Geographic Information Systems
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Lecture – 30
Introduction to QGIS

Hello, Namaste, welcome back to the course on geographical information system, as I spoke in the previous class, we have now covered about an introduction to GIS, I have spoke about different data models, we looked at what is the vector data model, we looked at what is the raster data model, then few applications of vector and raster and how do we capture data, we also looked at data acquisition.

And also looked at how a different data models can be stored, so with this now the next thing that we have to start looking at parallel is; how do we use software. Software is just a platform which gives you a lot of tools and there is a science behind these tools to work on this. So, now as I said we would rather use open source freely available software, open source software so, this particular class is actually would be handled by one of my research scholar and TA for this course.

I will introduce you to him, he is Prakash P. S, so he would be looking at the introducing you to the software that is quantum GIS, he would give you some history of quantum GIS and more importantly, dealing with some of the tools that are already available in quantum GIS, it is one of those software which can be used in alongside with any of the program coding languages and together coded together, so that you can use a tools from the QGIS, also in those program coding languages in order to improve whatever the programming analysis that you are trying to do.

Or development of a model that you are trying to build, so to introduce you to QGIS, I would now hand over this session; this particular lecture to Prakash P. S, okay so, he would carry out in next half an hour, he would you give an introduction of what is QGIS, how do you use a QGIS and what are the different ways of handling QGIS.

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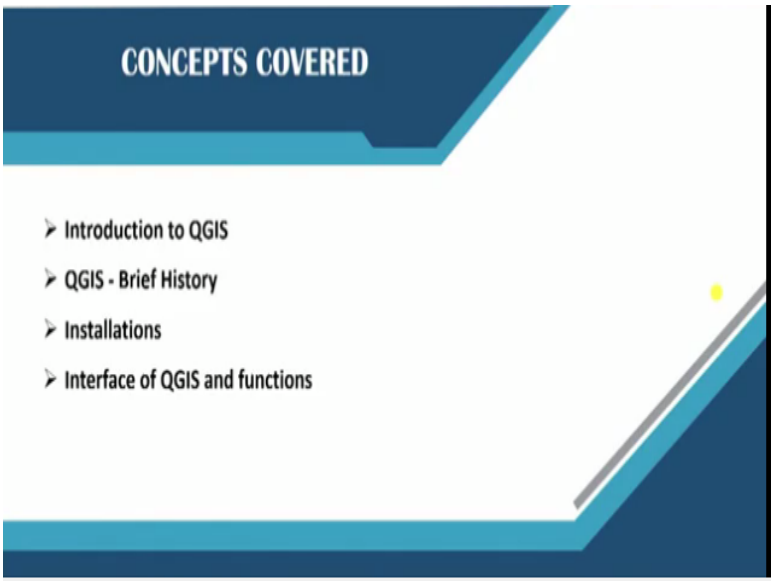

In this particular session, he would also look at installations, how do you install QGIS, how do you get, how do you actually accesses QGIS on World Wide Web, how do you downloaded install it and also give you some interfaces on functions of QGIS. So, I will now handed over to him so, let us meet in the; I would meet you again in the next class with the next set of lectures on what do you mean by a database and different models in a database and different databases also.

So, I will handed over to him, thank you very much, welcome to the course on geographic information system, this is module 6, QGIS and lecture 5, introduction to QGIS, so the concept covered in this particular session is introduction to QGIS, a brief history to QGIS, installation of QGIS software and how to download QGIS software from the Internet and install a different plug ins and we will cover the interface of QGIS and various functionalities of QGIS.

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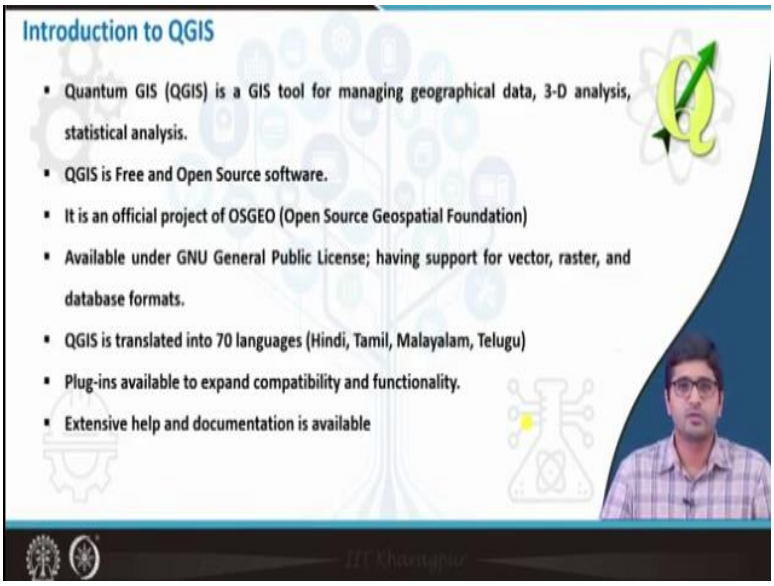

Quantum GIS are famously called as QGIS, it is a GIS tools for managing geographical data and to perform various analysis such as 3D analysis, buffer analysis, overlay analysis, geo statistical analysis as well. QGIS is a free and open source software which is freely available to download from the websites and to use both for commercial and any other purposes and it is so official project of open source geospatial foundation which develops various software's for geospatial purposes.

And it is available as a public license and it can handle data such as raster data, vector data, different database formats for example, it can handle shape files, it can handle GeoJSON or JSon files in terms of vector data or it can handle raster data such as tiff, geotiff or IMG formats and it can handle various database format such as dot csv files or dvs files etc., and QGIS is transmitted to 70 different world languages including Indian language such as Hindi, Tamil, Malayalam, Telugu.

And the main advantage of QGIS is availability of various plug-ins basically, plug-ins are extended functionalities for the existence software, so QGIS has multiple existing software apart from that if you want some more functionalities, you could simply search a Google search as a QGIS plug-in and the particular functionalities, so if that plug-in is available, you can simply go to QGIS and download that particular plug-in and start using on it.

So, how to; how exactly do that, we will see in the upcoming slides and one more important thing about QGIS is that availability of extensive help and documentation, since it is an open source software, people around the world use this particular software and they put up, so their positives and negatives about the software, so there is forum available for QGIS software as well.

So, there you can just ask query about your particular problem and somebody will answer that particular problem.

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So, when it comes to the platforms, QGIS is available for various operating systems for example, Windows, Mac, UNIX and Linux so, the majority of users use Windows and Mac version of QGIS, so in this particular session, we are going to see Windows version of QGIS.

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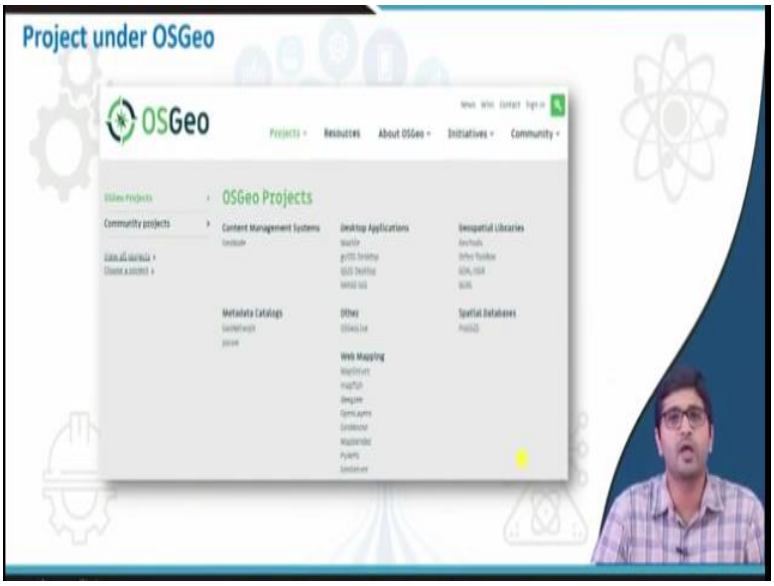

So, the QGIS is official project of open source geospatial foundation as I have mentioned earlier, so OSGEO has multiple projects, if you see, it is a screenshot of its portal, so QGIS falls under desktop application similarly, it develops geo spatial applications for web mapping or many other libraries as well.

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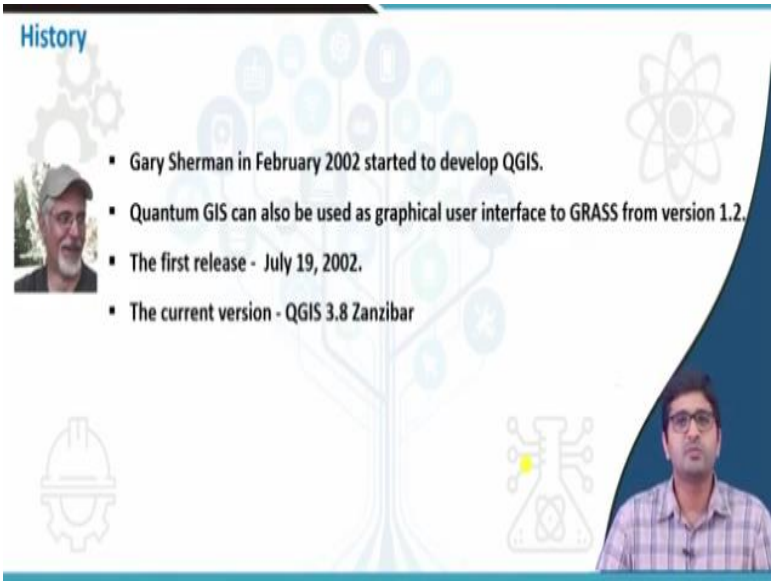

So, when we see the history of QGIS, it has been founded by Gary; Mr. Gary Sherman in the year 2002, he started developing in the year 2002, by July 2002, the first version of QGIS is released and the current version is QGIS 3.8 Zenzibar. So also, QGIS available as a graphical user interface to a software called GRASS from the version 1.2. GRASS is released much earlier to QGIS that is basically used for vector data analysis.

So, QGIS is majorly meant for raster data analysis, the combination of QGIS and GRASS can be used for any kind of geo spatial data analysis in an efficient manner.

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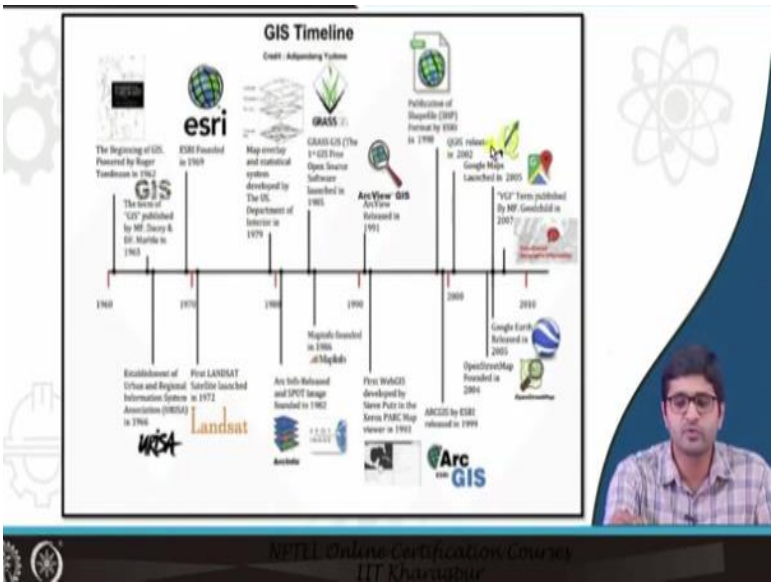

So, when we see that GIS timeline, QGIS falls under second half of the timeline, so initially from the year 1960; in the 1960's the beginning of GIS happen, the famous company ESRI founded in the 1969, so subsequent to that from 1980 to 2000, several ESRI products were released; Arc info or Arch view etc. The GRASS which I mentioned earlier is released in the year 1985, so we can clearly see the QGIS is released in the year 2002.Subsequent to that, the famous QGIS; Google, Google maps, Google Earth and open street map were released.

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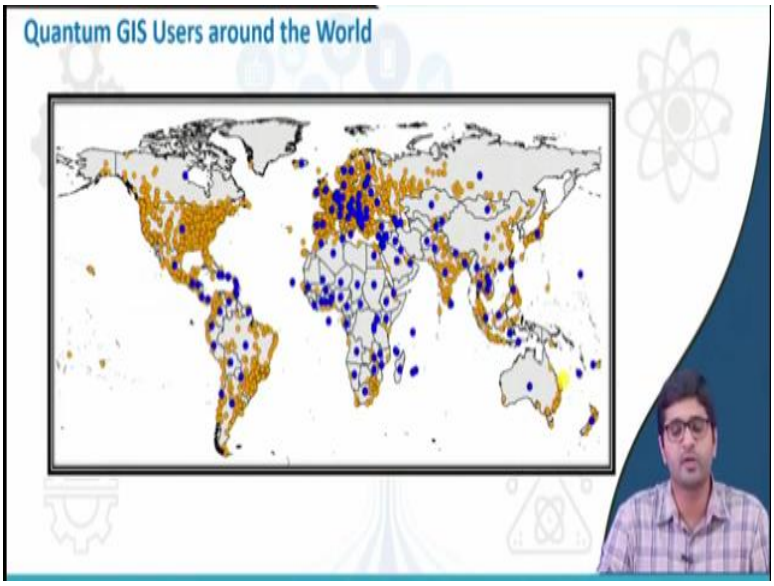

In terms of usage, QGIS users can be found around the world but the majority of users are there in American countries and European countries, so the Indian, African and South Western countries are picking up very fast.

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So, how to install QGIS software; you can go to this particular link to install the QGIS software or you can simply do a Google search as QGIS download, so you will find that QGIS dot org website under that, you can go to for users, there you will find the latest version of QGIS 3.8 Zanzibar, where you will find the download now option.

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So, if you click on this download now button, so it will go to a page where it shows multiple; shows option for multiple operating systems for example, if you want for Windows version, you just need to click here and download for windows version, so after that it shows a 2 version; one is for 64-bit operating system, one more is for 32 bit systems. So, if you are using 64 bit, click on that, the dot exe file will get downloaded to your system.

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So, that when you can directly install in your system, so based on 32 bit or 64-bit you can install QGIS software for your system. So, once you installed QGIS software, you will get a shortcut in your desktop, saying that QGIS desktop. So, basically QGIS is a desktop software, so if you

open that particular software, so it will open up the main window of the QGIS, this looks something like this.

The main interface of QGIS we look something like this, see here at the top, you will find menu bar, so it gives multiple functionalities, we are going to see what are the different functionalities of these things in subsequent slides and second part is; just below that you will find different tool bars. Here it gives the option to zoom in, zoom out or zoom to the extent or identify features etc., we will see each and every functions later.

And, so this toolbars can be completely customisable, you can keep these tool bars here or here or right side or just wherever you are comfortable with and third is the panels. So, it has a panel for browsing the files from the folder systems and there is a layer panel. In layer panel, you can click; switch off or switch on the layer switch you want in the map window or in the map view. At the bottom, it is called as status bar; in status bar, you will find the coordinates.

So, based on latitude or longitude or any other coordinate system, those coordinates will appear based on the mouse moment which you do on the map view and the particular scale with which you are viewing that will show up and EPSG 2960, this is the coordinate reference system which we use for this particular map will show here.

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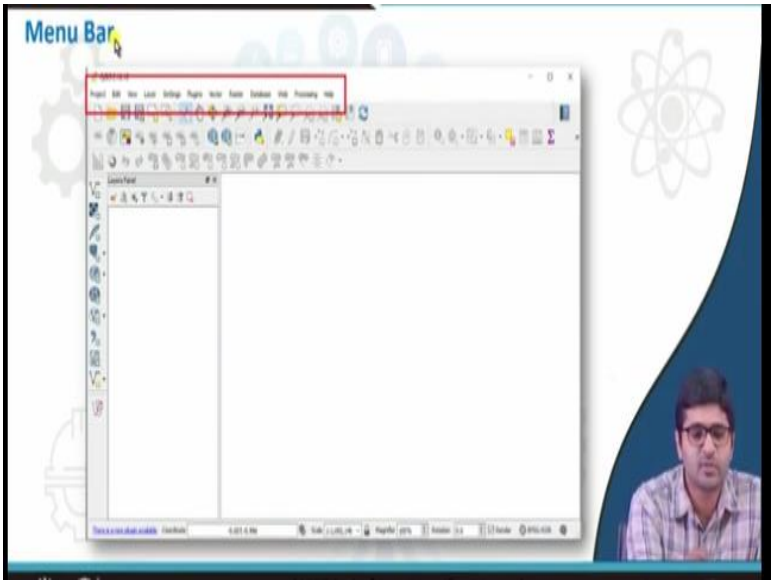

So, when we go deep into the menu bar, so it has multiple functions; project; edit; view like, so also many functions are there, one by one we will see.

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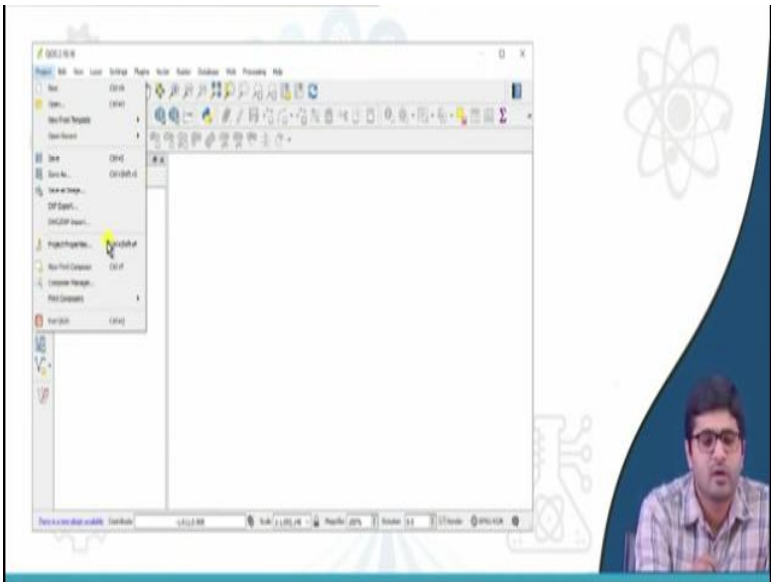

Under project you can open a new project or you can open an recent project which you already opened or you can save existing project, we can export the data, or you can create map composing or you can exit from the QGIS, all these functions are found under the project button.

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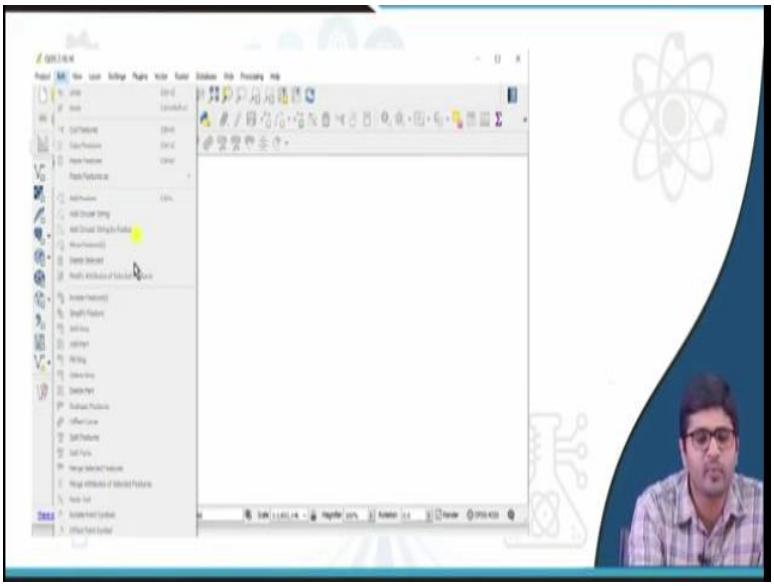

So, under edit button, if you are editing any maps in the map view, so the if map if any map is available in the map views, so these functions will appear as activated, so you can do undo or cut features or any kind of editing operations can be done under edit button.

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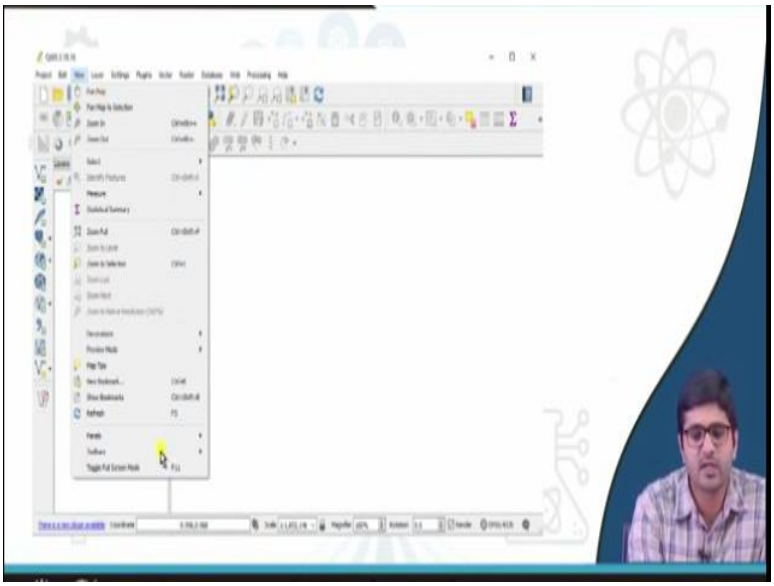

So, under view, so these pan buttons or zoom in, zoom out statistical summary of the layers or customisation of panels tool bars etc., can be done using view button.

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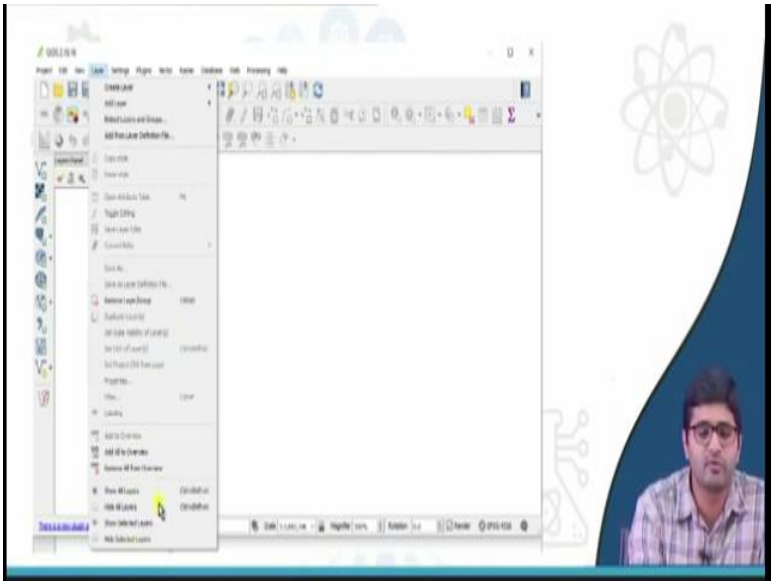

So, if you want to create a new layer or a shape file or add an existing layer which you are downloaded earlier or received from somebody, you can use creative layer to create new shape files, you can add existing layer using add layer button or you can connect existing databases or here also you can switch on, switch off layer using the layer button.

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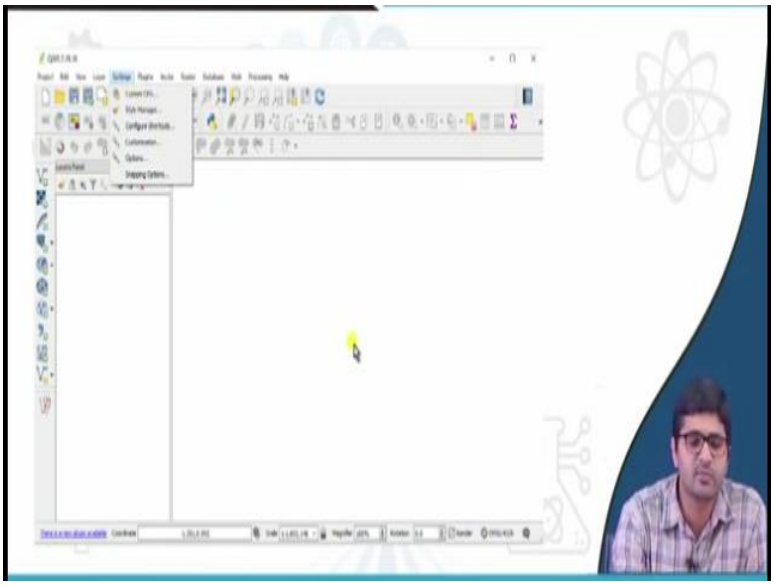

So, if you want to do settings such as, while you are editing the feature, you might want to do the snapping option on or off or if you want to customise the tool or if you want to send the CRS of the maps, this kind of settings can be done using the settings button.

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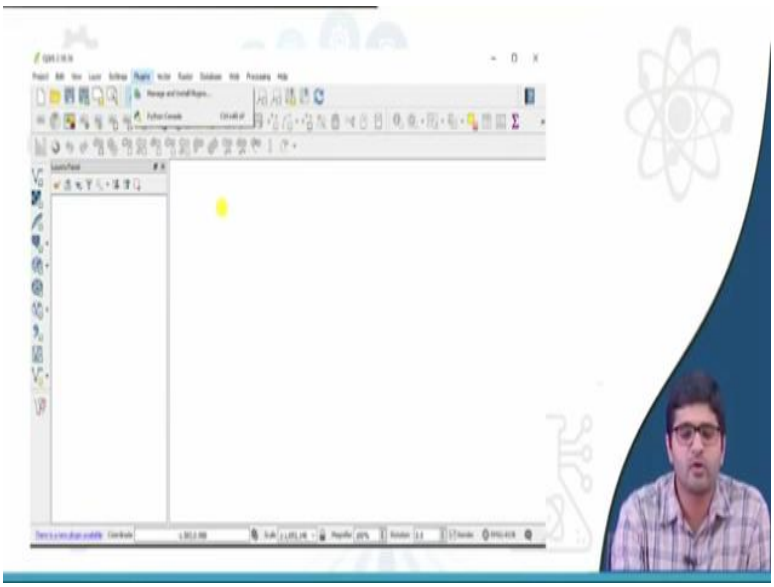

And as I mentioned earlier multiple or various plug-ins are available online to download QGIS, to use this particular button, you need to have internet connection and you need just need to press on manage and install plug-in's, so window will appear to download the plug in, so just have to type the name of the plug-in, so and if you type that so, the plug in will get install or if you want to customise any tools using python so, python console is also available under plug-ins button.

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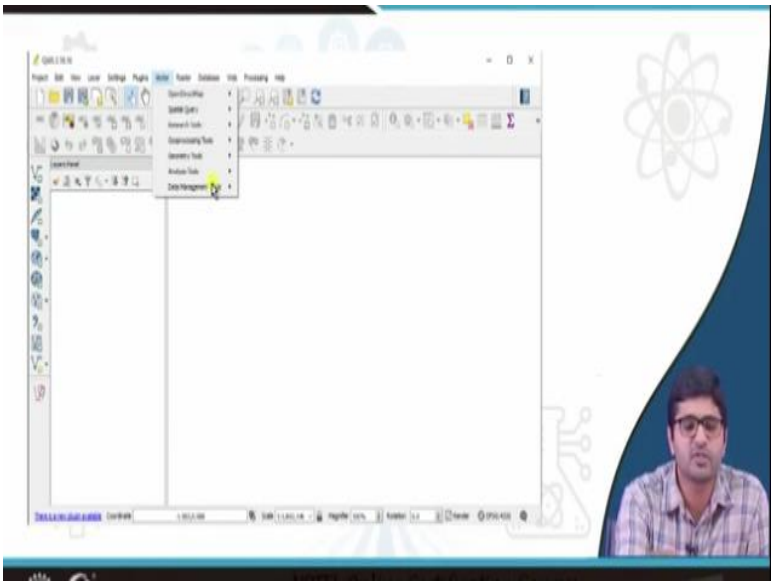

So, as I mentioned earlier, QGIS is majorly meant for vector analysis although, selector functions which are there in QGIS will list under vectors for example, special query; if you want to query particular thing in a particular map or if you want to perform geo processing analysis, geometrical analysis or any kind of data management tools, these kind of functions are find under vectors tool.

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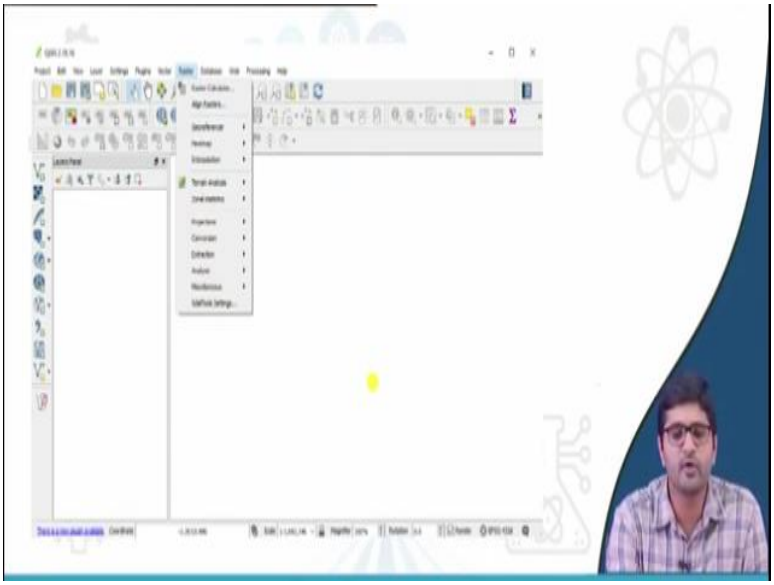

And apart from vectors, raster functionality is also available in QGIS, if you want to perform raster calculation functions or if you want to perform geo referencing operations or any conversions from raster to the vector or vector to raster or if you want to extract contours or extract raster's from the vectors, so this kind of functions are we can see under raster.

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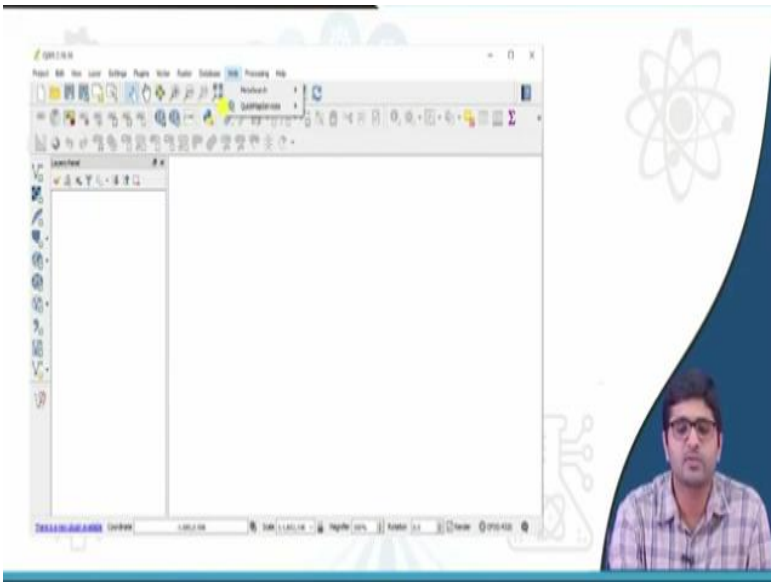

And database and web; these 2 are majorly meant for connecting external databases suppose, if you want to see Google Earth, satellite imagery as a base map, you can click on quick map service plug-in and you can see. A database is also similarly, if you want to connect post GIS or any other database outside from the QGIS, you can do here.

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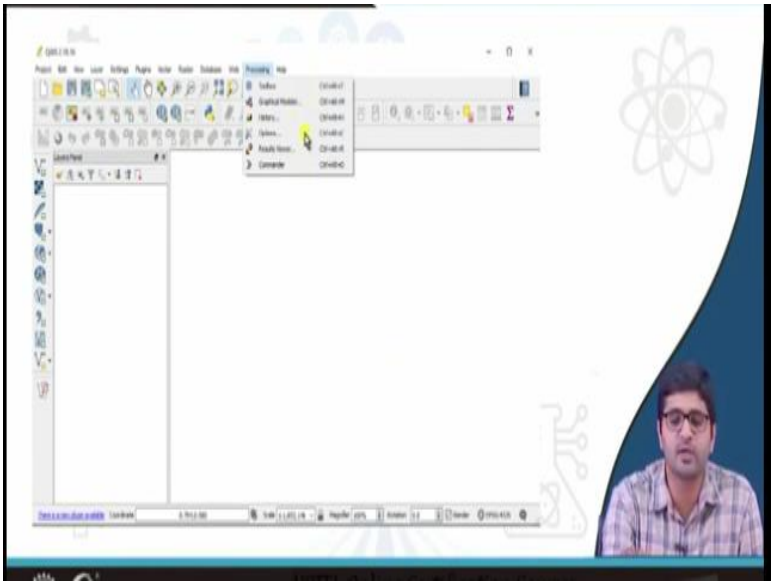

So, under processing if you install multiple tools, so those extra tools will be appearing under processing.

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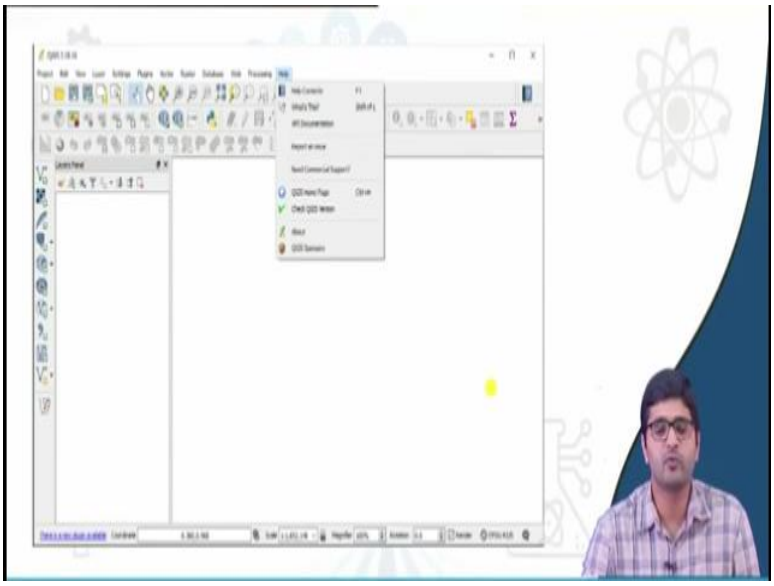

And if you need any help about the software or if you want to see the version of the software or if you want to understanding a tool, you can go to help end and this question mark button you can use it to understand more about the software and its functionalities.

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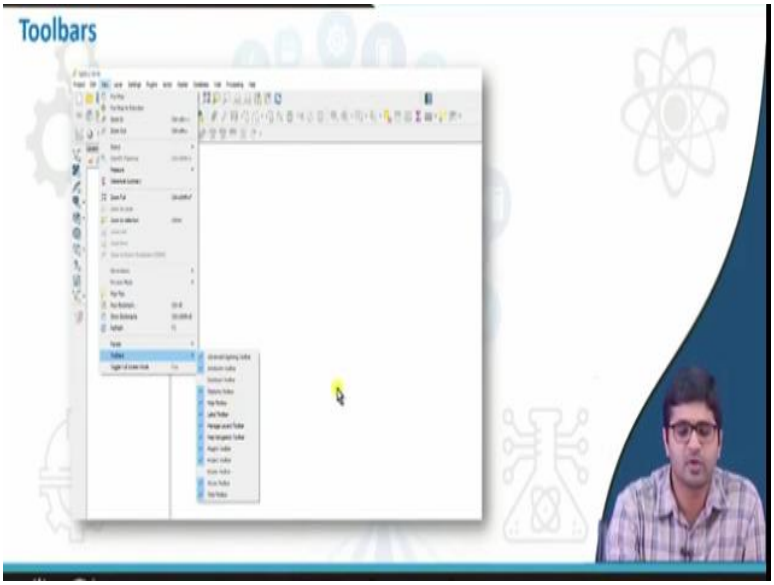

So, as mentioned earlier the tools existing in the QGIS can be completely customisable, you want some tool here or do not want it, so those kind of things we can switch on and switch off using view button and if you go to toolbar, you can switch off and switch on these layers tool bars.

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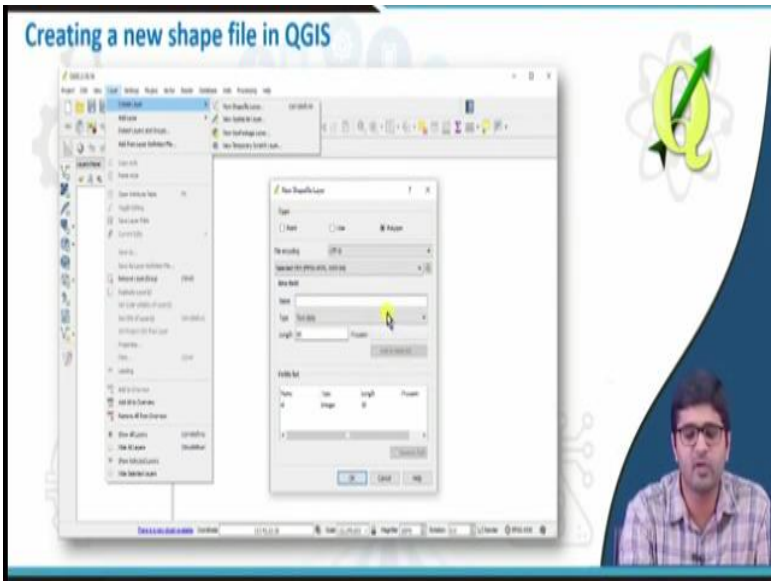

So, the next is important thing in QGIS; how to create new shape file in QGIS? So, share file basically, meant how mean, so how to create point lines or polygons in QGIS, so we will briefly see, so you just need to go to layers and create layer, so there is a button called new shape file layer so, if you click on that, a new shape file layer window will appear. Here, you need to say either point line or polygon; this is the basic data typing GIS as we learnt earlier.

So, if I want to create a polygon, I need to select polygon, if I want to create a line, I need to click a line or if I want to create a point again, I need to click on points. So, for example if I want to create a building polygon or a water body polygon, so I will select a polygon feature and then I can choose by here, the coordinated reference system, I can choose EPSG 4326, WGS 84 as my coordinate system or many other options are available, if you click here.

And then you can add multiple new fields here, so if you want to add a text field or if you want add a numeric filed or floating point field, you just give its name and the type of the fields and then press okay.

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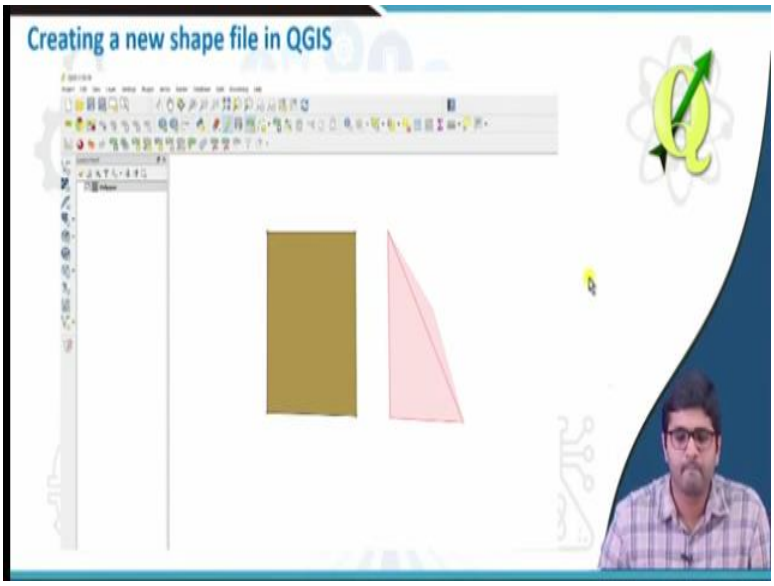

So, a feature will be created or a layer will be created at the left side in the layer panel, so here you can keep on adding multiple features polygons, if you select a polygon as a picture, so how to do that? You just have to select this particular layer and go to the pencil button, so here this start editing toggle editing button, you just need to activate that and then using add feature button, you need to; you can just start editing here.

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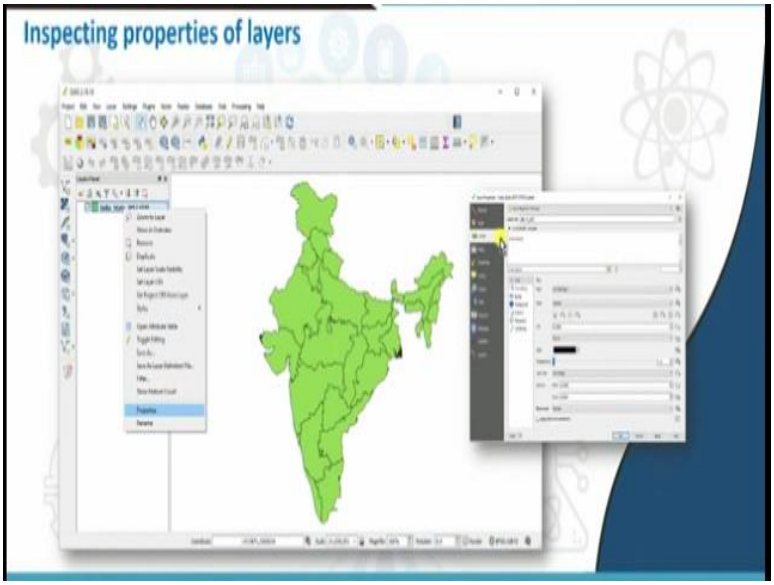

So, if you already have an existing shape file, how to open that; you just need to go to layer, add layer, add vector layer, so then you just need to browse the existing vector layer and that particular layer will open up in QGIS, for example here I have just taken all states, so India

country shape file, so I can go to properties and see its properties, here you can just opened a shape file layer, so the properties window will appear when you click on the properties.

Here, you can inspect, you can do a styling for the layer, you can label it so, you can check the meta data as well, so metadata includes the extent of the layer, the coordinate reference system and maximum minimum values when we consider raster, so any data about the data is called metadata, so this kind of information you can see in the property's table.

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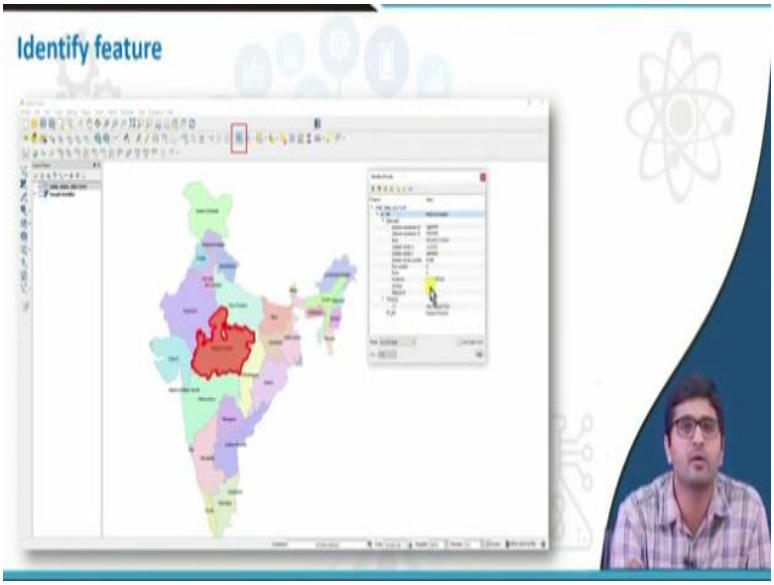

So, if you want to identify here, you can see the entire country I have labelled it using the state name and styled it, so if I want to see more information about these polygons or states, so how do I do that? I just need to go to identify button and click on that particular polygon, so the window will appear showing all the attributes about the; or attributes or information about that particular polygon or a feature.

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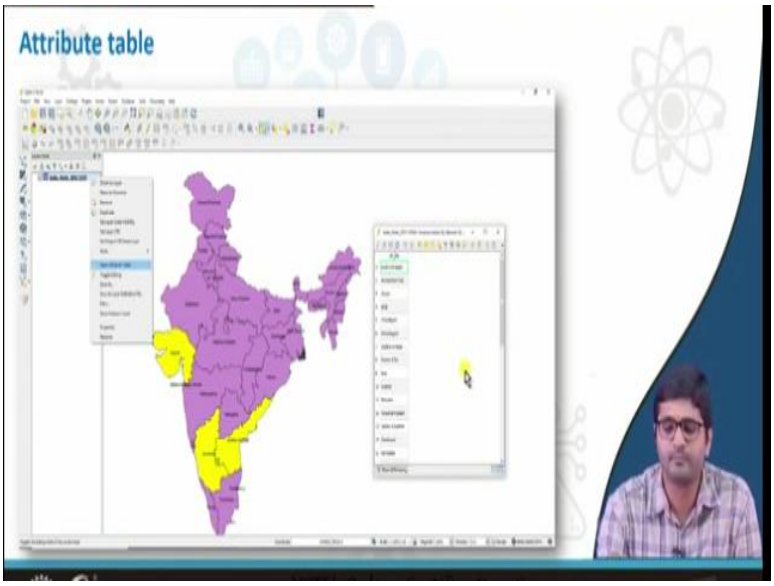

So, how to select multiple features from the polygon; so there is a select feature button, so it gives multiple options to select the features. First is select a single feature or select feature by polygon, select free hand or radius using multiple options you can select polygons but suppose, if you want to select multiple polygons together, you can use the 3 other options. So, if you want to select a single feature, you can select, you use a first option.

Here, I have selected 3 states of the country, so those 3 states will reflect in attribute table as well, so the selection will reflect in the attribute table as well. How to see this attribute table? you just have to go to the layers and right click on open attribute table, the attribute table will appear here in the map window.

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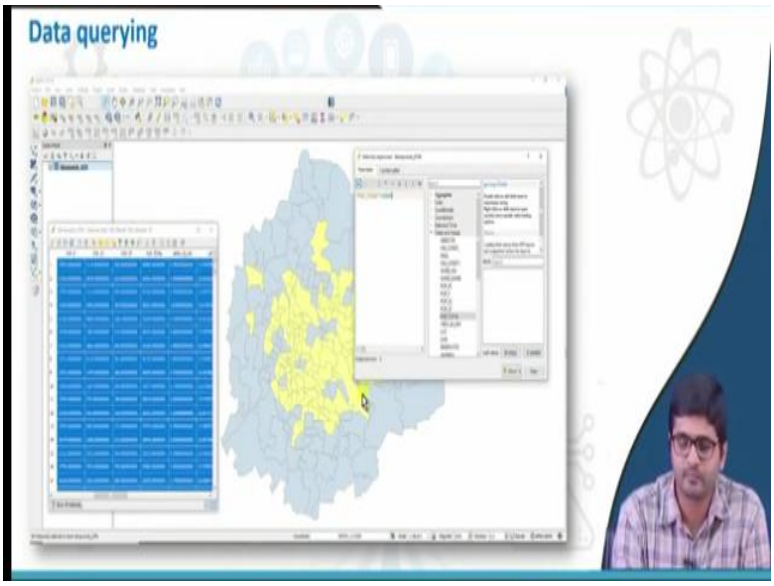

So, next is data querying; so how to query from the attribute table, so attribute table may contain multiple attributes but I want to see only few customised queried data, so how do I do that? For example, here I have taken wards of a particular city along with its attribute information, so it has attributes such as ward name, ward number, total population, male population, female population etc. So, if I want to see all the wards having population more than 30,000, so how do I do that? I just need to go to open attribute table here, so which we seen in the earliest slide.

And then just press on select by expression so, if you click on this particular button, select feature by expression so, the window will appear, so here just you need to click on fields and values and just double-click on total population and then just say greater than 30,000, so all the polygons which is having the population greater than 30,000 will highlight for you. So, similarly it will highlight in the attribute table as well, then you can save these things, I have separate layer.

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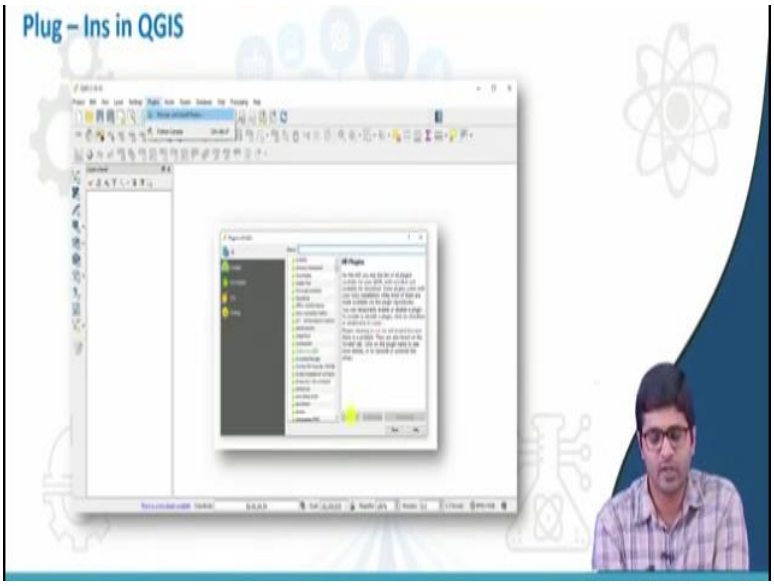

So, how to install plug-in's so, this we have seen earlier, you just need to go to plug-ins, for this to do; to install plug-ins, you need to have Internet connection, so if in case you are having the proxy you just need to set the proxy just by going to settings and options so, just click on manage plug-ins, a plug-ins window will appear. So, here for example, if I want to open street map plug in, I need to search open street map here.

So, the open street maps plug in will appear, you just need to click on install plug-in, the particular plug-in will get downloaded to your system and it will get installed in QGIS.

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So, one more important feature of the QGIS is the geo referencing tool, geo referencing usually refers to the method by which locations in the raster and vector are related to the actual ground surface or earth surface, so this can be performed using a raster function in QGIS, you just need to go to raster and click on geo referencer, a geo referencer window will appear here, using the at least minimum 4 coordinate, you just need to input 4 coordinates to the topo sheet, if you are using the topo sheet.

Or if you are using any images; satellite images, you need to import ground control points and then performed geo referencing operation here to fix it to the ground surface, you can fix any image or satellite image to the ground surface using geo referencing tool in the QGIS.

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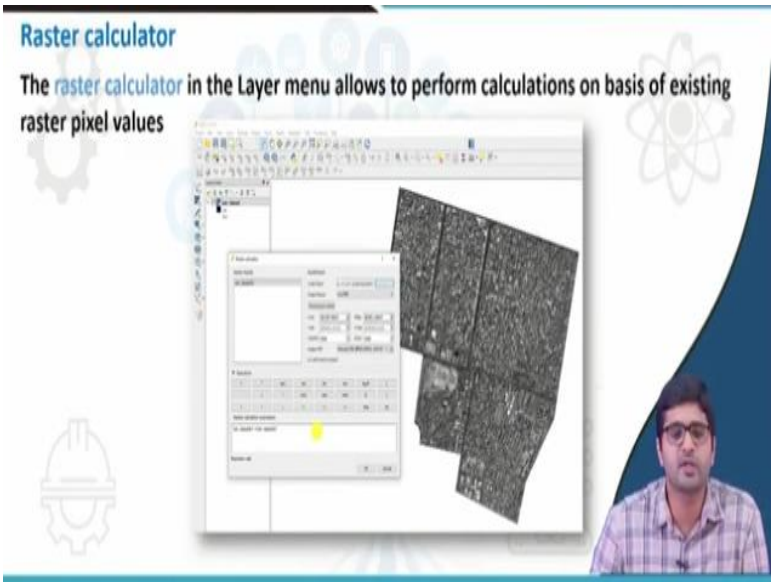

So, one more main functionality is the raster calculator, if you want to perform any kind of analysis such as if you want to perform indices, if you want to perform mathematical operations on rest raster, you can go to raster's and raster calculator, so this particular window will appear, here using mathematical functions you can perform any of the mathematical functions on raster band, so each and very band will appear.

So, if you are using RGB band; RGB or NIR band, you can perform an NDVI or any indices you can find it using raster calculator functionality.

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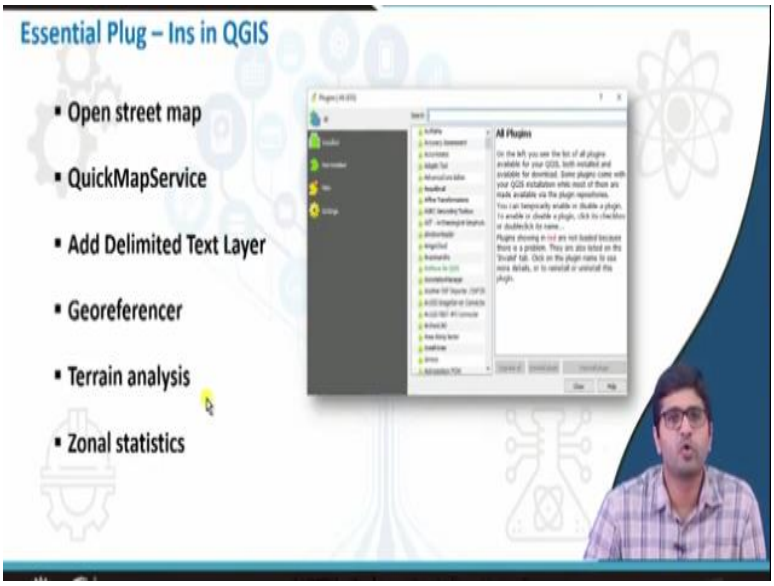

So, this particular page shows important essential plug-ins in QGIS, one plug-in I mentioned is open street map plug in, so if you can install open street map plug-in, you can perform 2 operations; one is you can get open street map as a base layer in QGIS and you can get an option to download open street map data from its depository, so directly to QGIS for US study area. So, these 2 functionalities; the main functionality is open street map plug in provides.

And if you want Google satellite or Google satellite imagery as a base layer, you just need to install QGIS map service; a quick map service plug in and to import Excel or dot CSV files to the QGIS file, you need to install delimited text layer plug-in and georeferencer plug-in we have seen and using terrain analysis you can perform slope analysis, hill shade aspect except etc., using elevation data.

If you have digital elevation models, you can perform terrain analysis in QGIS and one more functionally is zonal statistics basically, zonal statistics is performed using raster and vector layers, so if you want to perform analysis from the; for a raster for a particular area using a polygon or vector feature, so it gives maximum minimum standard deviation, mean, these factors for that particular zone.

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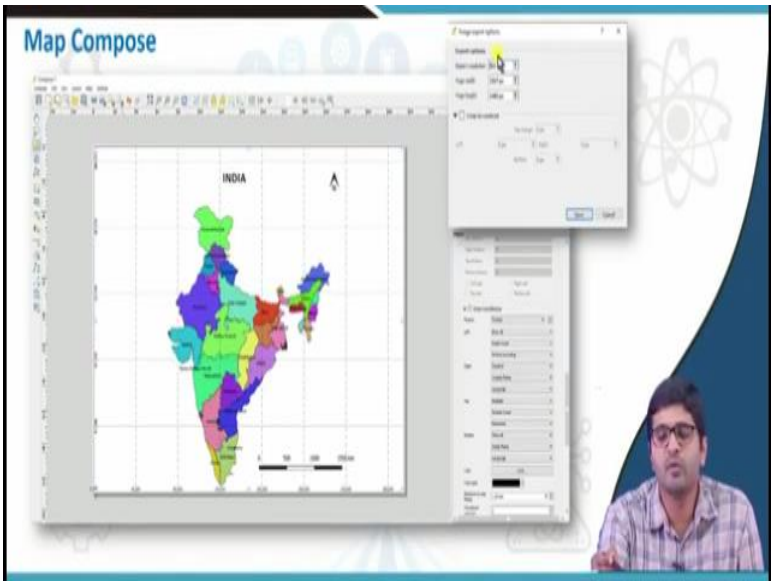

So, next is how to style and label in QGIS; so this one when we have seen earlier, so the entire, all states of the country have styled using different colours and the labels of the state names are showcased here. So, this one you can do just by right click on the layer and if you go to properties, this stylings can be done. So, finally after styling and labelling, you need to compose the maps for that finally, it can used or printed somewhere or it can used in any your reports.

To do that, you just need to go to the projects and click on new print composer, a compose manager will appear, you just need to create one compose manager, give its name and then press add, a compass; a composer will appear so, here you can add map elements such as title, north arrows, or scale bar or you cannot ledger as well and grids of that particular area you can also add and you can have complete customisations of the maps in the map composer.

And finally, export the map into an image format or pdf format of fixed width and height, so you can mention the DPI of the image as well.

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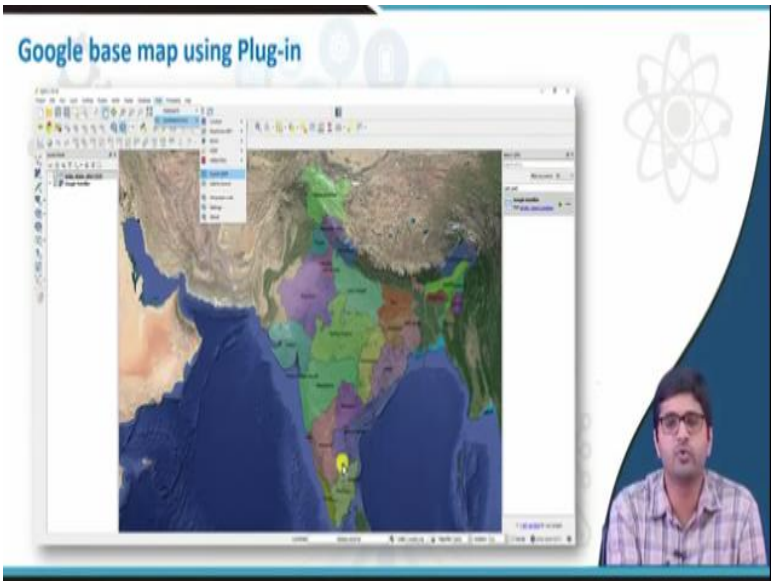

And Google map; Google satellite map which I mentioned earlier as a base map, here I have added you just need to go to web, quick map service and press on search QMS service, you just need to search Google satellite as a base layer, so if you already have a layer which is appearing on the screen, the Google maps will come behind that. So, if you change the properties or appearance, so you can go to any zoom level and see like you do it in Google earth.

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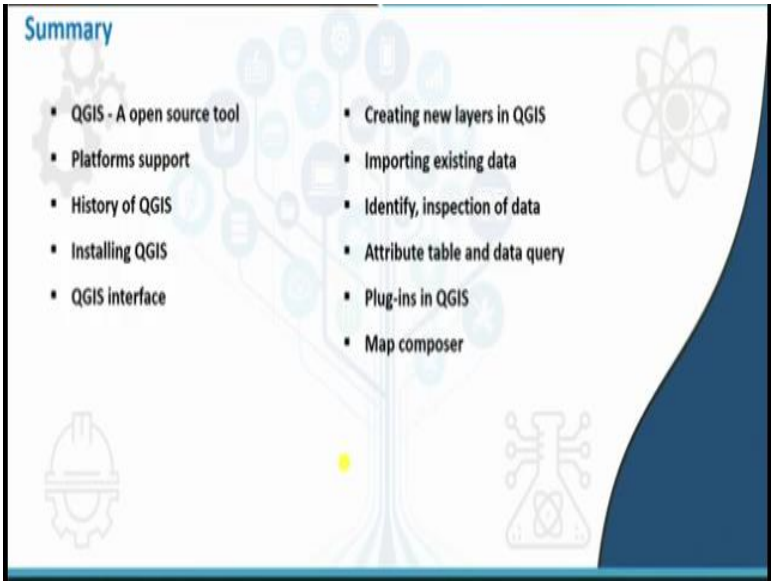

So, in a nutshell, so we have seen how to install QGIS as an open source software, so what kind of platform it supports and history of QGIS from when it is started and where it lies in terms of GIS timeline and how to install QGIS software, from where to download it and we have seen some of the interfaces of QGIS about various functionalities and how to create new layers in

QGIS, new shape file layers, how to bring in existing shape file layers, how to label it, how to style it.

And how to identify features in QGIS or any polygon or any features and how to inspect the data in attribute table and query the data's and installing new plug-ins and we have seen some important plug-ins as well like open street map layers, georeferencer, zonal statistics or any spatial plug-ins and finally, we have seen map composing, so how to compose a map after we created these things.

So, till now we have seen the various functionalities of QGIS software in terms of usage so, in the practical session we are going to look at the functionalities in detail, thank you.