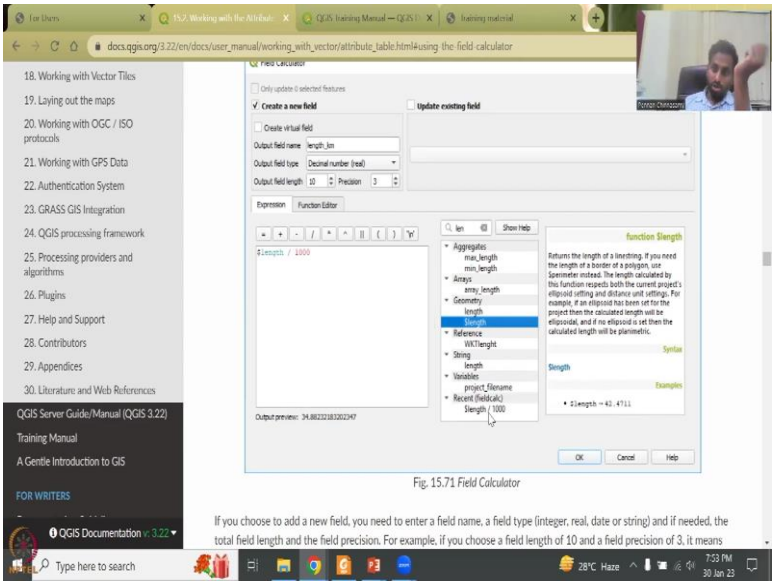

One tool that we will use more is the Field Calculator. It is actually used to create new fields, or create new rows and columns based on a existing column. For example, you have length divided by 1000. And so the function length, dollar length is how you write it the syntax, it returns the length of a nine string, if you need the length of a border of polygon, use dollar perimeter instead. So, here you could see that dollar length has given the output, the syntax is how you write the code. Here, there is a lot of codes sometimes that is where proprietary software will have this as a tool. But here, you will have to type it as a code.

If you just type it here in the search box and show help, it brings about a lot of lengths. And you know that you want to create the length of the create a new field where the length of a particular shapefile is stored. So, you could see here it is create a new field. So, in a table, you are creating a new field, a new column, and the column name is called length underscore kilometer, which means the output field is a decimal, it is a number with kilometers. So, maybe it was in meters the length, so length gives you the meter, the length of a line string in meters. So, what you would do is you divided by 1000 to get the kilometer.

So, some simple coding you will have to do. And you have to tell which column, which field you are going to take and then map it. So, you can also go and create a new field or update an existing field. If you update, the data will be corrupted or the data would be updated. So, as I always said, it is always easier to have a create new field and then preserve the old field so that you do not if you do a mistake in these kind of codings and stuff, you do not lose the initial information. So, field calculator is where you would go and delete a field, edit a field, convert a field or even create new fields as given here.

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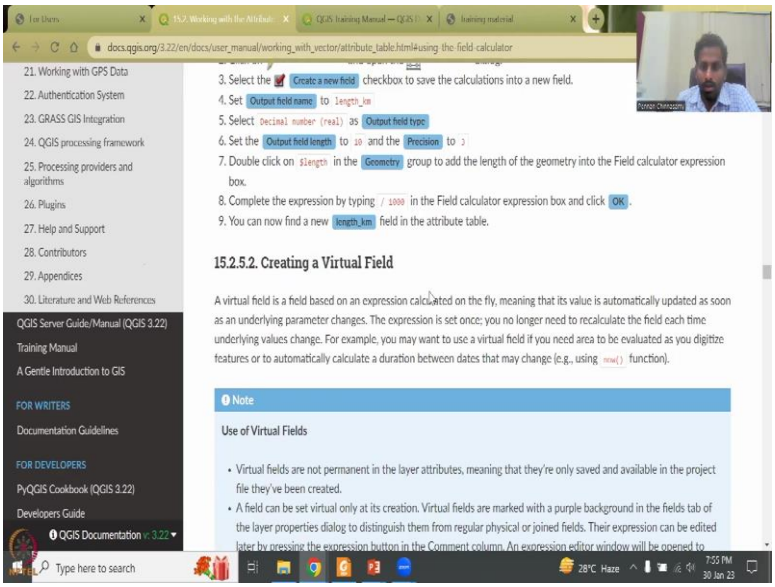

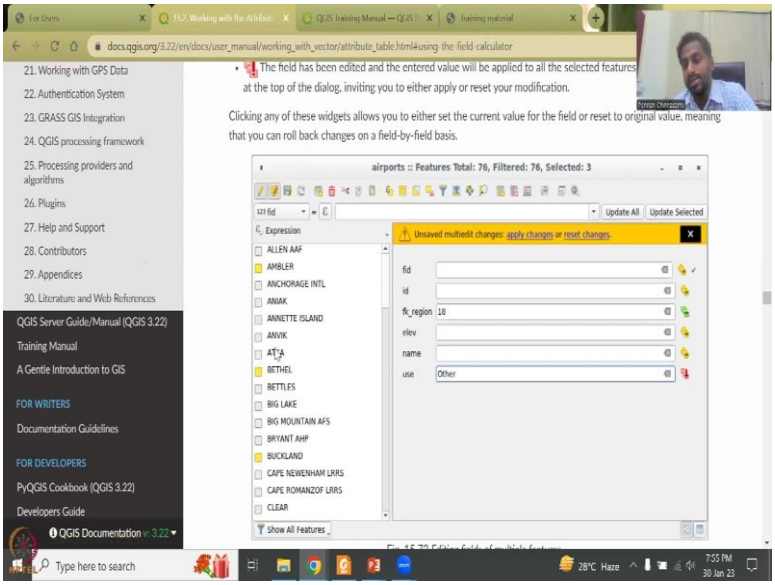

Multiple examples given editing multiples field how you would edit, use the toggle sign, the pencil sign, if you click and then say Edit, and then it will start editing. So, all these as I said, you could go through these tutorials. It has been given in the videos tutorial also. But for those who like to go through the exercise, you can go through this. It is like a cookbook recipe we say where we click click click and then each picture each image that comes is also given in the website so you can compare and then work through these homeworks.

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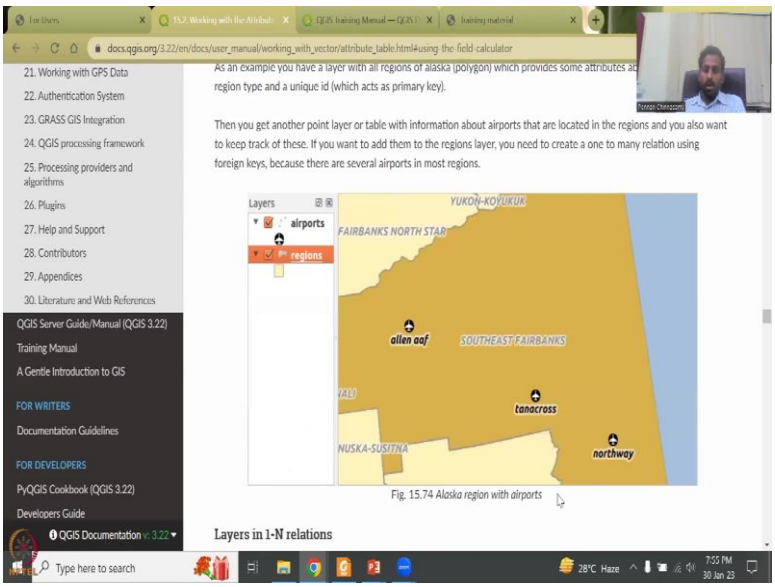

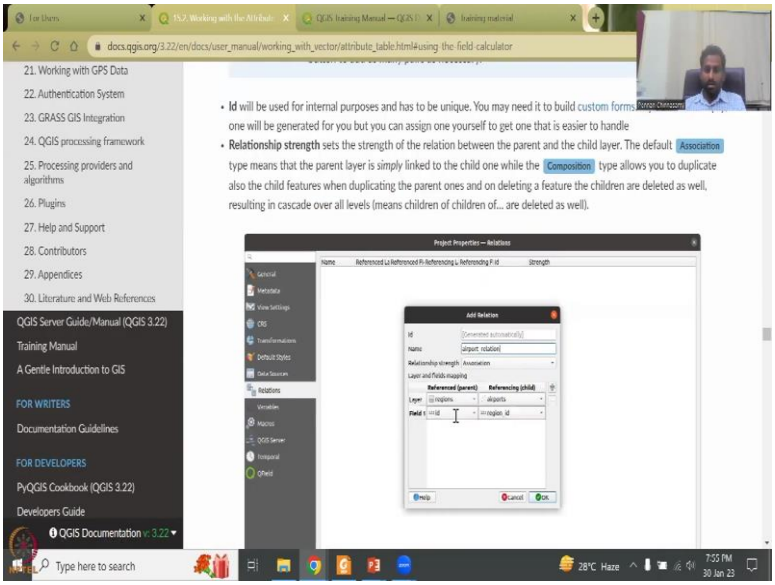

- **Id** will be used for internal purposes and has to be unique. You may need it to build custom forms one will be generated for you but you can assign one yourself to get one that is easier to handle
- **Relationship strength** sets the strength of the relation between the parent and the child layer. The default Association type means that the parent layer is *simply* linked to the child one while the Composition type allows you to duplicate also the child features when duplicating the parent ones and on deleting a feature the children are deleted as well, resulting in cascade over all levels (means children of children of... are deleted as well).

Fig. 15.75 *Adding a relation between regions and airports layers*

From the Relations tab, you can also press the Discover Relation button to fetch the relations available from the providers of the loaded layers. This is possible for layers stored in data providers like PostgreSQL or SpatiaLite.

Forms for 1-N relations

Now that QGIS knows about the relation, it will be used to improve the forms it generates. As we did not change the default form method (autogenerated) it will just add a new widget in our form. So let's select the layer region in the legend and use the identify tool. Depending on your settings, the form might open directly or you will have to choose to open it in the identification dialog under actions.

1	28	4	78,000	ANIAK	Other
2	29	4	1449,000	SPARREVOHN L...	Other
3	30	4	111,000	BETHEL	Civilian/Public
4	33	4	42,000	MEKORYUK	Other
5	58	4	492,000	CAPE NEWENH...	Other

OK Cancel

Fig. 15.76 *Identification dialog regions with relation to airports*

As you can see, the airports assigned to this particular region are all shown in a table. And there are also some buttons available. Let's review them shortly:

- The button is for toggling the edit mode. Be aware that it toggles the edit mode of the airport layer, although we are in the feature form of a feature from the region layer. But the table is representing features of the airport layer.
- The button is for saving all the edits in the child layer (airport).
- The button lets you digitize the airport geometry in the map canvas and assigns the new feature to the current region by default. Note that the icon will change according to the geometry type.
- The button adds a new record to the airport layer attribute table and assigns the new feature to the current region by default. The geometry can be drawn later with the Add part digitizing tool.
- The button allows you to copy and paste one or more child features within the child layer. They can later be assigned to a different parent feature or have their attributes modified.

They are given some example data and gone through these exercises.

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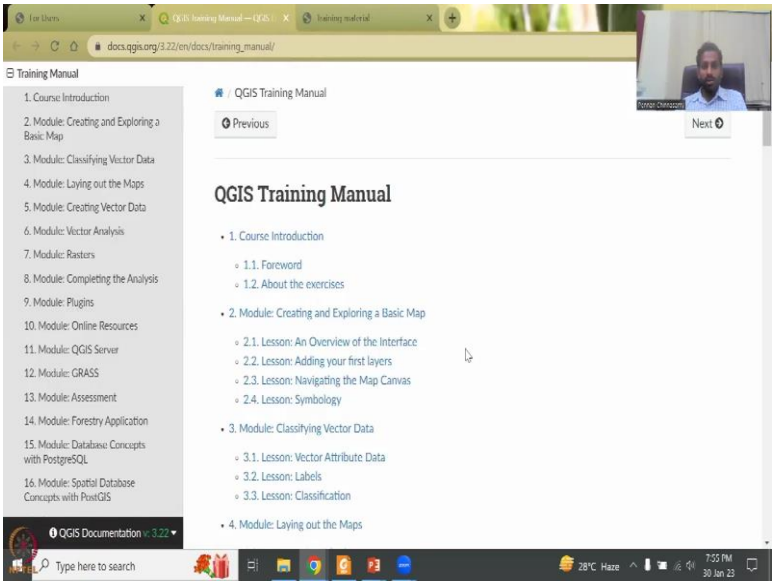

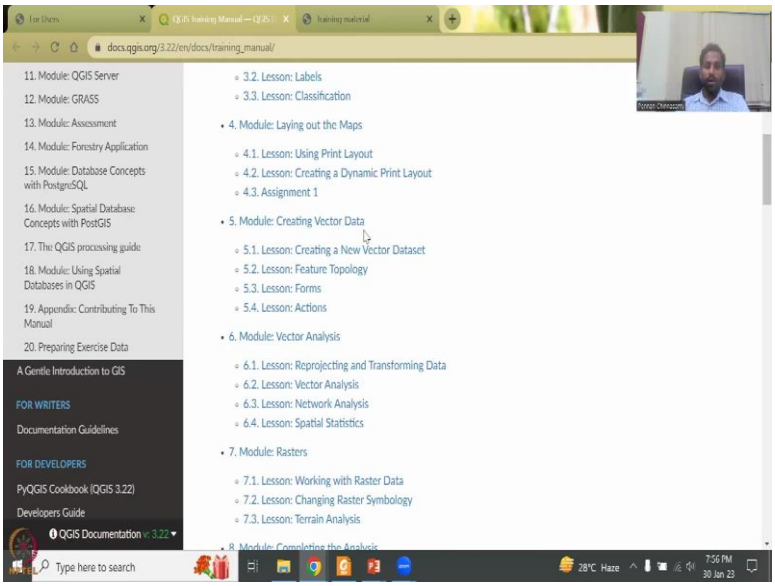

So, I will close this and then the manual is about using a QGIS tools, there are multiple modules, I would like you to concentrate on the creating vector data.

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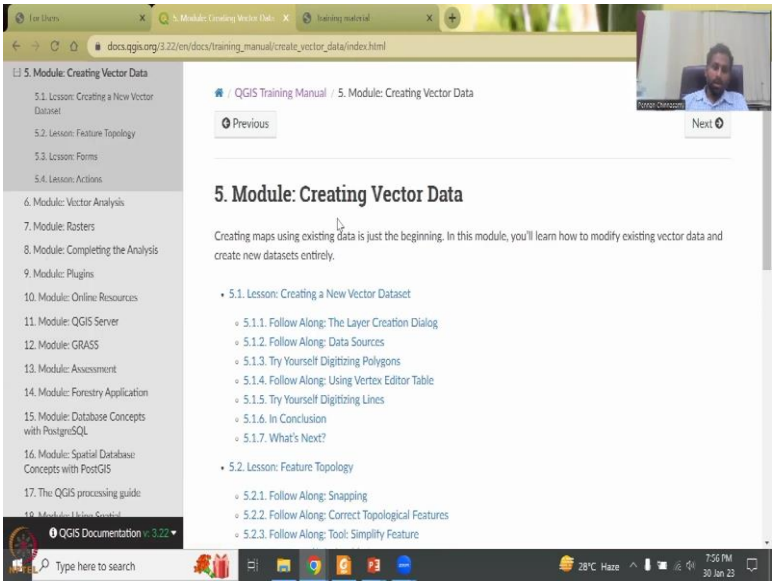
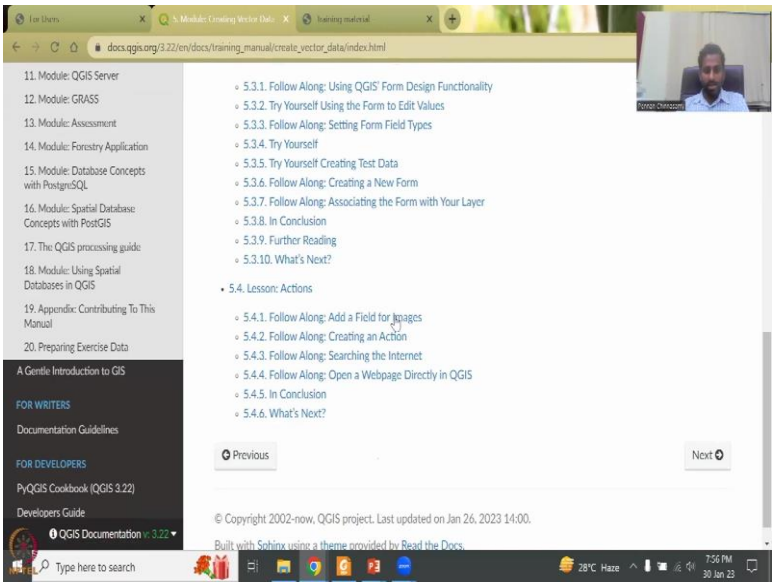
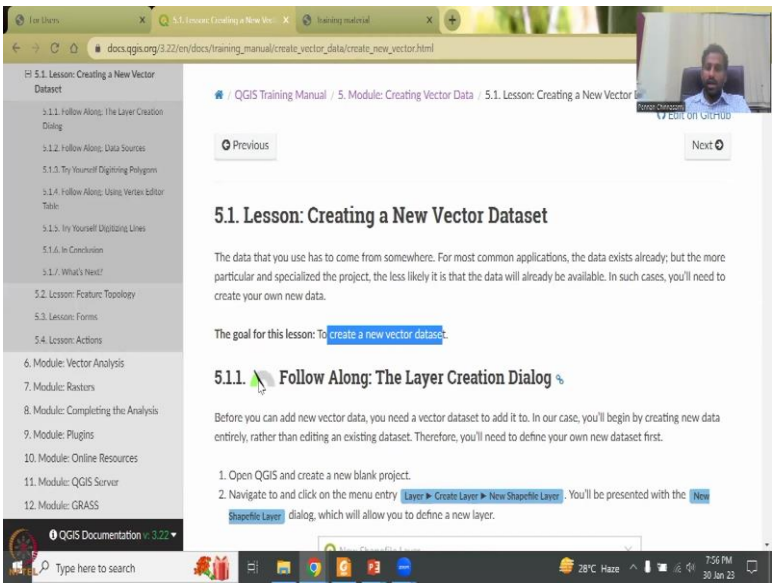
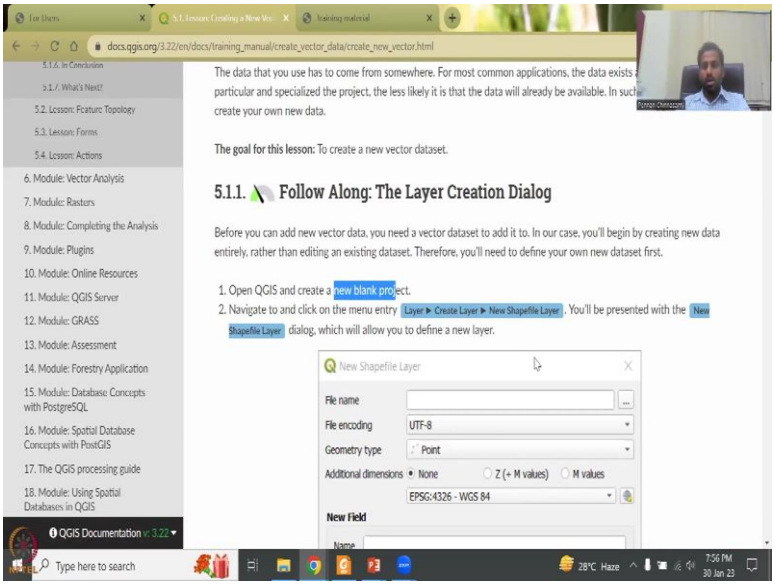
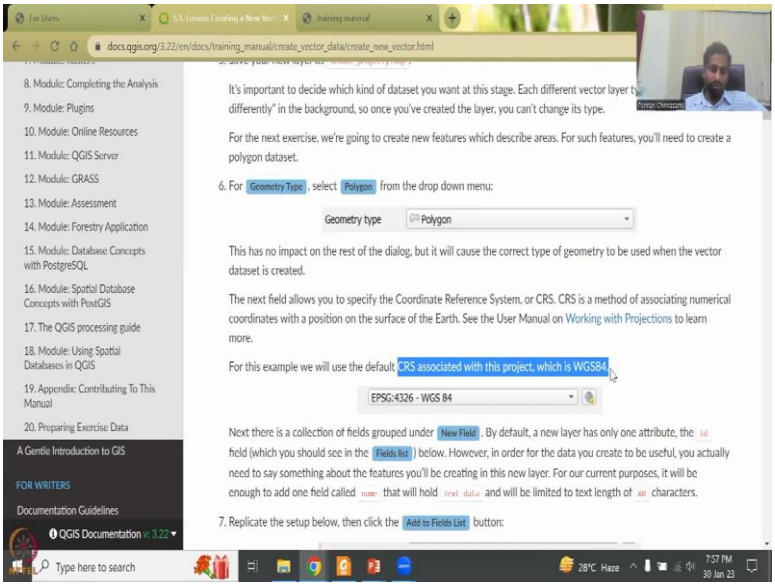






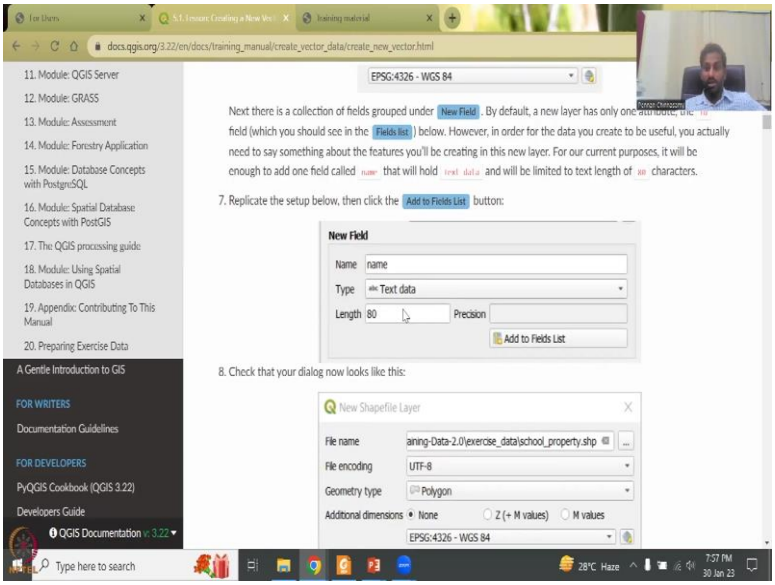


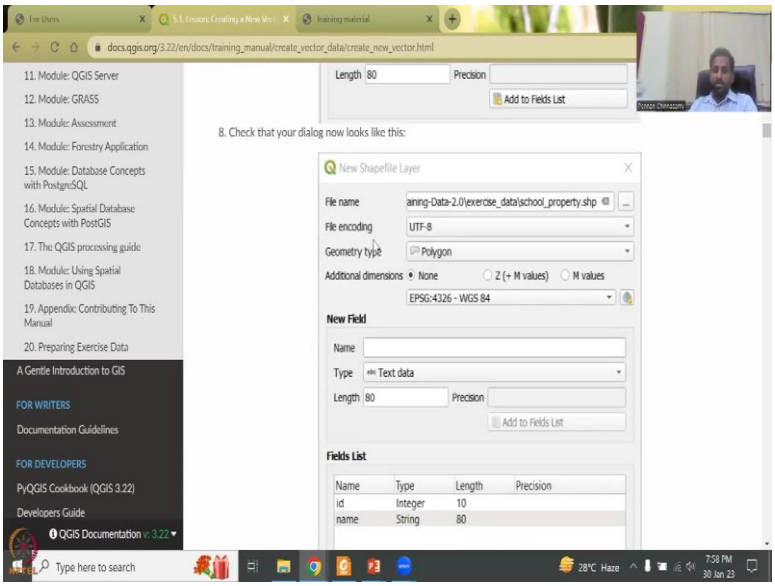


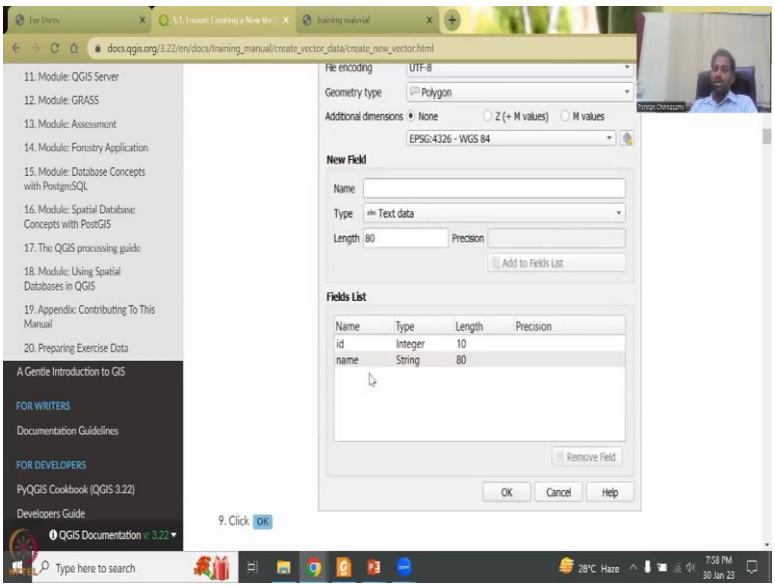
So, here you would say first lesson is to create a new vector data set, feature topology, forms actions, it will go through the create a new data set, and then it will tell you the goal is to create a new data set, it is not as difficult. It is green in color, so follow along, which means it just says open very, very simple basic steps, they will give you. Open QGIS, create a new blank project, navigate to create menu, and then we add the field.

So, each image is given to show you what we are going to do. So, this is a create a new shapefile and the shapefile type is a polygon. So, you have three-point line and polygon, they have taken the polygon. So, then you also have once you create it, you will have to give a projection and a coordinate system where the reference coordinate system has given us WGS 84. Again, if you do not know for your location, whatever here, the forum helps you, you can go and say for example, what is the CRS for Indian region and then you will get it.

(Refer Slide Time: 21:25)







So, then you add fields. So, once you create a Polygon Shapefile new database for vector, you will have to have columns where new fields or objects are going to be put, for example, you have a shapefile of states, then one of the field will be name. You want to give the district name or the state name and then the area the population, male or female. So, all these are fields of objects. And within the field, you have data, the rows become the attributes.

So, it says look at this new field, what type of field is a string? Is it a number, you will have to, since it is a name, it is a text data, how much length of the data you want to give, etcetera. So, all these are kind of self-explanatory, you would give within the field there ae two in this polygon there are two, one is name. And then the other is ID name. For example, state Tamil Nadu and ID is number 1, 0 1 would be the ID and it is 10 in number. So, maybe the zip code can also or the PIN code can also be kept here for a unique identifier.

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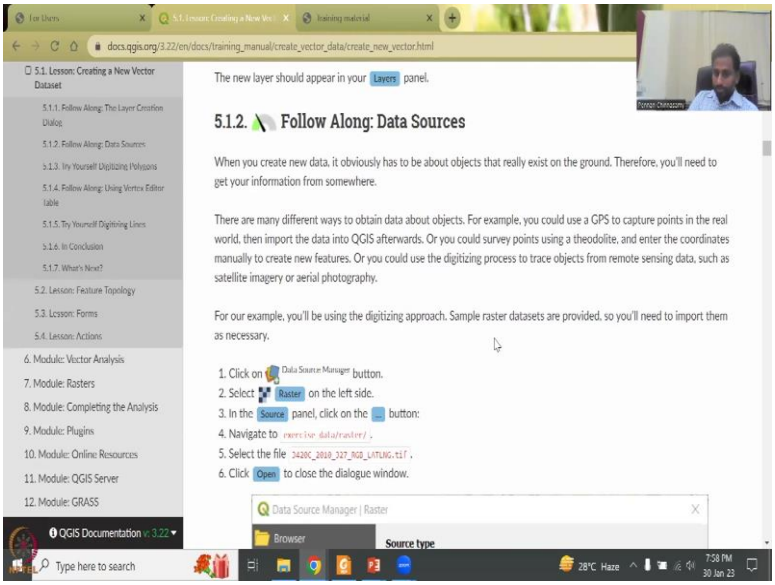

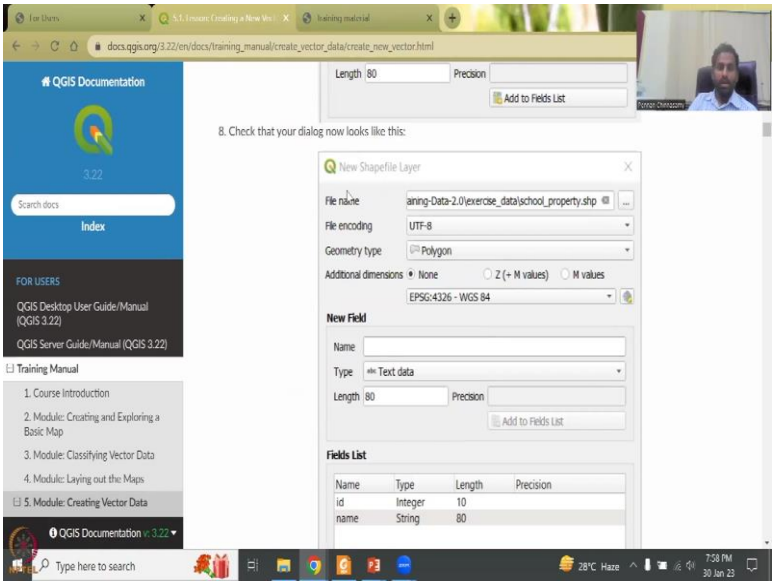

So, then you go to rasters another one. But we will come to this when we discuss the raster. So, we will keep this part alone for today.

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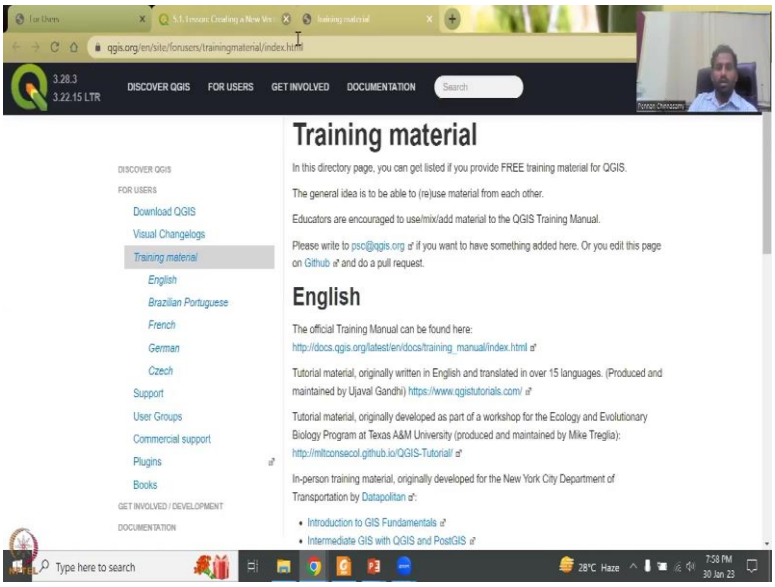

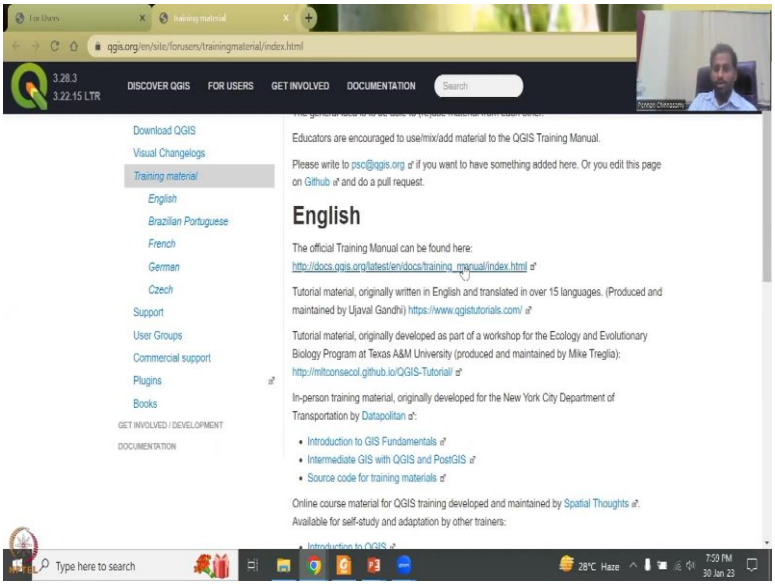
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Educators are encouraged to use/mix/add material to the QGIS Training Manual.
Please write to psc@qgis.org if you want to have something added here. Or you edit this page on Github and do a pull request.
English
The official Training Manual can be found here:
http://docs.qgis.org/latest/en/docs/training_manual/index.html
Tutorial material, originally written in English and translated in over 15 languages. (Produced and maintained by Ujaval Gandhi) https://www.qgistutorials.com/
Tutorial material, originally developed as part of a workshop for the Ecology and Evolutionary Biology Program at Texas A&M University (produced and maintained by Mike Treglia):
http://miltconsecol.github.io/QGIS-Tutorial/
In-person training material, originally developed for the New York City Department of Transportation by Datapolitan:
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Intermediate GIS with QGIS and PostGIS
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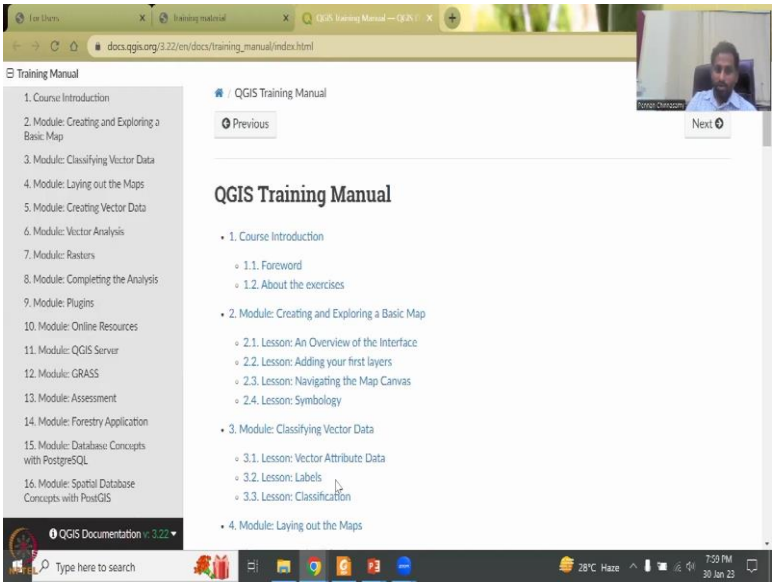
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4. Module: Laying out the Maps
5. Module: Creating Vector Data
6. Module: Vector Analysis
7. Module: Rasters
8. Module: Completing the Analysis
9. Module: Plugins
10. Module: Online Resources
11. Module: QGIS Server
12. Module: GRASS
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14. Module: Forestry Application
15. Module: Database Concepts with PostgreSQL
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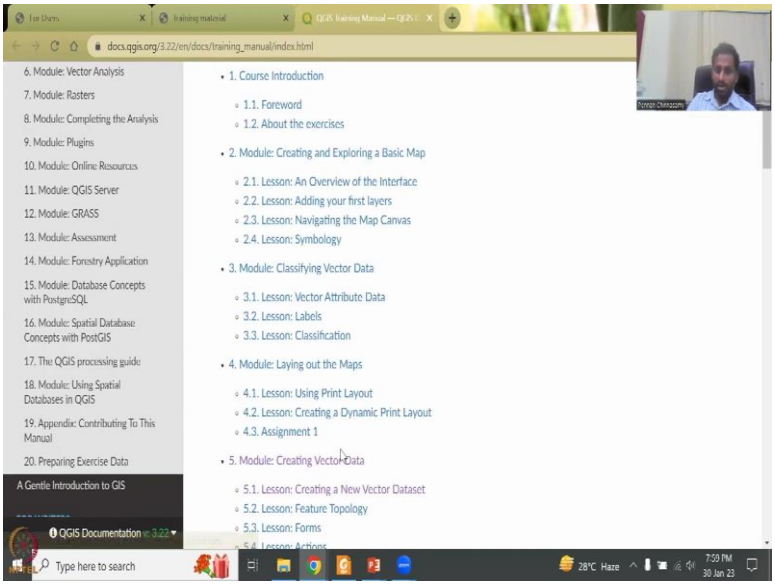
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So, moving on, they also have a training materials and English, Brazilian French, German and Czech. There are a lot of tutorials that they say available. So, for example, it says the official training materials can be found here. If you click it opens on the QGIS training modules, classifying vector data creating vector data, we just went through this tutorial.

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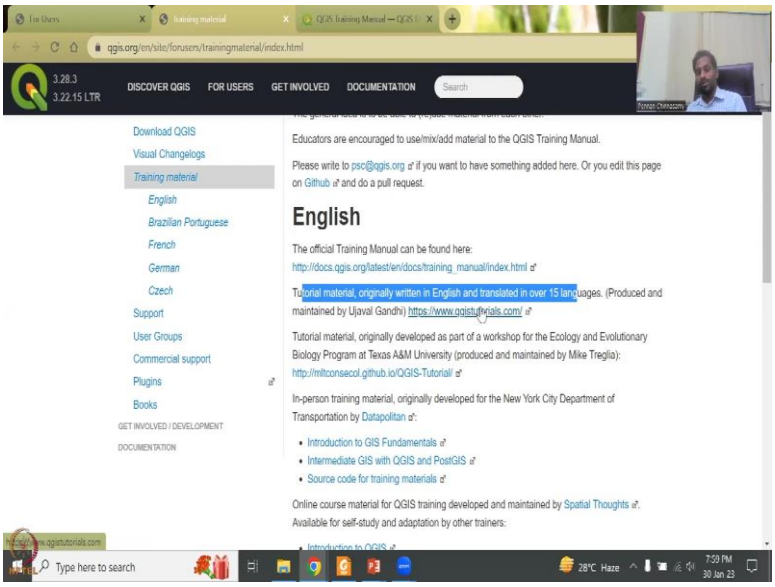

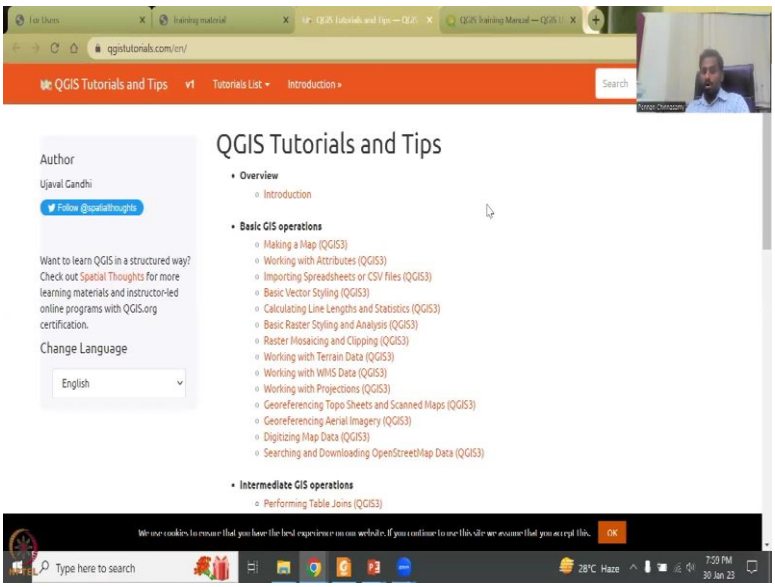

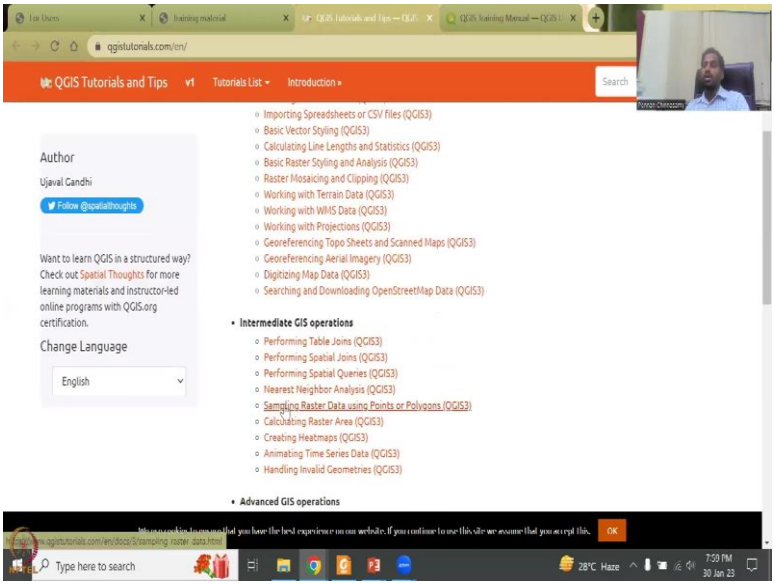
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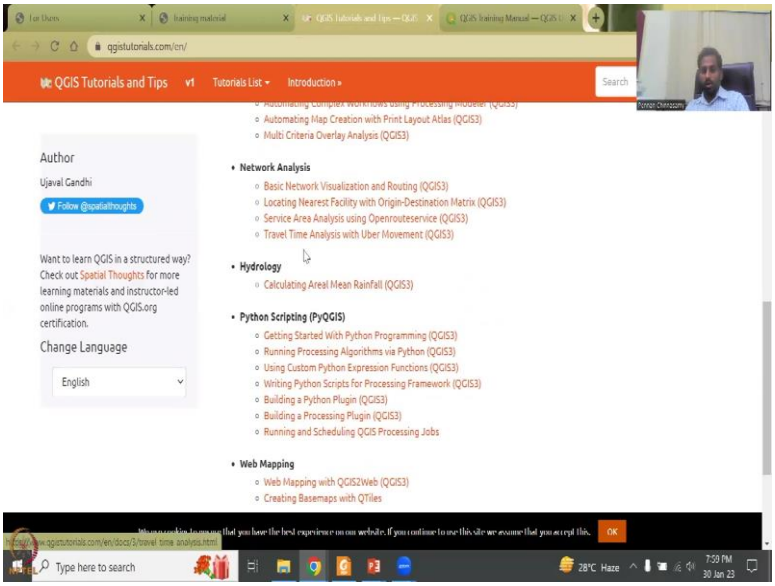
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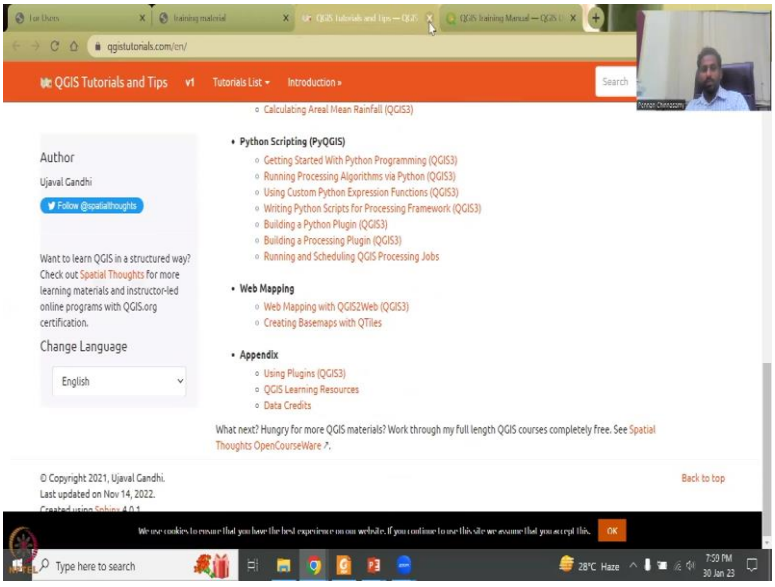
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Appendix
Using Plugins (QGIS3)
QGIS Learning Resources
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And then there is a workshop written in English translated in both languages done by Ujual Gandhi, who is like, as I said, a volunteer who gives lot of time on these. So, if you click this, you can also get into some other tutorials, all open source free based on QGIS. So, you have different versions, you have basic operations, you have the intermediate, advanced and then water specific etcetera.

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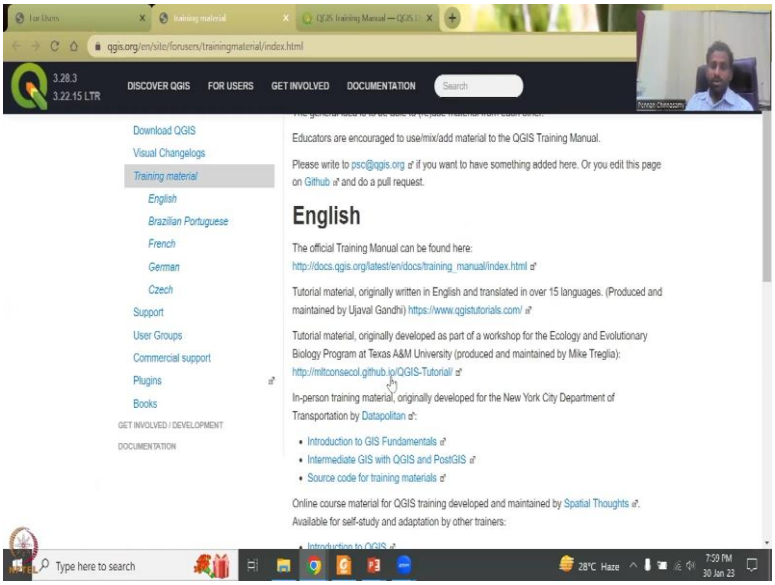

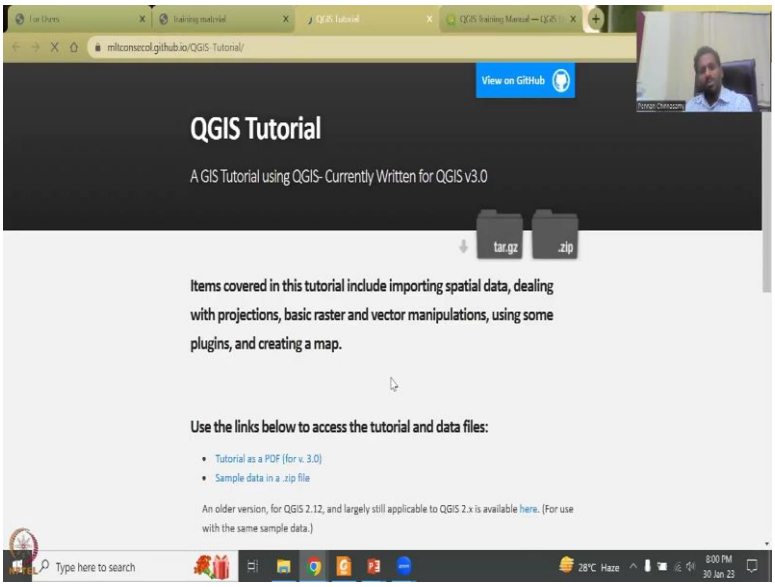

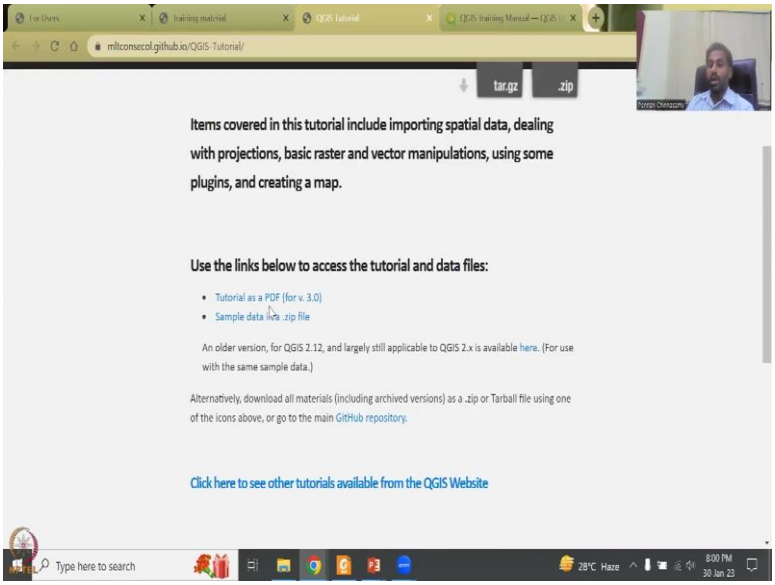
mltconsecol.github.io/QGIS-Tutorial/
tar.gz
.zip
Items covered in this tutorial include importing spatial data, dealing with projections, basic raster and vector manipulations, using some plugins, and creating a map.
Use the links below to access the tutorial and data files:
Tutorial as a PDF (for v. 3.0)
Sample data in a .zip file
An older version, for QGIS 2.12, and largely still applicable to QGIS 2.x is available here. (For use with the same sample data.)
Alternatively, download all materials (including archived versions) as a .zip or Tarball file using one of the icons above, or go to the main GitHub repository.
Click here to see other tutorials available from the QGIS Website
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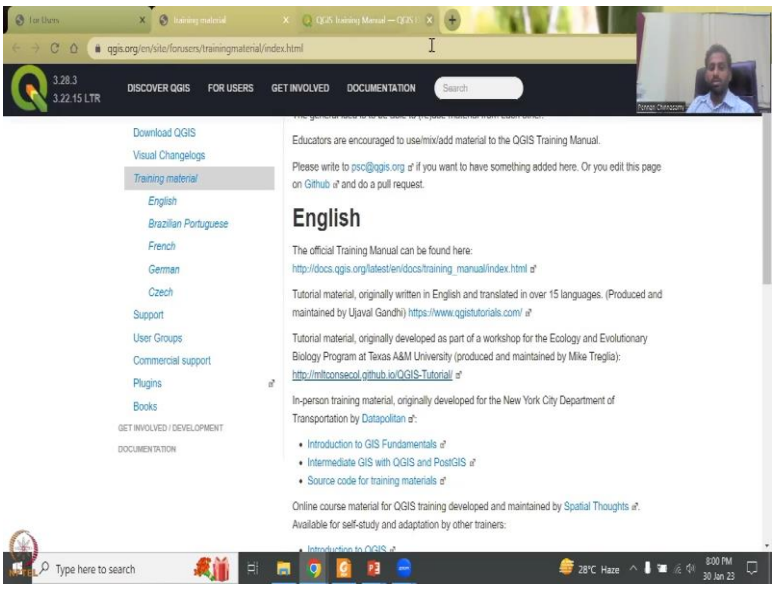
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DOCUMENTATION
Educators are encouraged to use/mix/add material to the QGIS Training Manual.
Please write to psc@qgis.org if you want to have something added here. Or you edit this page on Github and do a pull request.
English
The official Training Manual can be found here:
http://docs.qgis.org/latest/en/docs/training_manual/index.html
Tutorial material, originally written in English and translated in over 15 languages. (Produced and maintained by Ujaval Gandhi) https://www.qgistutorials.com/
Tutorial material, originally developed as part of a workshop for the Ecology and Evolutionary Biology Program at Texas A&M University (produced and maintained by Mike Treglia):
http://mltconsecol.github.io/QGIS-Tutorial/
In-person training material, originally developed for the New York City Department of Transportation by Datapolitan:
Introduction to GIS Fundamentals
Intermediate GIS with QGIS and PostGIS
Source code for training materials
Online course material for QGIS training developed and maintained by Spatial Thoughts.
Available for self-study and adaptation by other trainers:
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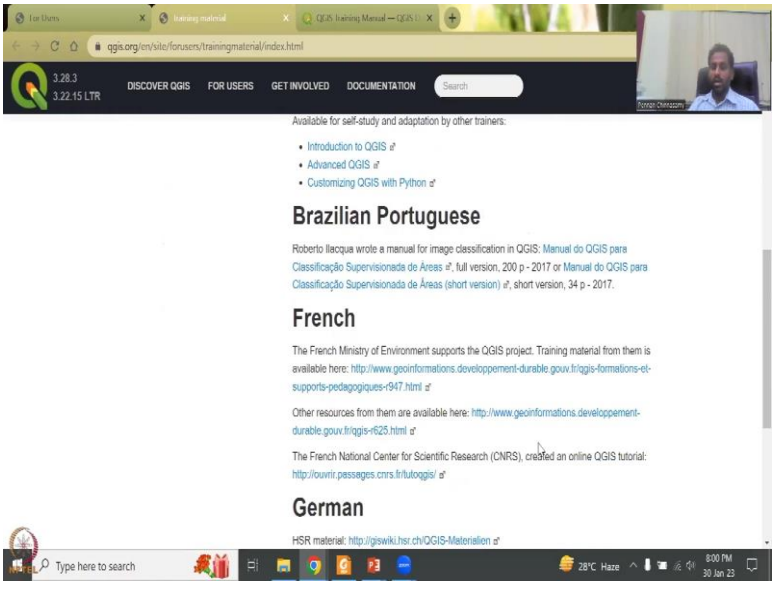
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Available for self-study and adaptation by other trainers:
Introduction to QGIS
Advanced QGIS
Customizing QGIS with Python
Brazilian Portuguese
Roberto Ilacqua wrote a manual for image classification in QGIS: Manual do QGIS para Classificação Supervisionada de Áreas, full version, 200 p - 2017 or Manual do QGIS para Classificação Supervisionada de Áreas (short version), short version, 34 p - 2017.
French
The French Ministry of Environment supports the QGIS project. Training material from them is available here: http://www.geoinformations.developpement-durable.gouv.fr/qgis-formations-et-supports-pedagogiques-r947.html
Other resources from them are available here: http://www.geoinformations.developpement-durable.gouv.fr/qgis-r625.html
The French National Center for Scientific Research (CNRS), created an online QGIS tutorial:
http://ouvrir.passages.cnrs.fr/tuloggis/
German
HSR material: http://giswiki.hsr.ch/QGIS-Materialien
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And then there is also a tutorial material download as part of the workshop on ecology and evolutionary biology program at Texas, A&M university. So, you can click here and then go in. Most of them are not videos. So, however, it is still okay to go through and do like cookbook recipe.

As I said, step one, they will ask you to add in an image is there. So, you will have it. It is written in simple English, it is not difficult. So, please go through it. There is a fundamental GIS, intermediate of GIS with QGIS and post GIS. And then a lot of coding, if you would like to do the advanced part can be done here. So, this introduction, advanced and customized QGIS, plugins and Python. You could definitely use these. These are the training materials.

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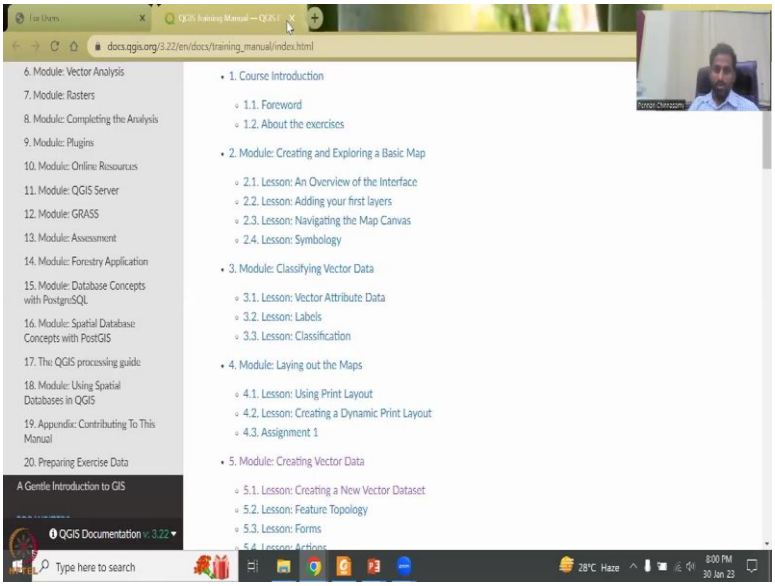
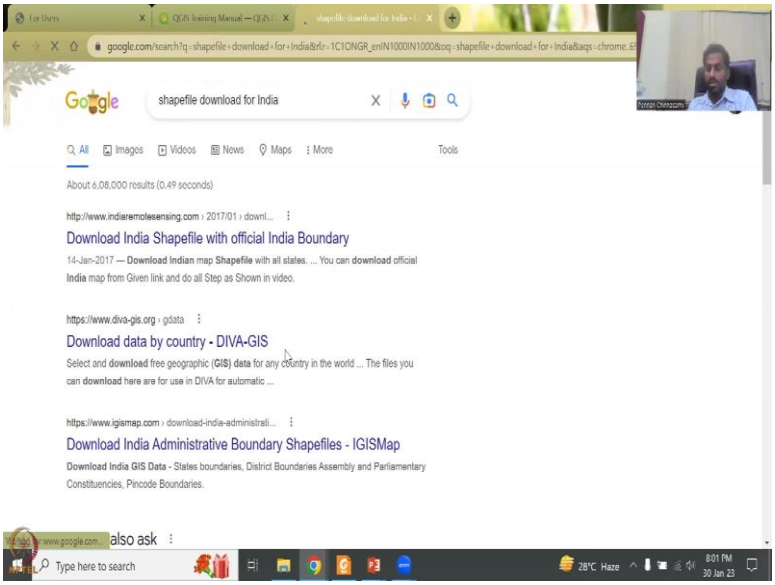
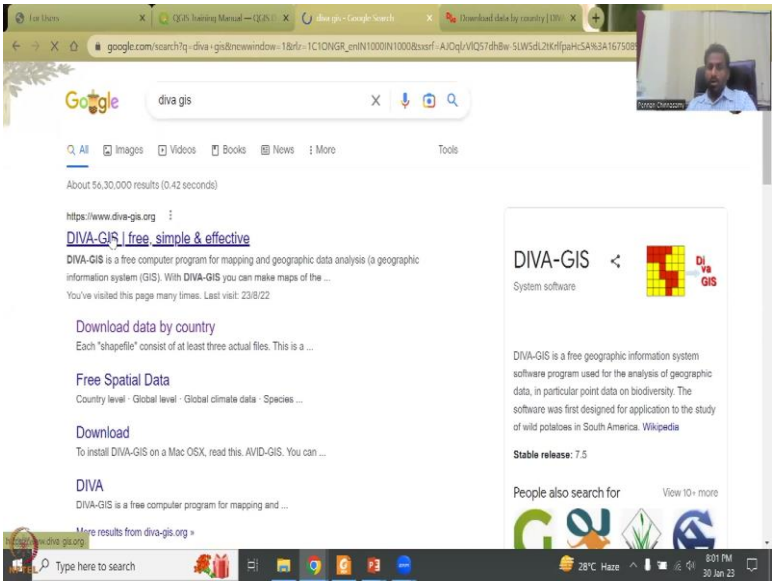
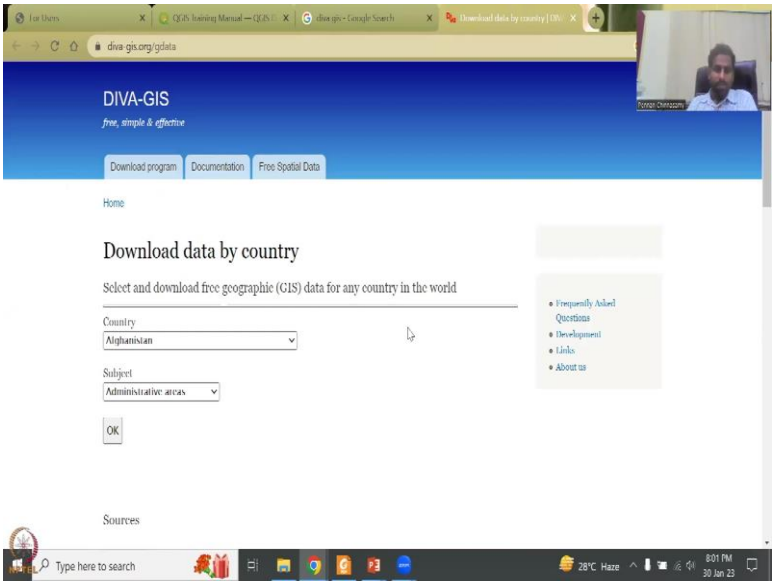


And the training materials that we find online are also usable, for example, every entity private or government agencies do spend a lot of time on these kind of tutorials to support students, researchers and anyone who would like to use QGIS. So, coming back, I would like to again stress the fact about QGIS.

(Refer Slide Time: 25:14)

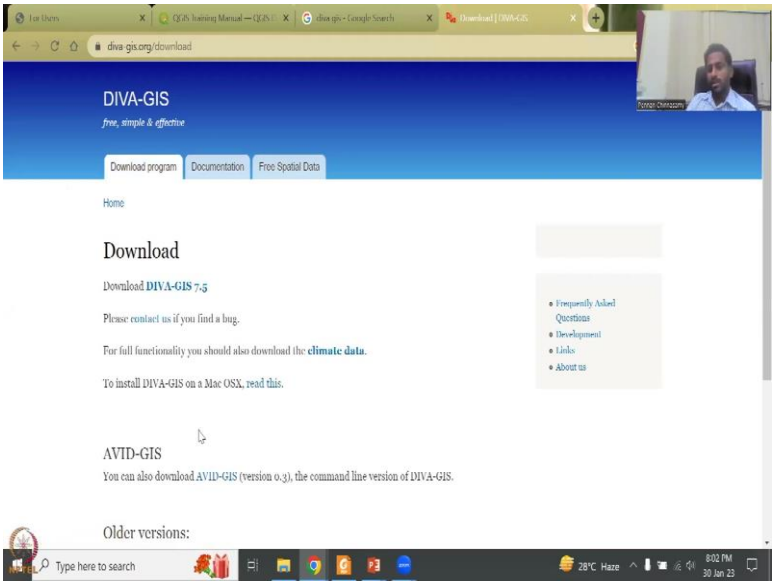


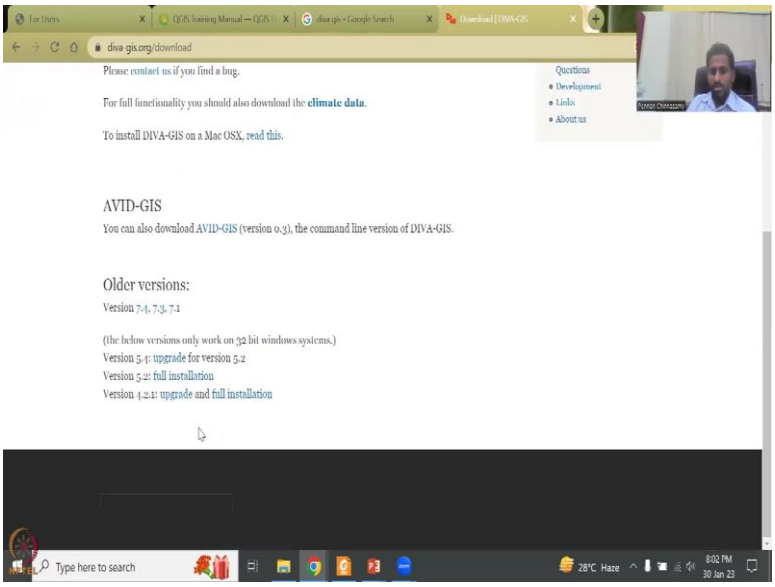


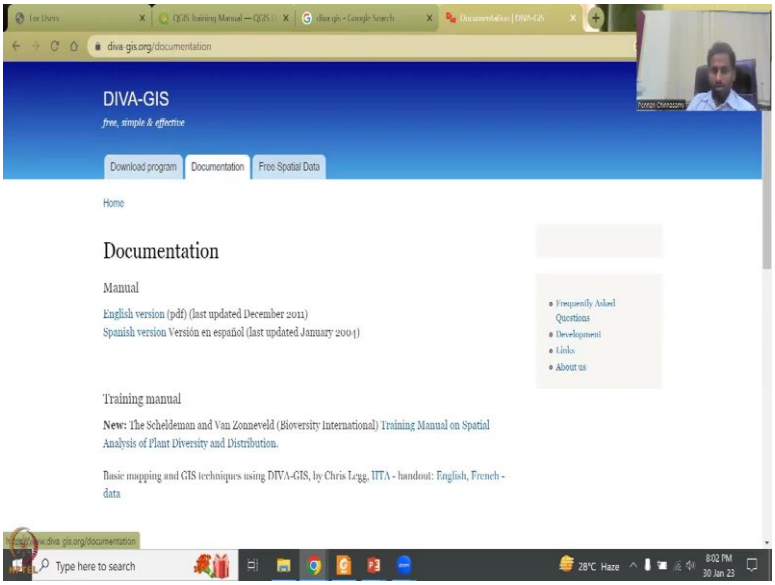


But before that I would like you to look at how do you search for meta data. So, you have type shape file, download for India just say for searching. So, in QGIS you can see that lot of downloads shapefiles boundaries, DIVA-GIS etcetera is there. I will explain DIVA-GIS here. So, how you ever searched for if you want is just DIVA-GIS. It opens like this. It is a very useful data archive for point data and some raster data.

(Refer Slide Time: 25:53)



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English version (pdf) (last updated December 2011)
Spanish version Versión en español (last updated January 2004)
Training manual
New: The Scheldeman and Van Zonneveld (Bioversity International) Training Manual on Spatial Analysis of Plant Diversity and Distribution.
Basic mapping and GIS techniques using DIVA-GIS, by Chris Legg, IITA - handout: English, French - data
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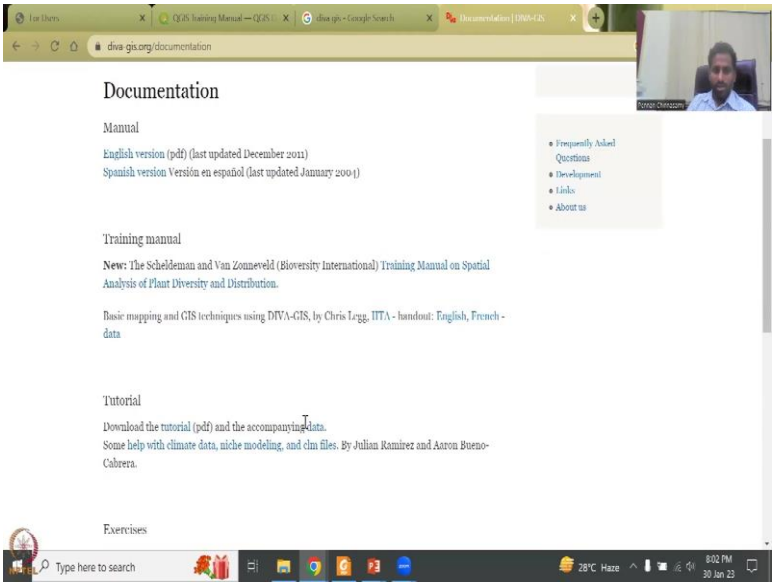
diva-gis.org/documentation
Documentation
Manual
English version (pdf) (last updated December 2011)
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Training manual
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Basic mapping and GIS techniques using DIVA-GIS, by Chris Legg, IITA - handout: English, French - data
Tutorial
Download the tutorial (pdf) and the accompanying data.
Some help with climate data, niche modeling, and clm files. By Julian Ramirez and Aaron Bueno-Cabrera.
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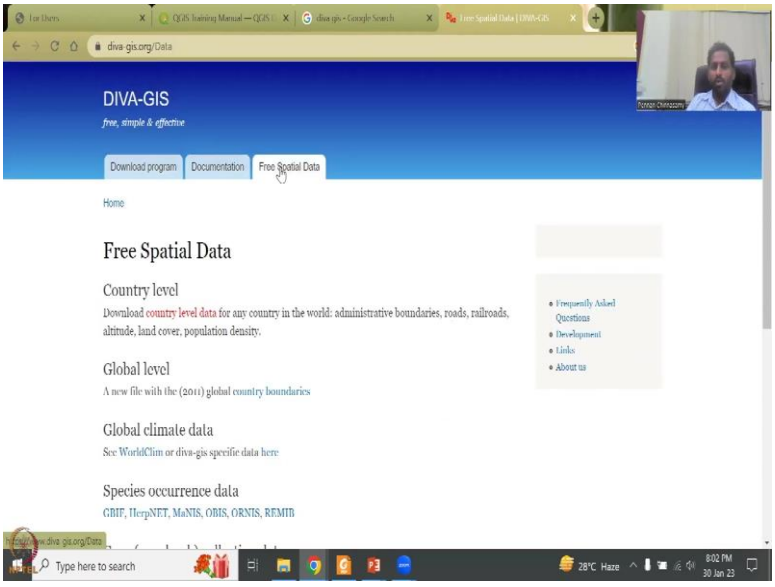
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Country level
Download country level data for any country in the world: administrative boundaries, roads, railroads, altitude, land cover, population density.
Global level
A new file with the (2011) global country boundaries
Global climate data
See WorldClim or diva-gis specific data here
Species occurrence data
GBIF, HerpNET, MaNIS, OBIS, ORNIS, REMIB
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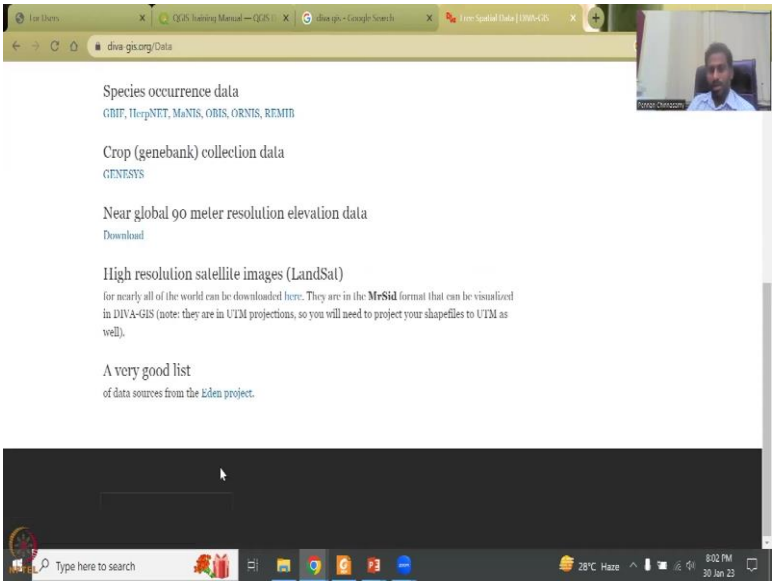

Once you click DIVA-GIS or download data by country, you will go through the download program to look at what is this DIVA-GIS is about, how is it free and then documentation English and different language and then how it has become free spatial data and all of this what are the data that you can collect? Sometimes it also brings data from multiple resources for example, here you have Eden Project and Landsat data from different resources. The elevation data is also here.

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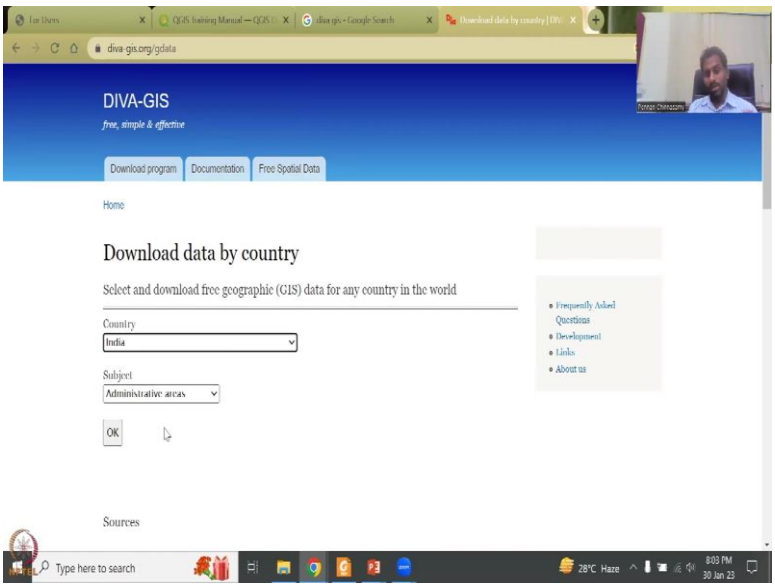

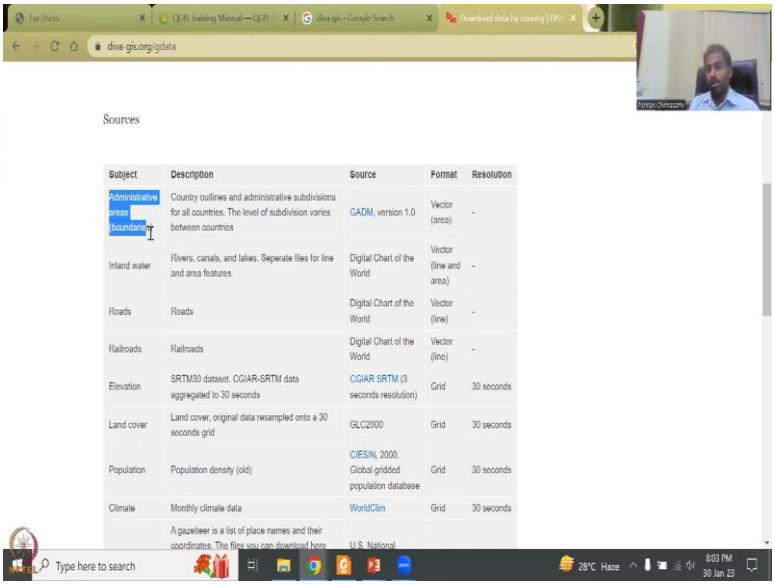
diva-gis.org/gdata
Sources
Subject | Description | Source | Format | Resolution
Administrative areas (boundaries) | Country outlines and administrative subdivisions for all countries. The level of subdivision varies between countries | GADM, version 1.0 | Vector (area) | -
Inland water | Rivers, canals, and lakes. Seperate files for line and area features | Digital Chart of the World | Vector (line and area) | -
Roads | Roads | Digital Chart of the World | Vector (line) | -
Railroads | Railroads | Digital Chart of the World | Vector (line) | -
Elevation | SRTM30 dataset. CGIAR-SRTM data aggregated to 30 seconds | CGIAR SRTM (3 seconds resolution) | Grid | 30 seconds
Land cover | Land cover, original data resampled onto a 30 seconds grid | GLC2000 | Grid | 30 seconds
Population | Population density (old) | CIESIN, 2000. Global gridded population database | Grid | 30 seconds
Climate | Monthly climate data | WorldClim | Grid | 30 seconds
A gazetteer is a list of place names and their coordinates. The files you can download here
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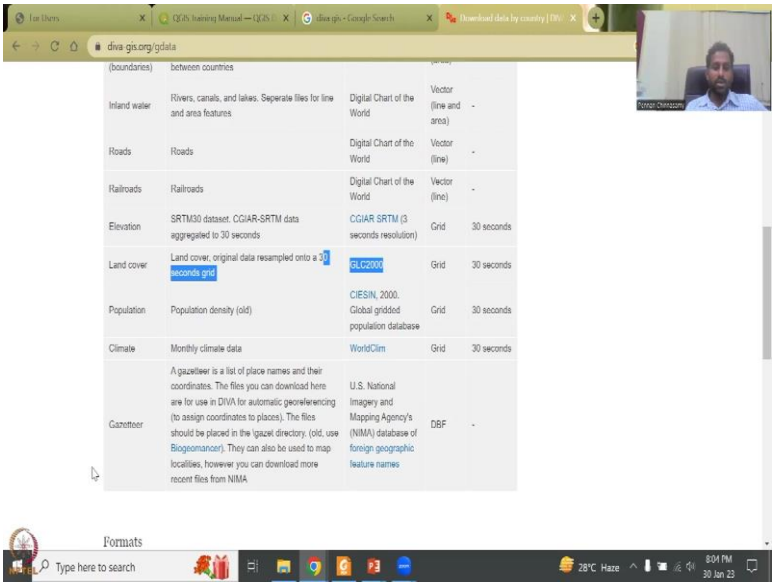
diva-gis.org/gdata
(boundaries) | between countries
Inland water | Rivers, canals, and lakes. Seperate files for line and area features | Digital Chart of the World | Vector (line and area) | -
Roads | Roads | Digital Chart of the World | Vector (line) | -
Railroads | Railroads | Digital Chart of the World | Vector (line) | -
Elevation | SRTM30 dataset. CGIAR-SRTM data aggregated to 30 seconds | CGIAR SRTM (3 seconds resolution) | Grid | 30 seconds
Land cover | Land cover, original data resampled onto a 30 seconds grid | GLC2000 | Grid | 30 seconds
Population | Population density (old) | CIESIN, 2000. Global gridded population database | Grid | 30 seconds
Climate | Monthly climate data | WorldClim | Grid | 30 seconds
Gazetteer | A gazetteer is a list of place names and their coordinates. The files you can download here are for use in DIVA for automatic georeferencing (to assign coordinates to places). The files should be placed in the \gazet directory. (old, use Biogeomancer). They can also be used to map localities, however you can download more recent files from NIMA | U.S. National Imagery and Mapping Agency's (NIMA) database of foreign geographic feature names | DBF | -
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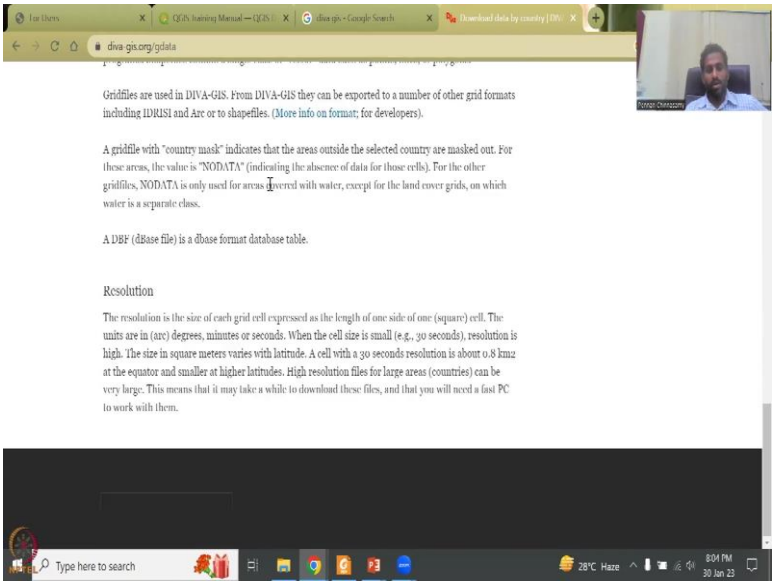
diva-gis.org/gdata
Gridfiles are used in DIVA-GIS. From DIVA-GIS they can be exported to a number of other grid formats including IDRISI and Arc or to shapefiles. (More info on format; for developers).
A gridfile with "country mask" indicates that the areas outside the selected country are masked out. For these areas, the value is "NODATA" (indicating the absence of data for those cells). For the other gridfiles, NODATA is only used for areas covered with water, except for the land cover grids, on which water is a separate class.
A DBF (dBase file) is a dbase format database table.
Resolution
The resolution is the size of each grid cell expressed as the length of one side of one (square) cell. The units are in (arc) degrees, minutes or seconds. When the cell size is small (e.g., 30 seconds), resolution is high. The size in square meters varies with latitude. A cell with a 30 seconds resolution is about 0.8 km2 at the equator and smaller at higher latitudes. High resolution files for large areas (countries) can be very large. This means that it may take a while to download these files, and that you will need a fast PC to work with them.
Type here to search
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So, I would like to conclude by just going through this exercise of how do you get country level data. So, click DIVA-GIS. Again, the boundaries may be different, they keep updating, they key changing these boundaries. So, please be very cautious about using it. Use mostly the Indian government websites, some data if it is not available, yes, you can use these kinds of resources, but be very careful on the northern boundaries and other boundaries of India because sometimes they do not have accurate information, which is the full coverage. But they will give you what is the data about.

For example, I have click India. And they tell what are the data that they have and what is the source. So, sources this one so, you have unrestricted boundaries, this is where I am talking about the boundaries may or may not be correct. There is no vouching of these who are the government agency telling that this is the correct data to use like this, there will be multiple data online. Please do not use them unless otherwise it has been verified and the government of India approves it.

Here this has not been approved as the boundaries. So, be careful in using it. Maybe you can go to the source and if that is approved, you can use it. But for the southern part, most of these data are accurate especially the administrative boundaries, inland water which is the rivers canals, road network, railroads, elevation data is same, you do not have boundaries, it is a raster. It is a continuous data.

So, you can take it the land use land cover is their population from the census and then put it in as GIS format. World Claim climate, data world climate or World Claim data is pretty good and well used by researchers around the world. It gives you rainfall, wind speed, temperature, humidity, most of the parameters for climate are given here and also name or coordinates which gives you some administrative data also, the formats whatever formats, what is the resolution, all these can be obtained from here the format and resolution.

Resolution is mostly given as spatial resolution. It is not talking about temporal for example, land use land cover is for a particular year 2000. It is not every year every 5 years once and the units is 30 seconds, you can always convert the unit to matrix by using some formulas.

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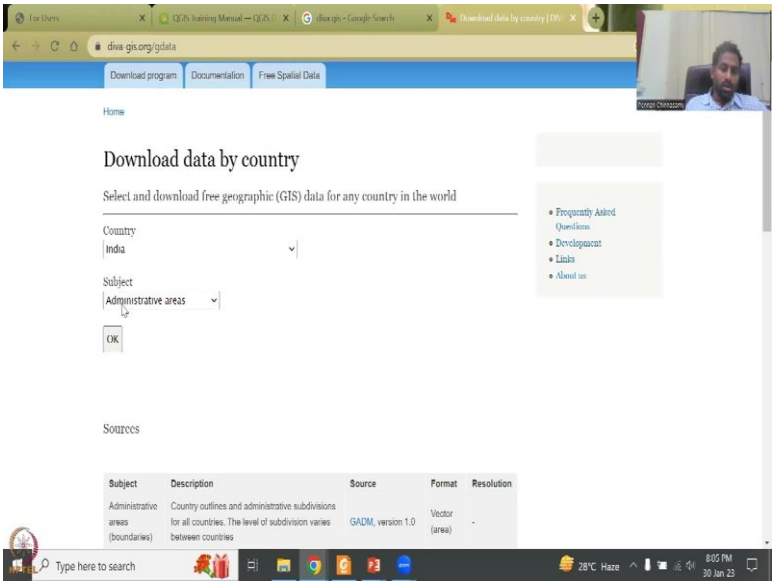

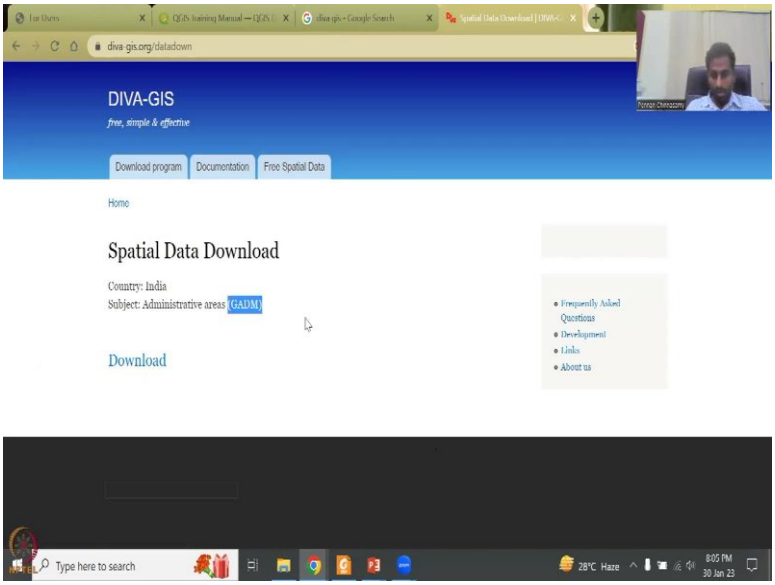

So, once you get okay it will ask you to download the data as a zip folder. You can download it and apply it in GIS, but again be careful on understanding the data is it been approved by government of India.

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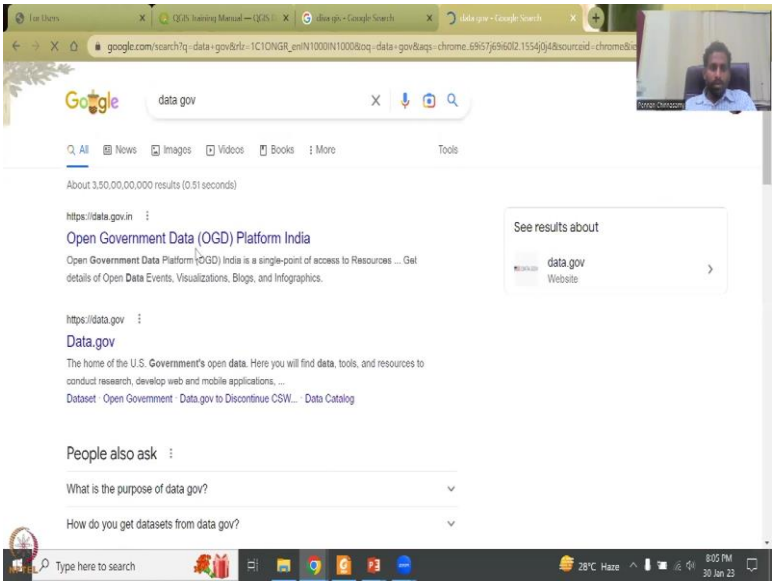

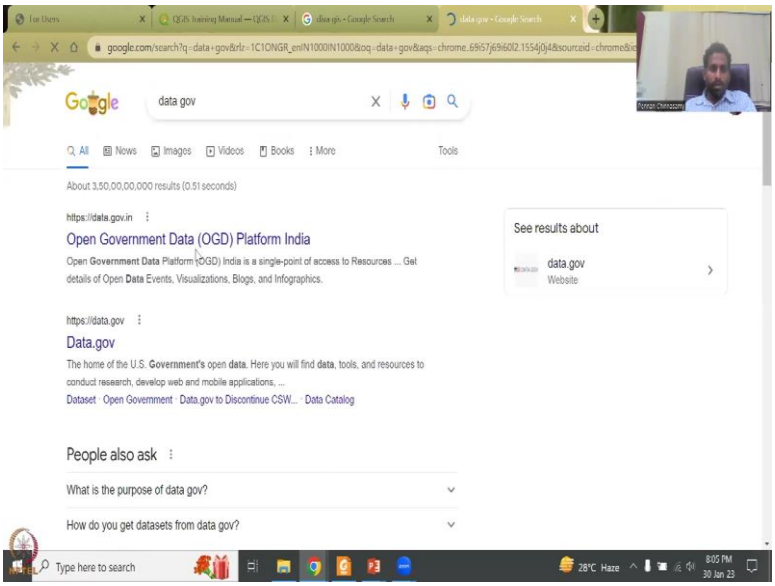

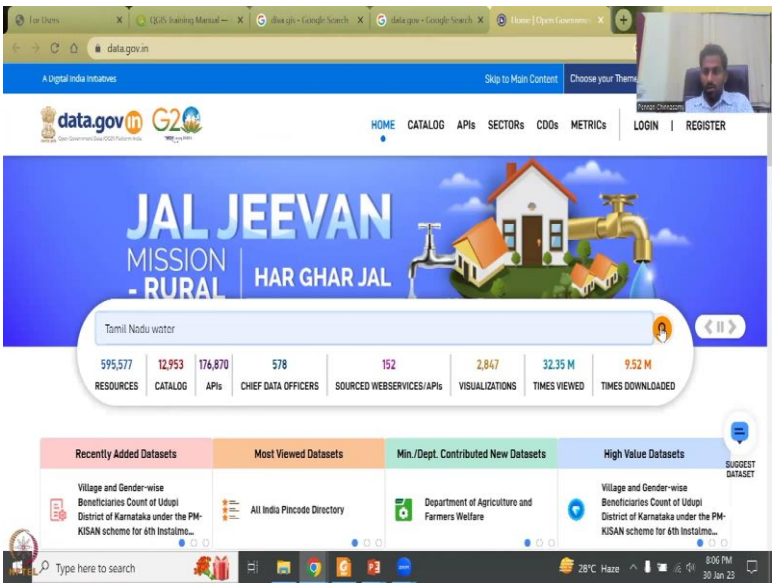

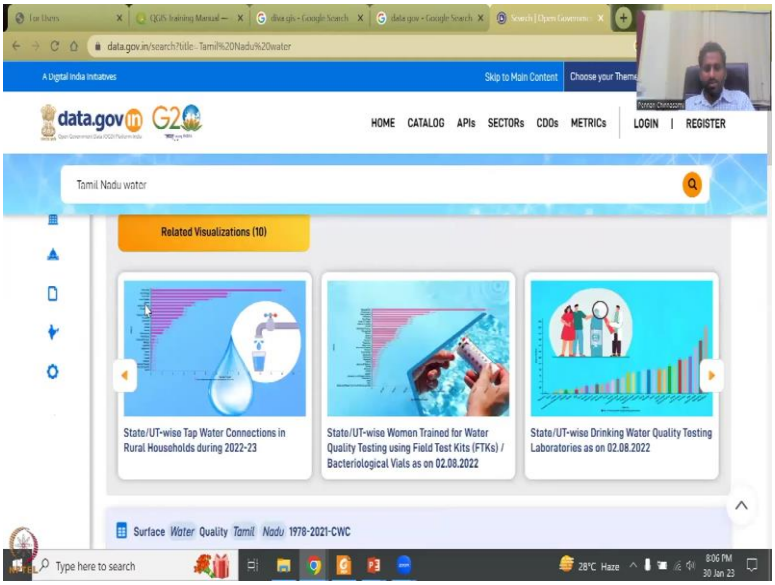
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Tamil Nadu water
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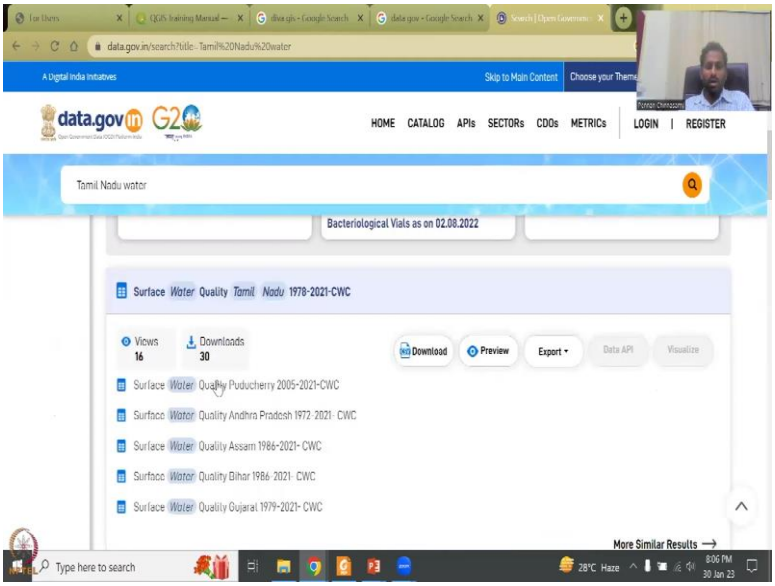
State/UT-wise Women Trained for Water Quality Testing using Field Test Kits (FTKs) / Bacteriological Vials as on 02.08.2022
State/UT-wise Drinking Water Quality Testing Laboratories as on 02.08.2022
Surface Water Quality Tamil Nadu 1978-2021-CWC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Surface Water Quality Assam 1986-2021-CWC
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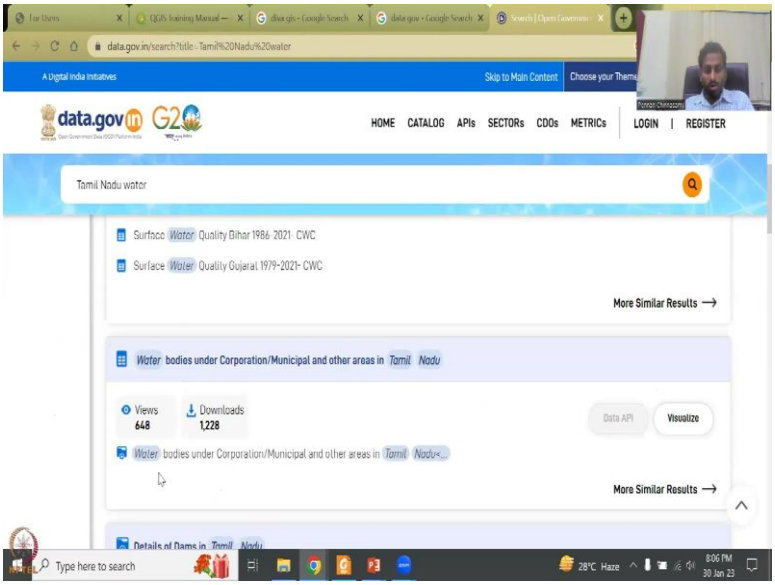
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Tamil Nadu water
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Water bodies under Corporation/Municipal and other areas in Tamil Nadu
Views 648
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Data API
Visualize
Water bodies under Corporation/Municipal and other areas in Tamil Nadu...
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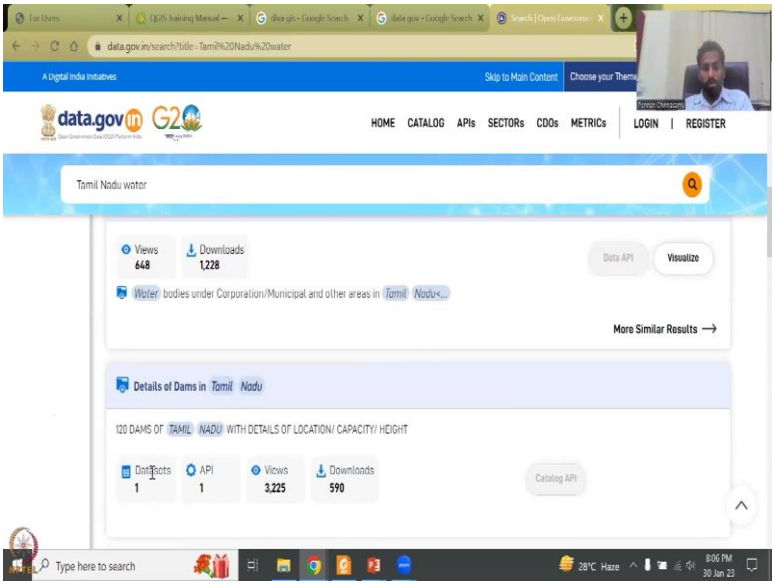
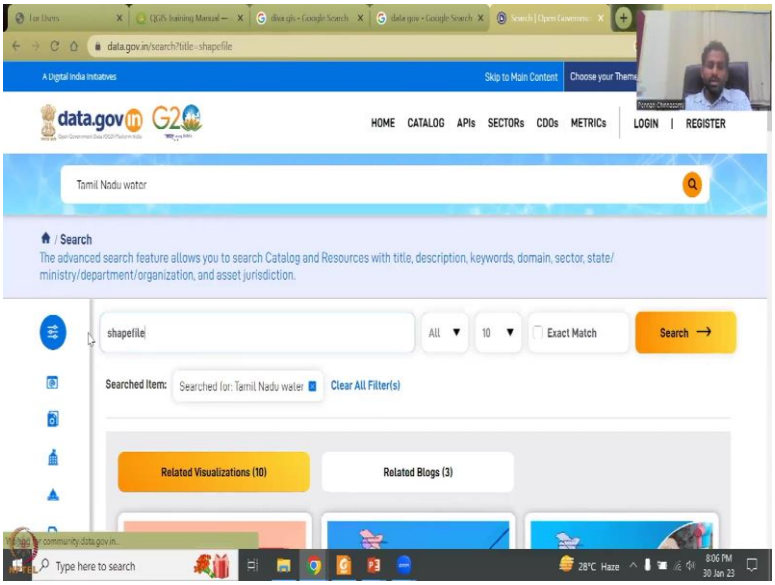
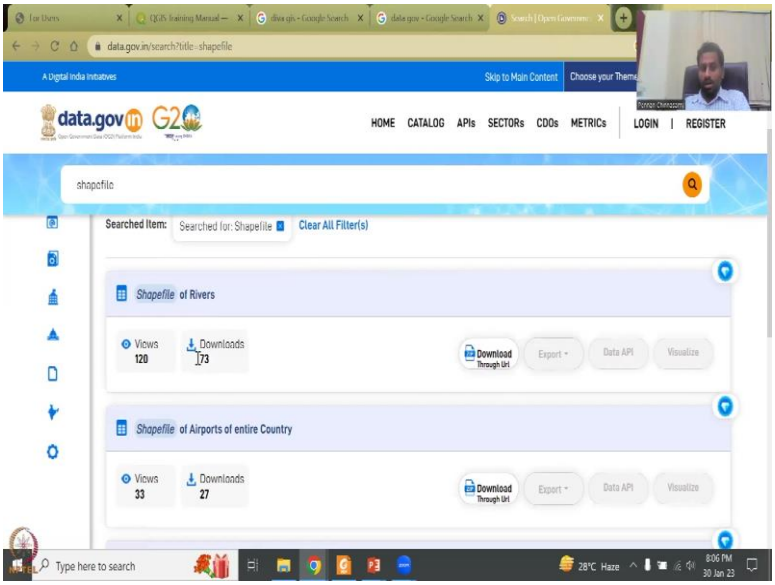


So, one more link that I would like to share is data dot go dot in. So, this is a good data set that we can use. Open data platform. Here also you can get good amount of shapefiles and point data. The point data can go into, you can make a shapefile or you can make a vector shapefile as discussed in the tutorials earlier.

So, for example, you can go here and click, I put Tamil Nadu water and click and then it will, it will tag whatever data it has. So, for example, surface water quality from Puducherry on the Pradesh, water bodies, number of water bodies, et cetera. You can, it is all in a data set module like a table and then you know that table is there, you know is Tail Nadu, you can link it with the GIS database.

(Refer Slide Time: 30:40)

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shapefile
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Clear All Filter(s)
Shapefile of Rivers
Views 120
Downloads 73
Download Through Url
Export
Data API
Visualize
Shapefile of Airports of entire Country
Views 33
Downloads 27
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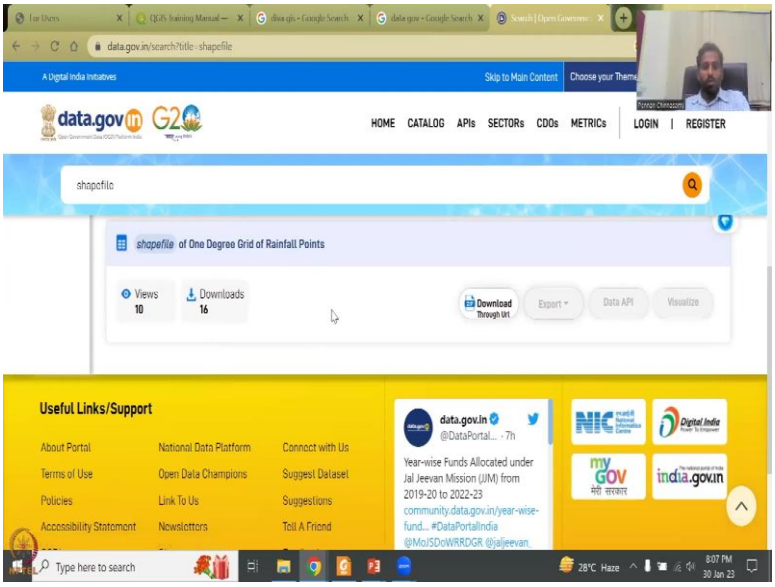
30 Jan 23


data.gov.in/search?title=shapefile
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shapefile
shapefile of One Degree Grid of Rainfall Points
Views 10
Downloads 16
Download Through Url
Export
Data API
Visualize
Useful Links/Support
About Portal
Terms of Use
Policies
Accessibility Statement
National Data Platform
Open Data Champions
Link To Us
Newsletters
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Suggestions
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Year-wise Funds Allocated under Jal Jeevan Mission (JJM) from 2019-20 to 2022-23
community.data.gov.in/year-wise-fund... #DataPortalIndia
@MoJSDoWRRDGR @jaljeevan
Digital India
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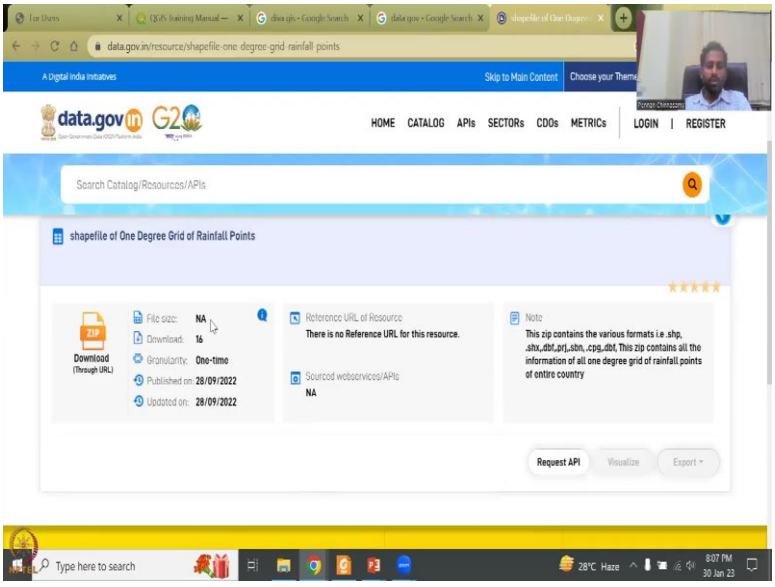
data.gov.in/resource/shapefile-one-degree-grid-rainfall-points
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shapefile of One Degree Grid of Rainfall Points
Download (Through URL)
File size: NA
Download: 16
Granularity: One-time
Published on: 28/09/2022
Updated on: 28/09/2022
Reference URL of Resource
There is no Reference URL for this resource.
Sourced webservices/APIs
NA
Note
This zip contains the various formats i.e .shp, .shx,.dbf,.prj,.sbn, .cpg,.dbf, This zip contains all the information of all one degree grid of rainfall points of entire country
Request API
Visualize
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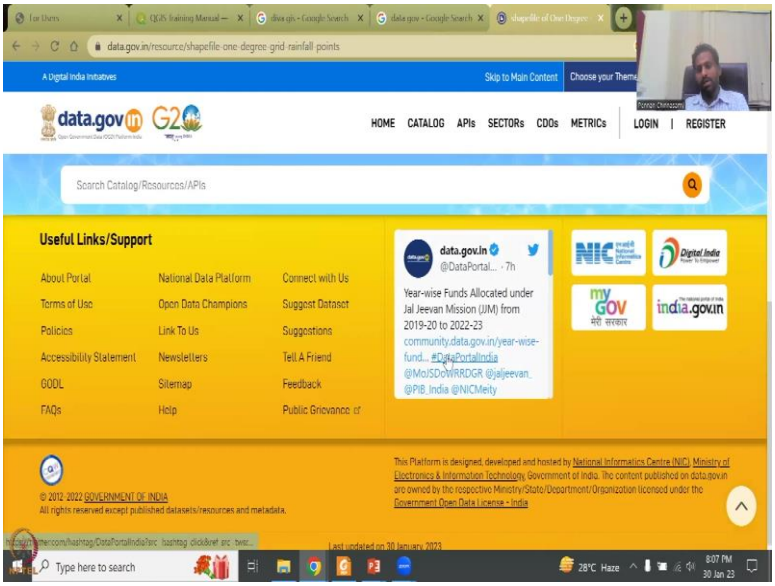
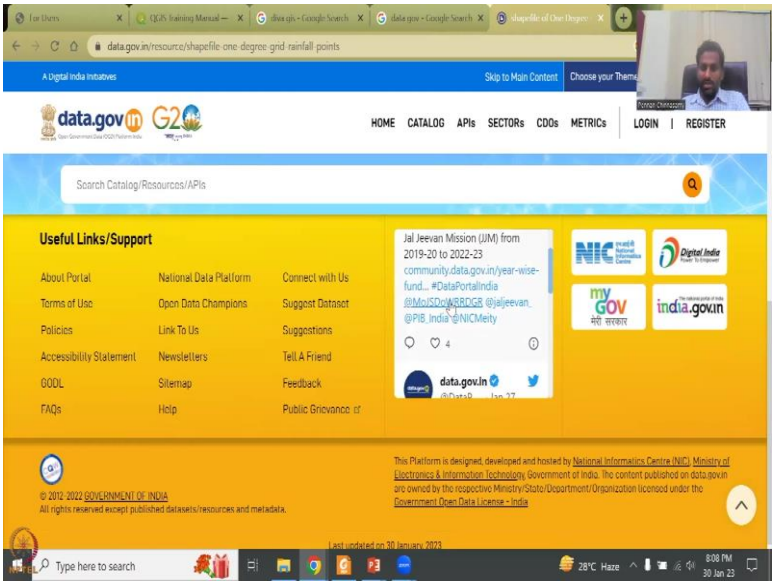
30 Jan 23

Sometimes shapefiles are given as formats. So, you can click shapefiles of rivers. So, you can see here the government of India, this is a government of India data so you can use it, it has been approved and put as data in the data dot gov. You can download as a zip through the URL, how many downloads, etcetera.

So, shapefiles of rivers, airports, and then rainfall points where exactly you can get rainfall points. If you click here, more and more information about the data comes up. And then you can see that published date updated, what it contains the data about the data, gridded rainfall points of the entire country. So, all these are pretty well established. And it is also having lots of other data.

(Refer Slide Time: 31:30)





community.data.gov.in/year-wise-funds-allocated-under-jal-jeevan-mission-jjm-from-2019-20-to-2022-23/
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Home » Visualizations » Year-wise Funds Allocated under Jal Jeevan Mission (JJM) from 2019-20 to 2022-23
Year-wise Funds Allocated under Jal Jeevan Mission (JJM) from 2019-20 to 2022-23
January 27, 2023
Author: OGD PMU Team
This step chart provides information about the year-wise funds allocated under Jal Jeevan Mission (JJM) from 2019-20 to 2022-23 (as on 12th July, 2022). A total of Rs. 8,274.16 crore funds were allocated under JJM. The highest of Rs. 3,590.16 crore fund was allocated in 2022-23 and the lowest of Rs. 390.31 crore fund was allocated in 2019-20.
Note : Source – Rajya Sabha Unstarred Question No. 106. Data Figures are in Rs. Crore.
Dataset URL: https://data.gov.in/resource/year-wise-funds-allocated-under-jjm-jal-jeevan-mission-12th-july-2022
Archives
Year of 2023 (20)
Year of 2022 (278)
Year of 2021 (376)
Year of 2020 (392)
Year of 2019 (342)
Year of 2018 (281)
Year of 2017 (255)
Year of 2016 (265)
Year of 2015 (275)
Year of 2014 (243)
Year of 2013 (29)
Trending
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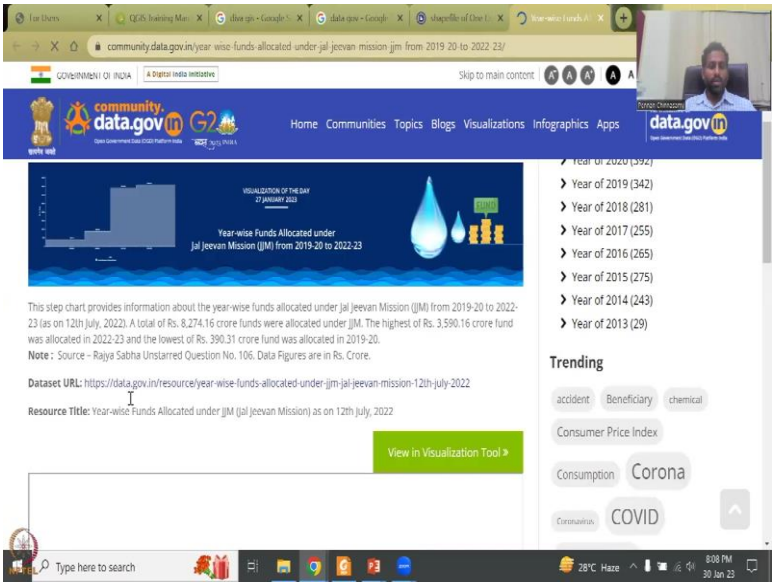
30 Jan 23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VISUALIZATION OF THE DAY
27 JANUARY 2023
Year-wise Funds Allocated under Jal Jeevan Mission (JJM) from 2019-20 to 2022-23
This step chart provides information about the year-wise funds allocated under Jal Jeevan Mission (JJM) from 2019-20 to 2022-23 (as on 12th July, 2022). A total of Rs. 8,274.16 crore funds were allocated under JJM. The highest of Rs. 3,590.16 crore fund was allocated in 2022-23 and the lowest of Rs. 390.31 crore fund was allocated in 2019-20.
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Dataset URL: https://data.gov.in/resource/year-wise-funds-allocated-under-jjm-jal-jeevan-mission-12th-july-2022
Resource Title: Year-wise Funds Allocated under JJM (Jal Jeevan Mission) as on 12th July, 2022
View in Visualization Tool »
Year of 2019 (342)
Year of 2018 (281)
Year of 2017 (255)
Year of 2016 (265)
Year of 2015 (275)
Year of 2014 (243)
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Trending
accident
Beneficiary
chemical
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Corona
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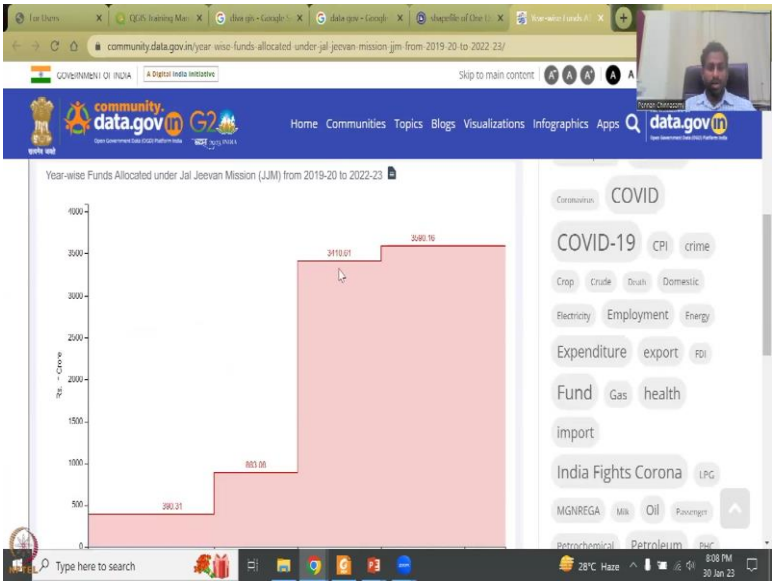
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Year-wise Funds Allocated under Jal Jeevan Mission (JJM) from 2019-20 to 2022-23
Rs - Crore
390.31
803.06
3410.61
3590.16
COVID
COVID-19
CPI
crime
Crop
Crude
Death
Domestic
Electricity
Employment
Energy
Expenditure
export
FDI
Fund
Gas
health
import
India Fights Corona
LPG
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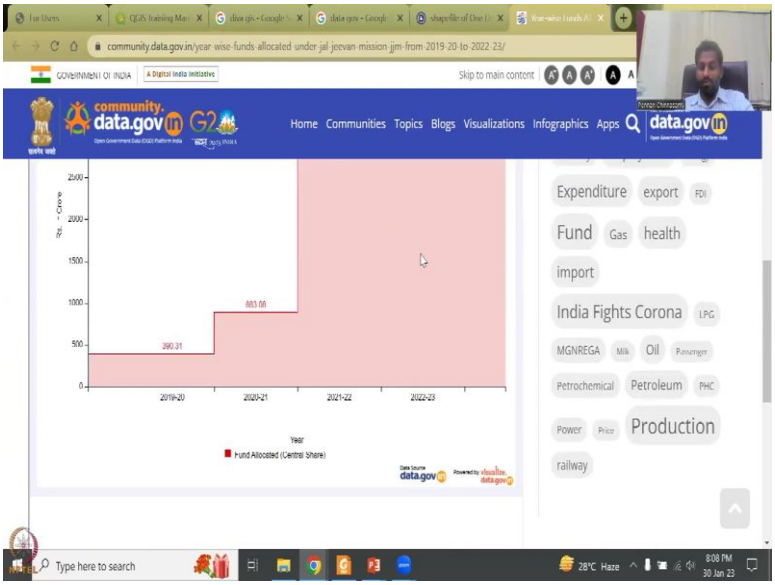

For example, here, you have year wise funds are located under Jal Jeevan Mission. So, this is a very rural development scheme. We have discussed this in the first two weeks of the lecture. So, basically, this gives you data about how much funds are located. Now for rural development, we need this information because we are going to put it in a map and show that this is the how much funds have come, but how is the benefit.

So, funds versus benefit ratio, you can analyze and work it through, it is shared in Twitter, but the links are coming take you back here, for example, I am going to click this, it will come back basically it is a Twitter handle there, but then it goes and comes back to the data dot gov dot in where the data is being stored.

Some other so, you can see primary data are brought in and then you will have all the data in visualized Excel sheet or some format. So, you do have a running database. So, you can also take these data and then put it in your computer new shapefile. For example, if this is a year fund allocated central share for entire country, you can see that around 390.31 crores has risen to 3,590 crores in 2022. So, in this this, you can also type it as a attribute value in your database. So, lot of lot of data can be taken. One goal of this is also to give students a link to where you can find data.

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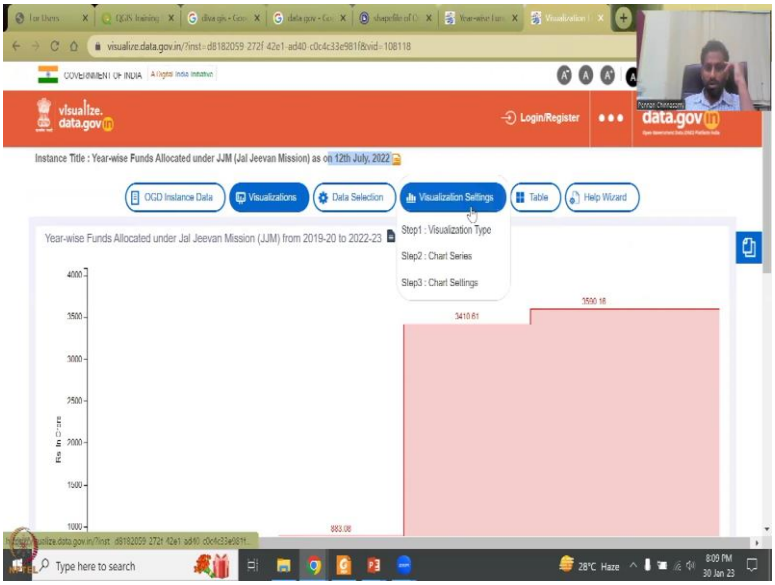
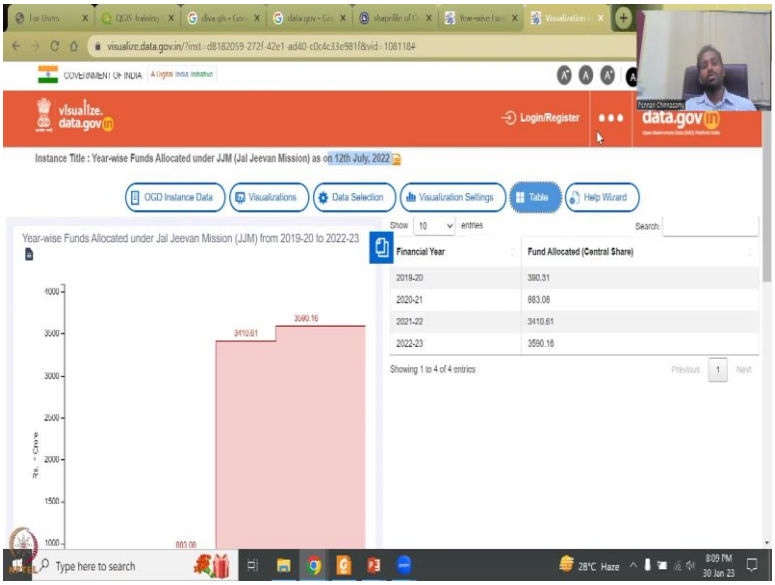
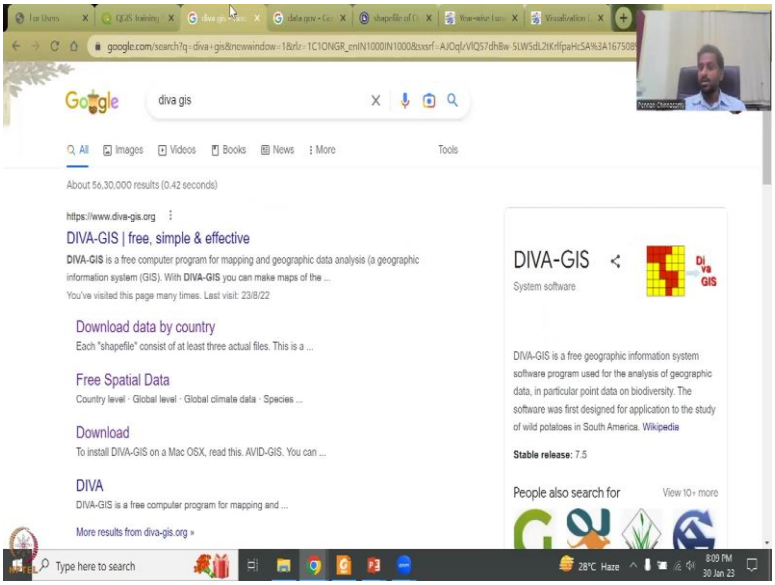
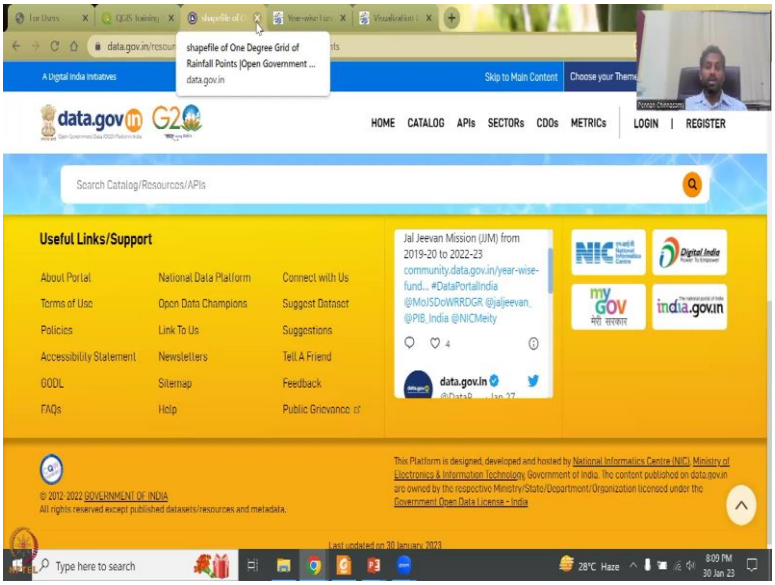
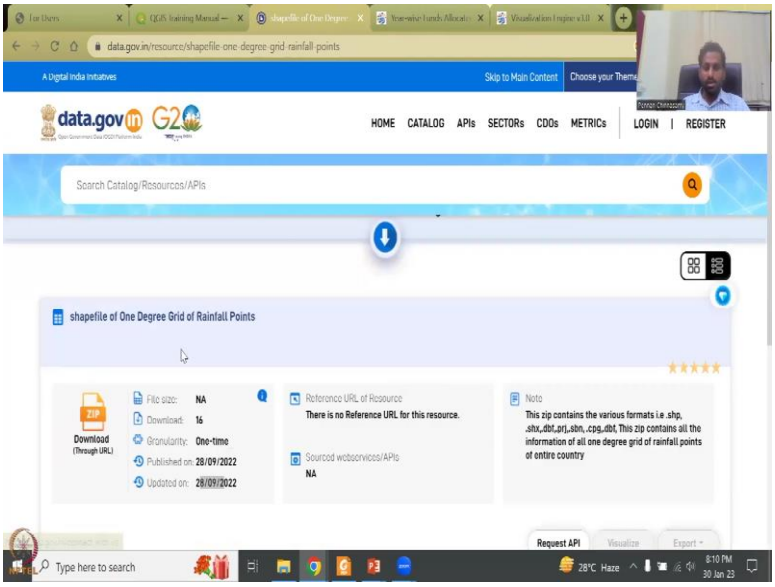






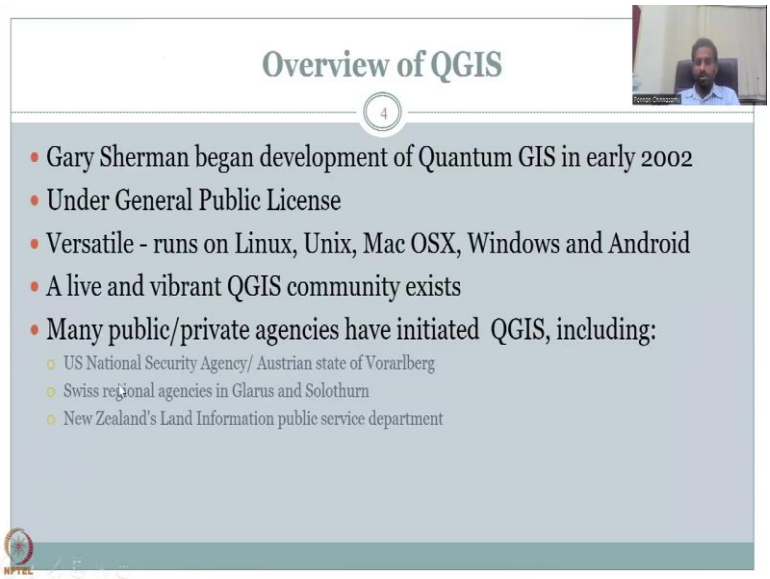




So, there is a visualization tool you can go through, which has been updated on 12 July and then you can download the data as a table. So, you can see here the table was there as I said, you can convert the table back into shape file and put it across India. So, these are the ways you could find data. I will cover two datasets one is DIVA-GIS, lot of people use it. However, the boundaries could be wrong and there is no guarantee the boundaries are working, but data dot gov dot in has most of the data scrutinized by the Government of India.

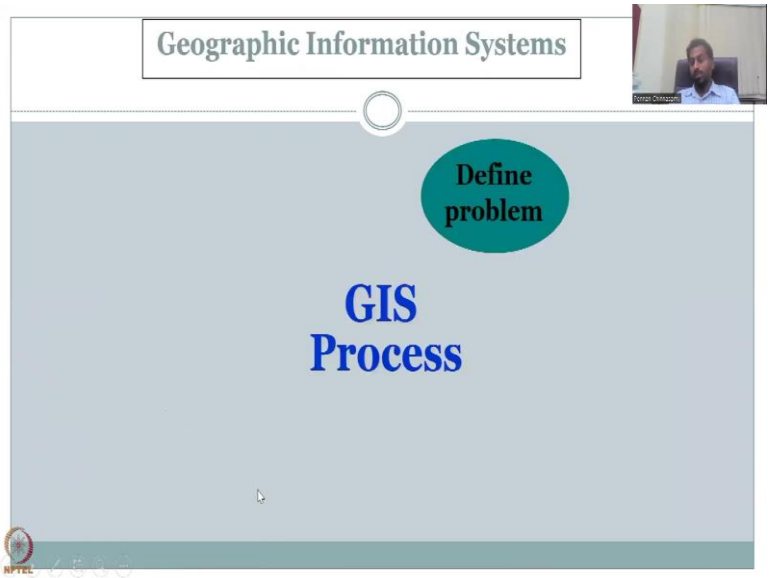
So, it is actually a trustable data source. Sometimes there is a less speed updating and that is why people use open source data's like DIVA-GIS and other sources, but slowly this is also picking up because spatial data and mapping has been key indicators for nations development, which has been covered in programs like Gati Shakti and mapping of India water bodies et cetera.

(Refer Slide Time: 34:31)



So, with this, I would like to get back to what we have been discussing on the links. We have worked through this tools. As I said QGIS has been use from 2000 to 20 years at least. Public License works on all software open source software's and operating systems and multiple agencies are being using it the US, New Zealand etcetera.

(Refer Slide Time: 34:57)



The process is cyclic in terms of using and defining the problem. But please understand that always there is a possibility of from the decision coming back into redefining the problem, creating more datasets and then updating the data sets.

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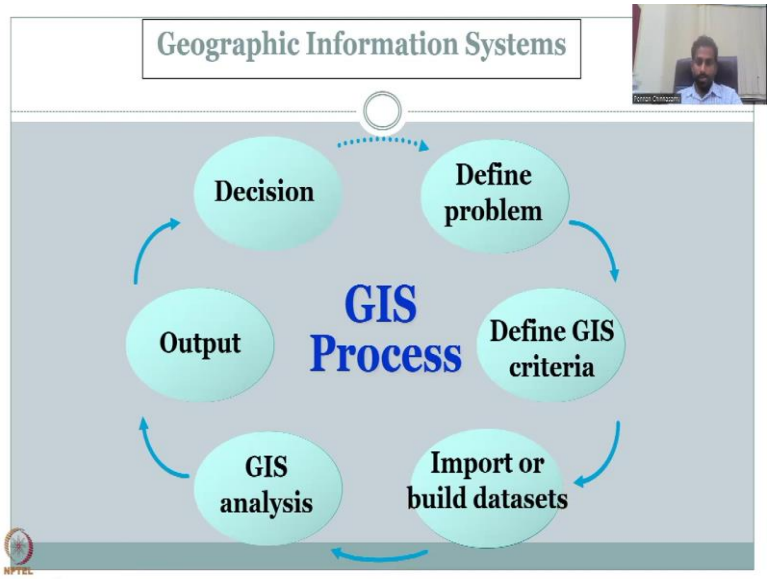

With this I would like to conclude week 4 lecture. There will be lot of discussions on Agriculture and Rural Development, which is put up by the NITI Aayog vision of New India. And there is lot of mapping and data that can be used remote sensing and GIS. I will see you week 5 lecture. Thank you.