Remote Sensing and GIS for rural development
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Week – 7
Lecture – 33
Ground Control Points from Google Earth Pro and Basemaps

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Hello everyone. Welcome to NPTEL course on Remote Sensing and GIS for Rural Development. This is Week 7, Lecture 3. In this week, we have been looking at Google Earth Pro for accessing data and information quickly which can aid in creating a database for rural development. In the last examples we have looked over the lectures of Google Earth pro's toolbox and what can be achieved.

We also noted that there are some advanced levels which a lot of students do, spend time on for example Google Mars and Google Moon, Sky, etcetera. But we will focus on Google Earth. A lot of data is present and we looked at some methods to limit the bandwidth and memory of running Google Earth Pro. In today's class, we will look at how one can extract information from Google Earth Pro using ground control points.

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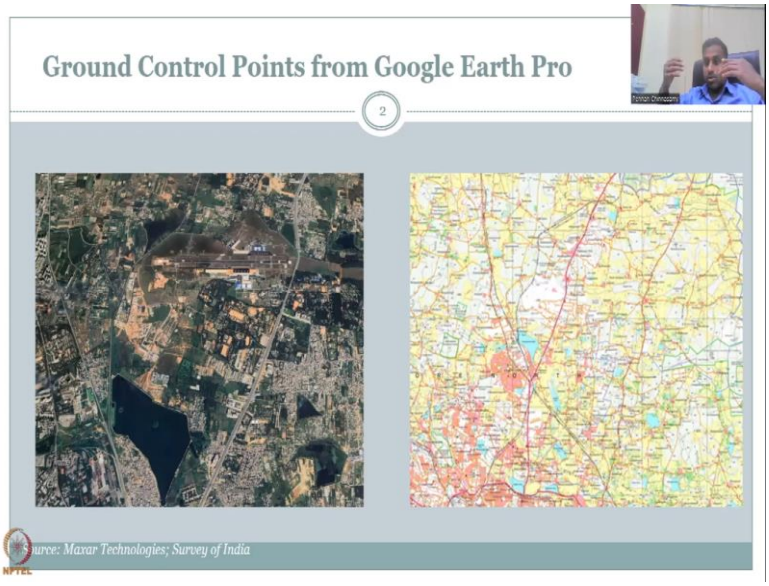

So, in this week 6 and 7, we have been looking at tertiary or proxy data that can support our analysis for rural development. In one such case, we looked at a scanned topo sheet. A scanned map from Survey of India. We notice that there is lot of information hidden in the paper maps but unless it is put on a GIS platform, we cannot quickly take the data out. And one way we look at it is by using the Lat Longs provided in the map as ground control points or GCPs.

So, in the Geo Referencer tool, there is a lot of ground control points we need to give, at least six, for the nearest neighbor method that we used, for polynomial 2 method. Let us say, we need six points but you get an image from aerial photography or a paper map that does not have this information, then what do you do?

Let us look at some examples. So, this is a beautiful aerial imagery taken from Maxar Technologies. I am making a guess here saying that this map is on the Ilahanka lake but there is no other information on it. For example, there is no Lat Longs, date, time of flight. So, the other accessories that you can take for using as ground control points.

This is similar to a lot of paper maps. You can have a paper map like this where only part of the map is available, you do not have the boundaries where you have the GCPs that can be extracted nor the grids are there but there is no data on the grids. Let me zoom in and show you.

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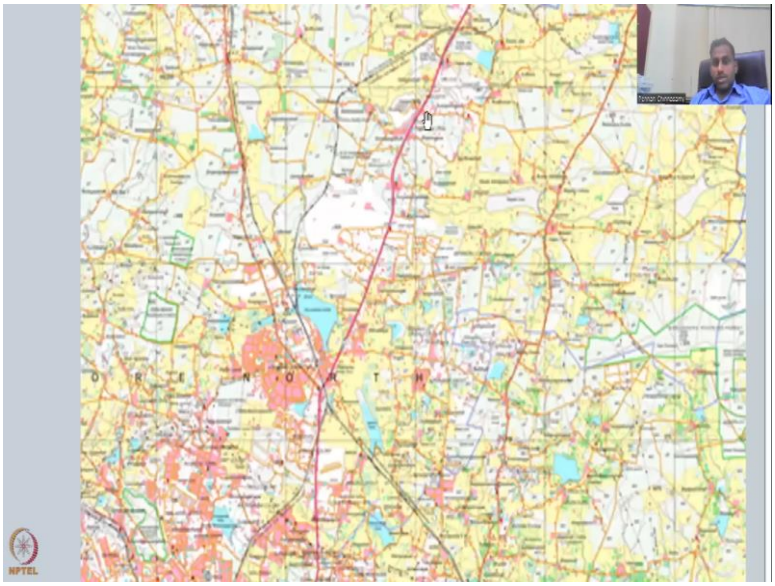

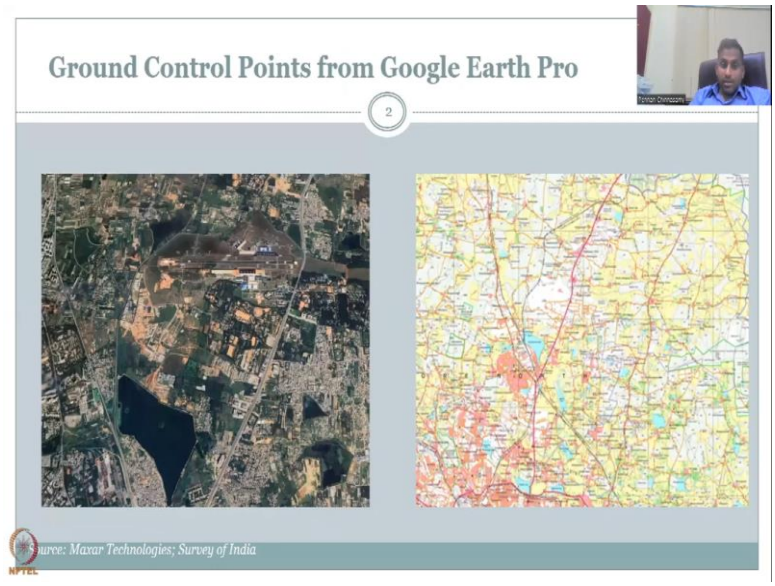

So, you can see that there is no numbers or any data information that can be taken out. But there is this Ilahanka lake and other data that can be identified, names etcetera. So, the idea here is to use Google Earth in parallel to look at similar imagery and then extract the data out. Let us take a case study of this image. This would have been taken in a particular date. So, let us open our Google Earth Pro and we can look at what are the points that can help in assessing these boundaries. So, let me open and share the Google Earth Pro.

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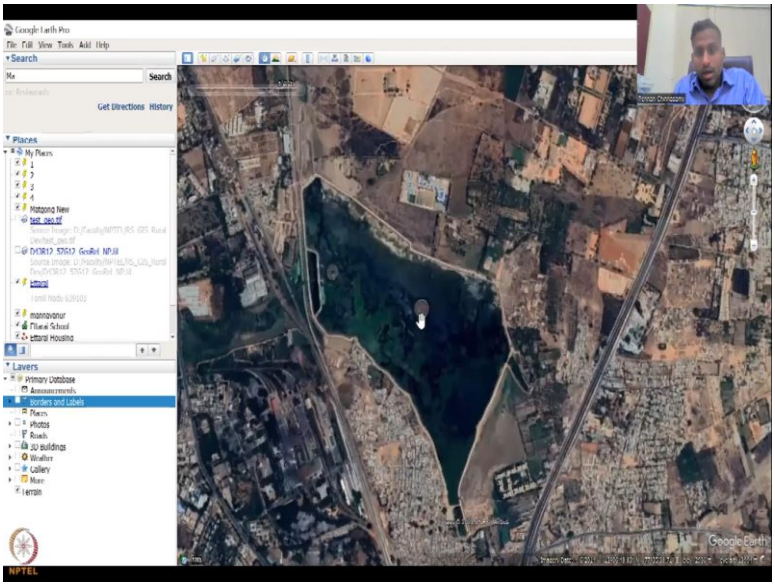

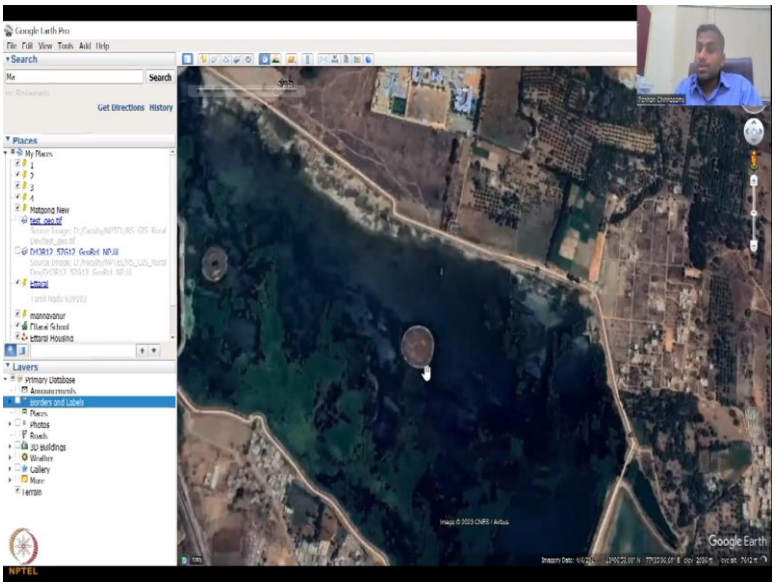

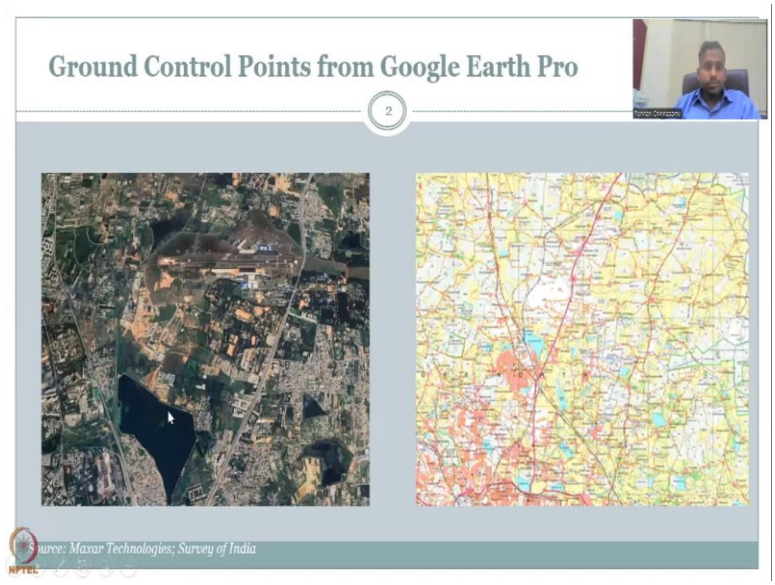

Yes. So, now, what you could see here is an image which was very similar to our image to the image that we had on the PowerPoint. What we can access is, for example, you can look at some control points like these small circles. I hope you remember that these two circles were present in the imagery also. So, I am going to share just in between these two screens so that we can toggle back and forth and see the image. So, here. We did see this part.

So, you do have these two circles and this circle is there. So, kind of these are like aeration chambers or valves to keep aeration in the lake, some drainage lake, so that if the lake goes over a particular volume it will be drained. So, some structure, let us keep it as some structure and it is circular and there is a center in the circle. So, that point is enough for taking one control point. So, this is how one can go ahead and collect ground control points. Let us take two points just for example.

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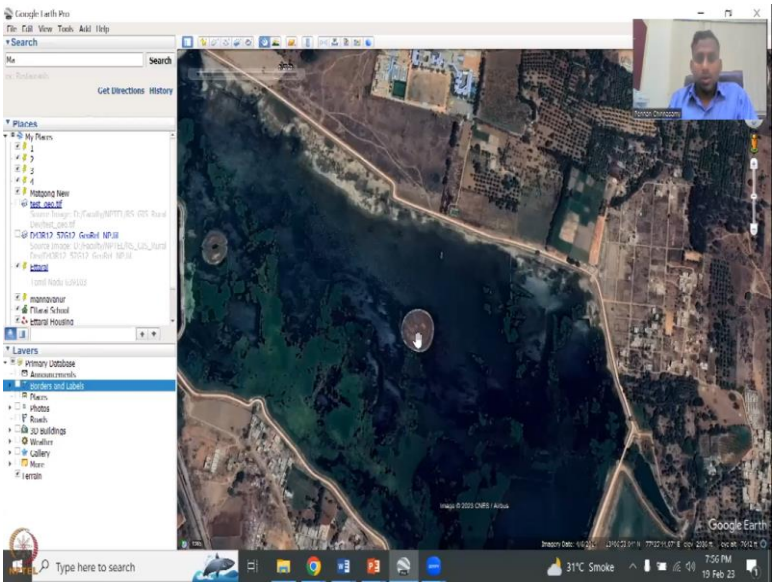

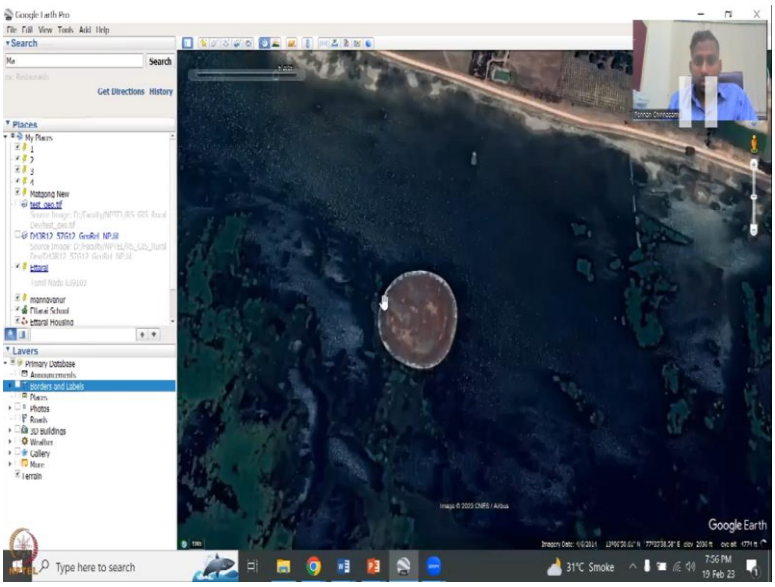

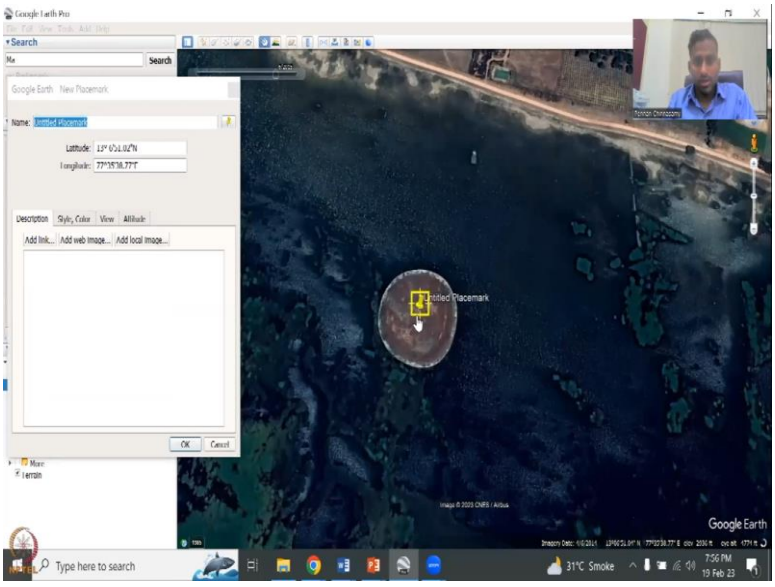

So, as I said, this is the circle and you can take a point on the center of the circle and you collect the Lat Long. So, this Lat Long is where you can enter in the GCP Lat Long. The ground control points in the Geo referencer tool, you can use this and put control points. Similarly, let us take another point.

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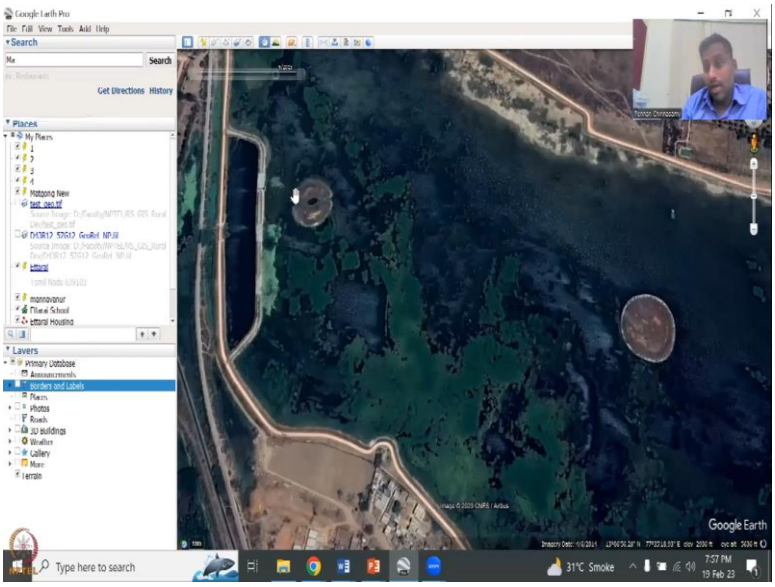

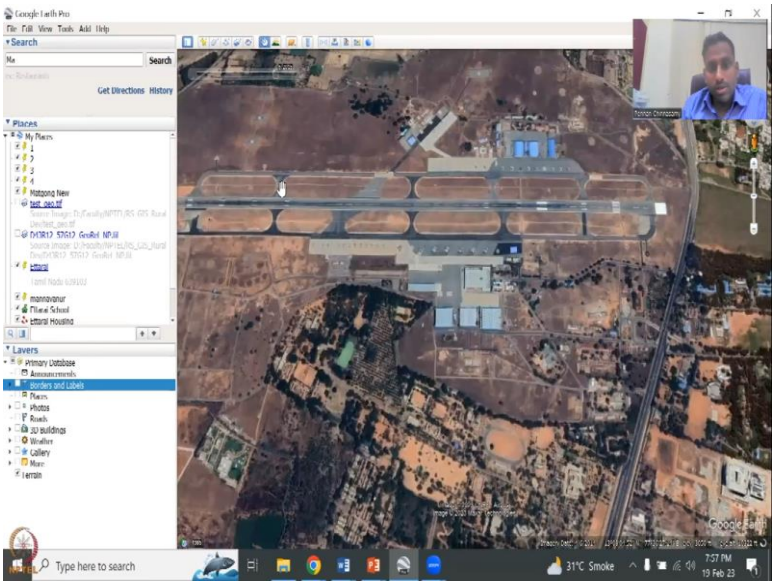

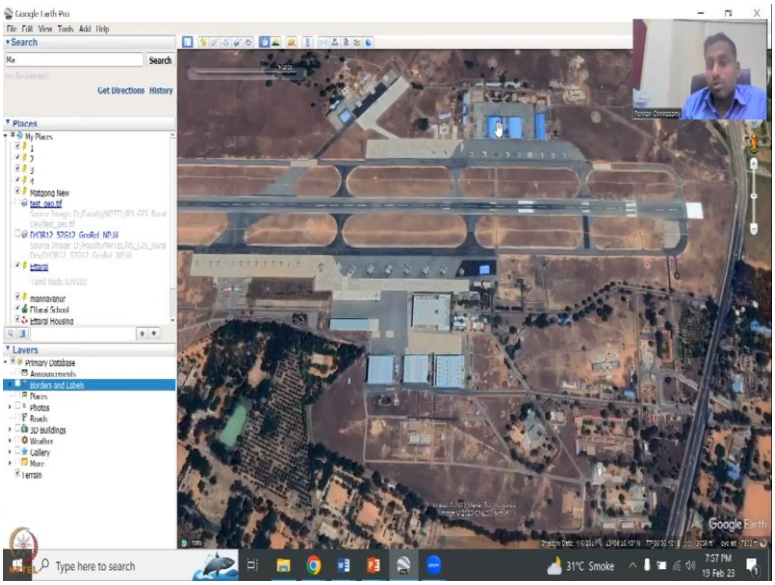
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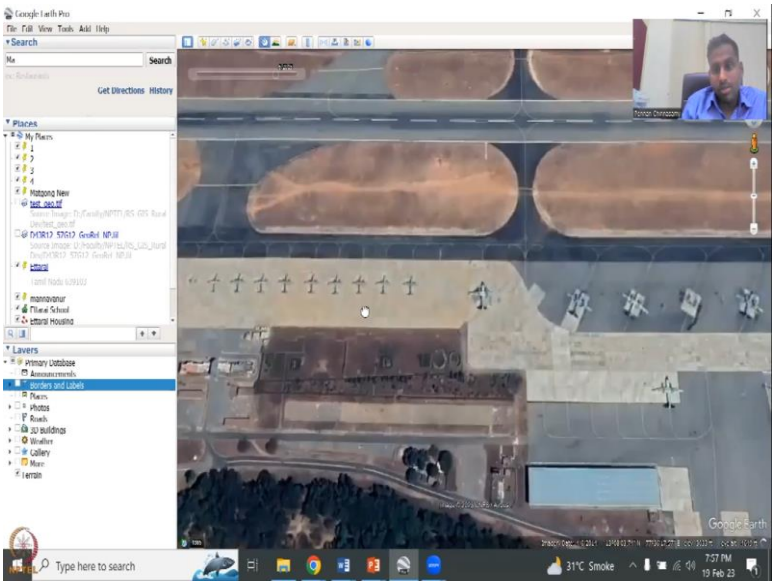
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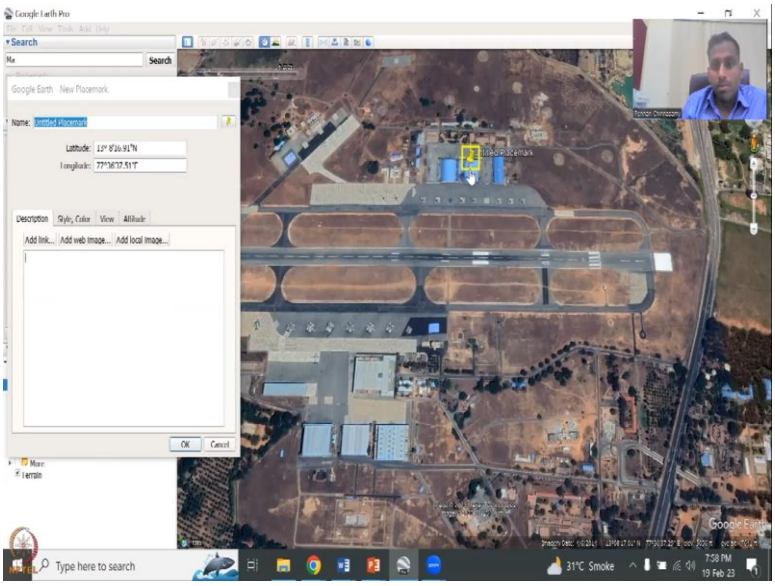
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You can take another point here because that is also in the image. You could take this ground, you could see there was a ground that was taken or yeah, airport. So, this is a flight deck. So, a pathway, runway for the flight. You can take these two, one of these two chambers, the center of the chamber because airports do not change much.

So, all these, the planes you can see here the planes, all these are parked, looks like a Air Force Base because there is no commercial means it will be too long too much longer or a bit bigger than this one. So, you have these two hangers also. You can take those locations, for example, you can see.

Either you can put your pointer here and read it at the bottom of the screen, you will see at the bottom of the screen there is the Lat Longs, if I put the marker here or just put the marker on top and then same way you have to put the marker on the image, when you do the GCP points. You remember, in the GCP points, you can zoom in and put the points.

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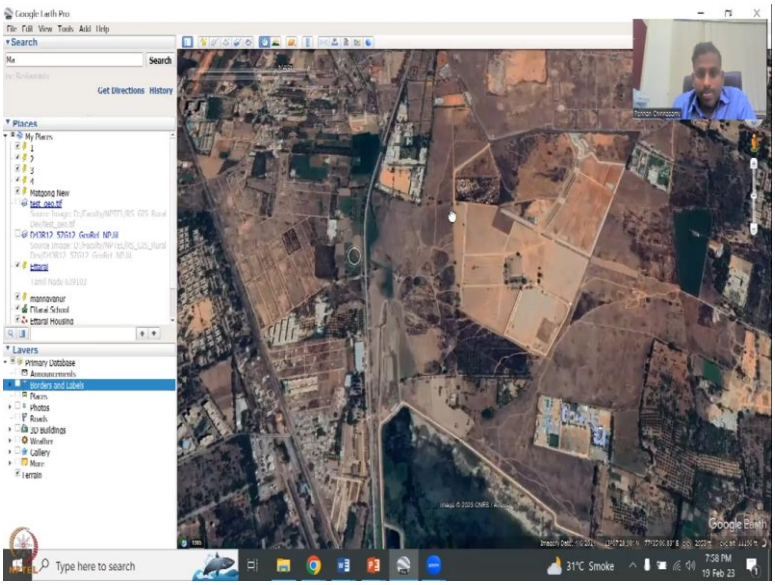

So, you could see the lake and on top of the lake, there are some areas of interest, the airport is around here somewhere. So, you could extract those points clearly from the maps. So, these parts have been changed. So, we do not know much about, maybe we can use a different area image. Let it load and then we will find. So, you can keep on updating the image to find the correct control points and then extract those control points.

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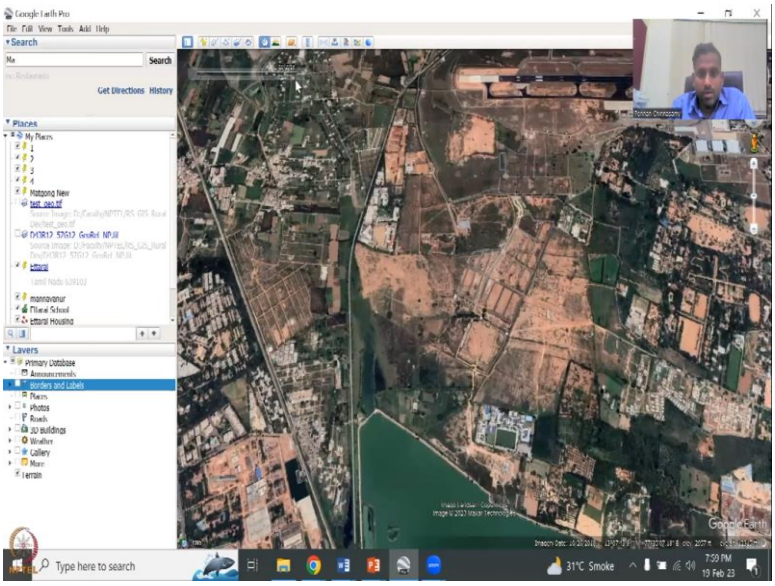

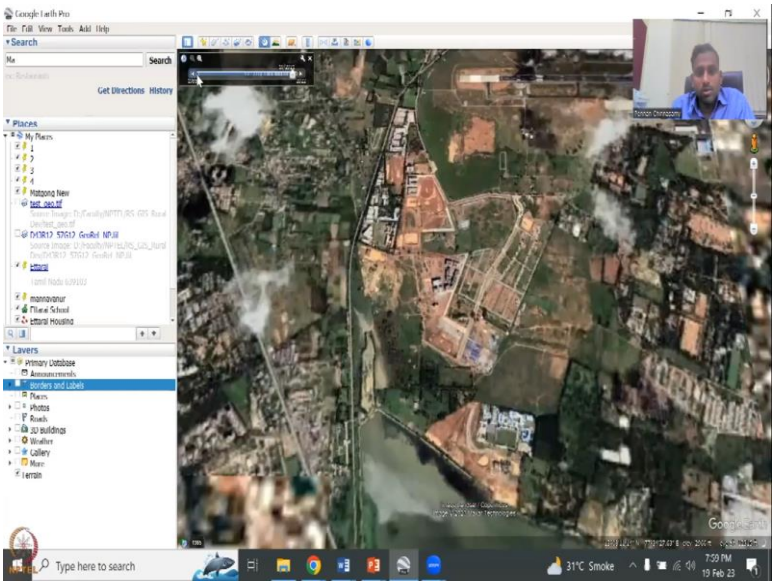
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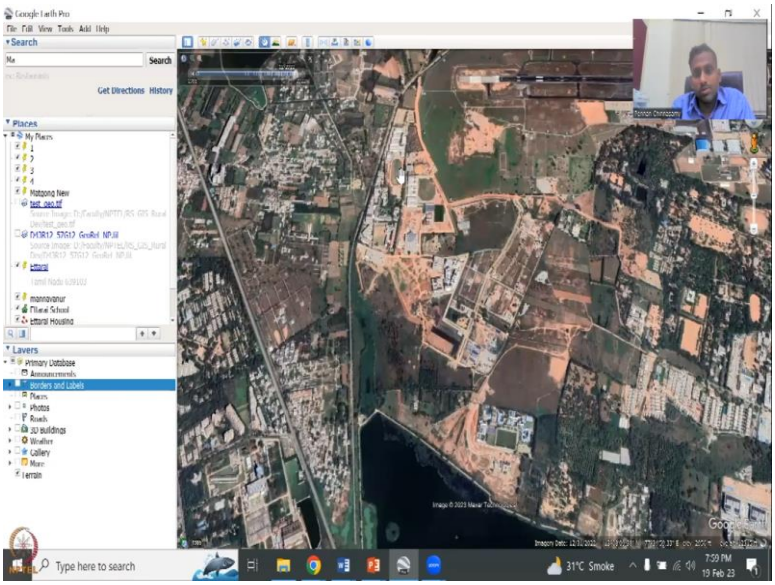
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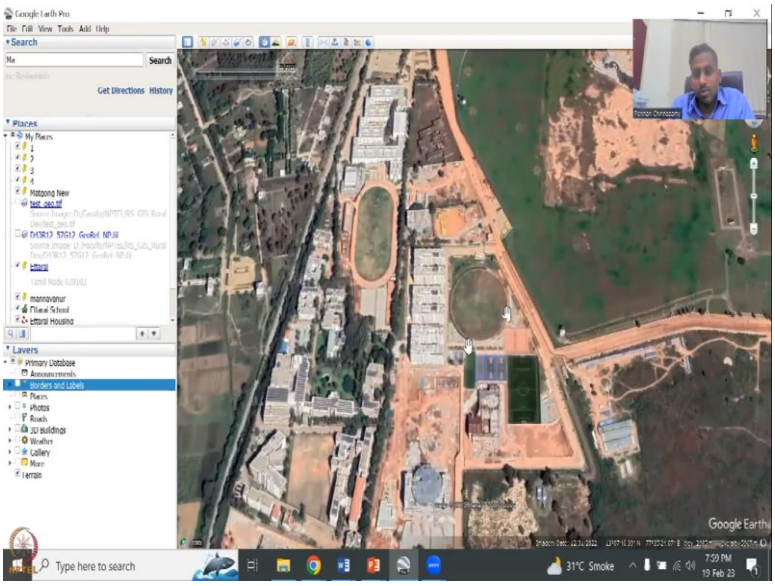
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So, you can see here something is developing or maybe we will just use the latest one. Oh yeah. So, there is the ground. So, maybe the ground was being built. Initially there was no ground. So, they are trying to build the ground. There is nothing here but then the recent years 2022, there is two grounds. So, it looks like one tracking field and then a cricket ground. So, and a football ground also. So, you can put a pointer at the center of the ground or the center of the cricket or football.

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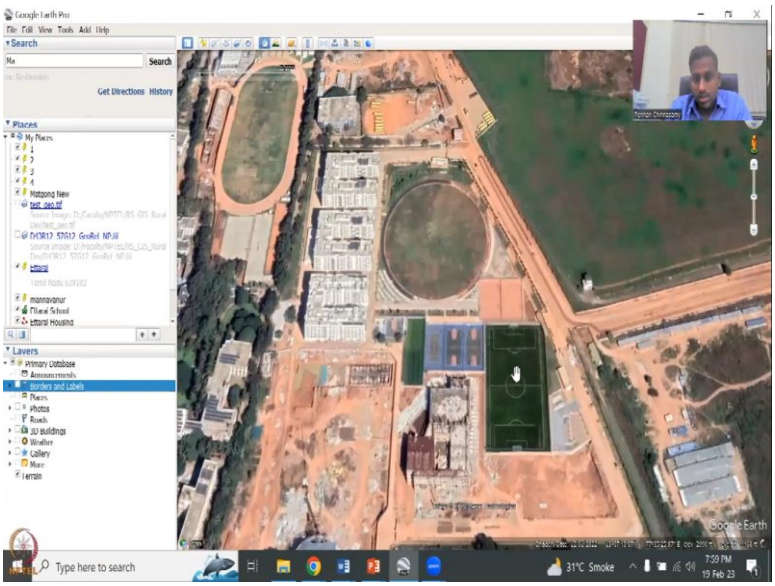

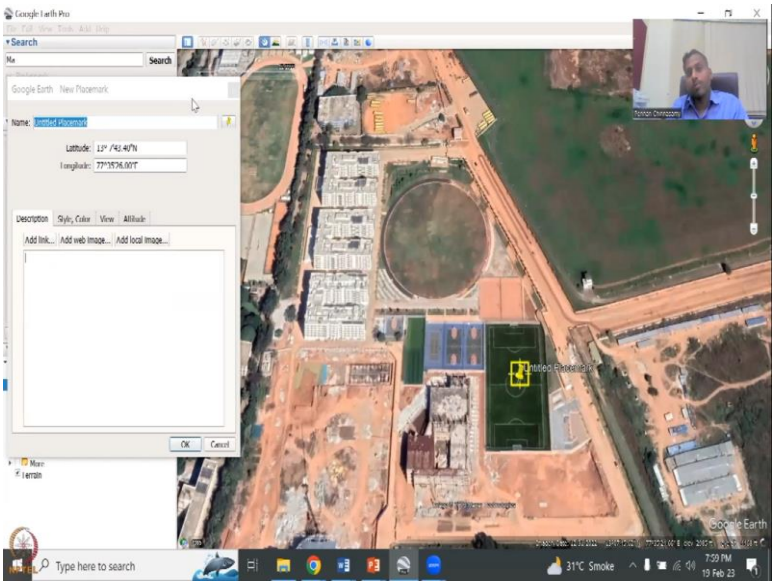

You can see here there is a circle at the center. So, you can just put it, this is easier to mark, you can put it on the center and then take the Lat Long. So, by doing this, you can extract control points into your GCP, the geo referencer and then you can reference the image which we have in the Google Document. So, this is it.

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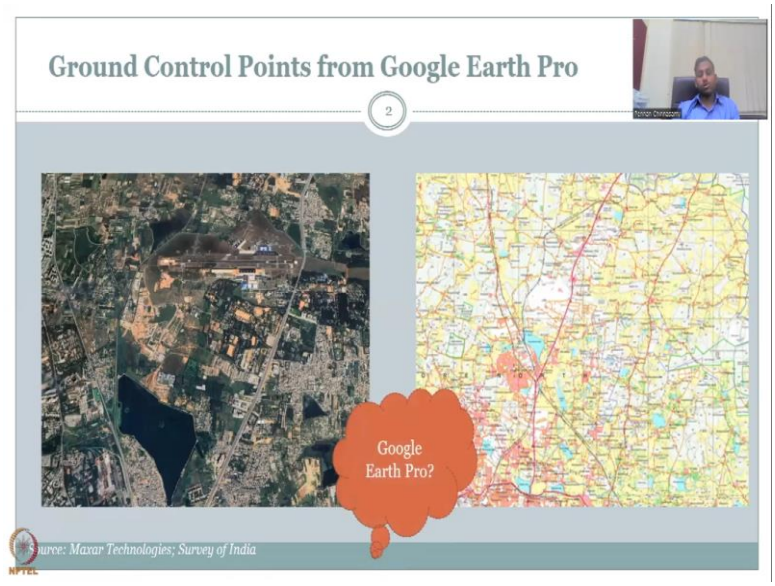

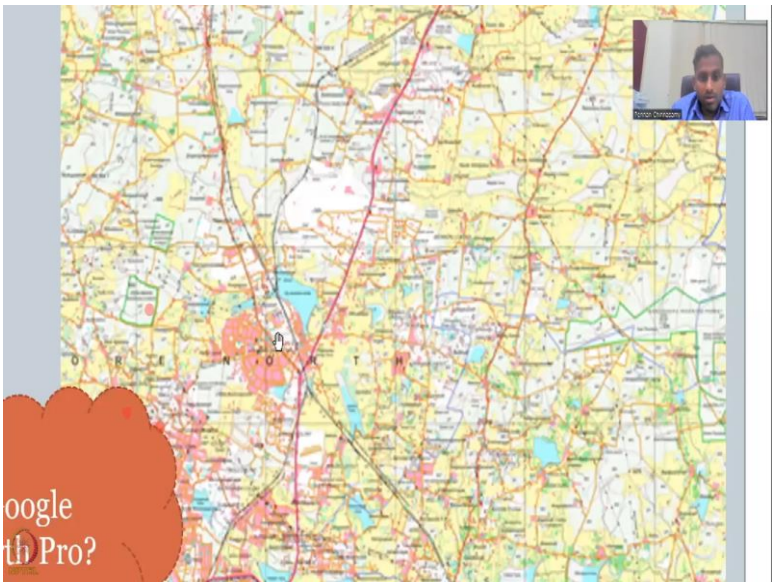

Using Google Earth Pro, we have showed that we can extract information. First thing, the first step is to focus on the image you have, find points where exactly you can put a point. As I said let us see I am going to put some points here. So, we said that this is one point, this is one point, and then we saw a cricket ground, a football ground. In the center of football ground we put a point, you will have to zoom in.

So, when you do the geo referencer, you will zoom in and then take the values. Then you go back and forth in Google Earth and then you collect the GCP point Lat Longs, put it here and then you extract it. The same thing here. You could look at the center of the lake or the center of the structure. So, the center of the structure does have a point. So, this one, we could see

here there is a point. I will show you. In the Google Earth, if you go back to Google Earth, reset this structure. There you are.

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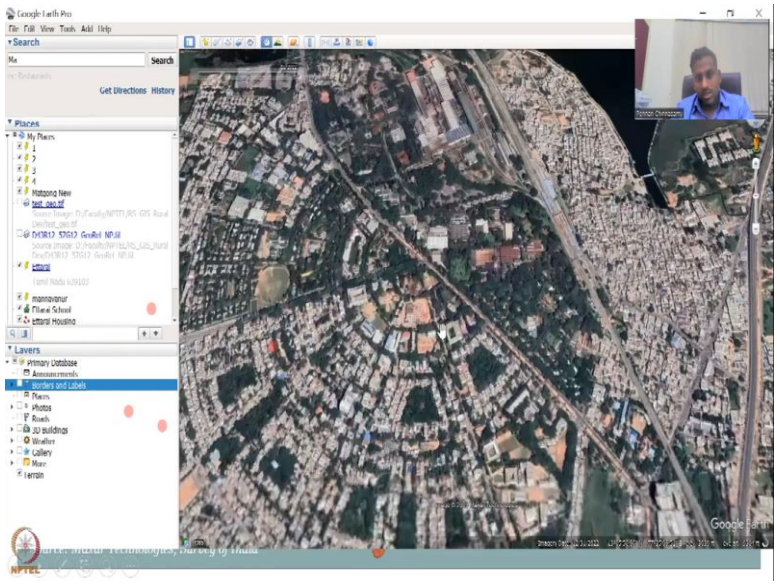

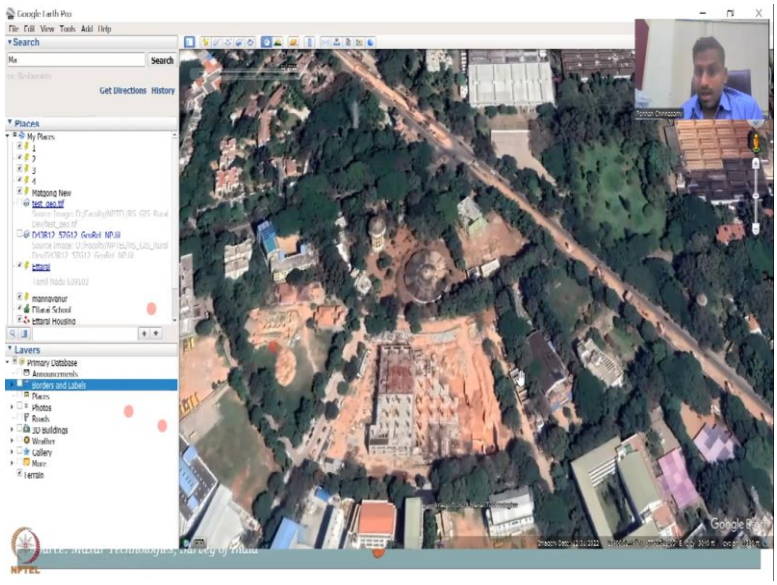

So, you see this semicircle and then the center of the circle has a point. So, here we can take a Lat Long and that Lat Long will coincide to the Lat Long here and then we take the GCP points. This is, it is not as accurate as taking values from a map but if you triangulate the four or six points, take as much points as you can, let us say six, eight points then while triangulating between the points, there will be some assessments and the accuracy will be improved because of the model because it is interpolating between the data. So, let us move on now. We will go to the QGIS part.

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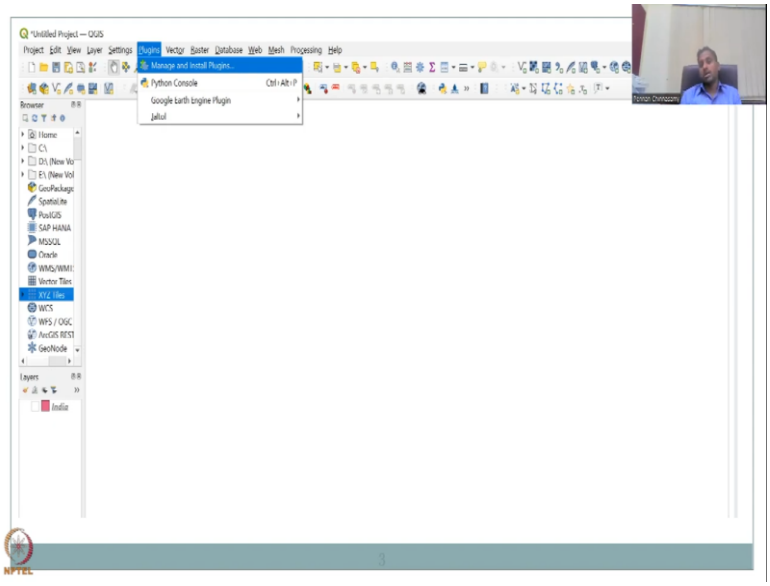

So, this is by shifting back and forth between the two softwares, one is Google Earth Pro and then QGIS. However, there are multiple ways of bringing a map background into QGIS, we will look at some. But before that I would like to introduce the concept of plugins. So, plugins are a toolbox, a set of toolboxes that have already been created by users, volunteers and you can run it efficiently or effectively with simple inputs.

Say for example, you need to add a plus b plus c is equals to d, instead of putting a b c separately and merging them into one raster, you can open this tool and just quickly add it. So, it is basically a GUI a graphical user interface with all the tools in the background. So, let me introduce the concept of plugins from where we will jump into a couple of plugins which are very important for bringing the background image.

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So, in the user guide, you will find that the plugin database is there for learning and understanding the plugins. The link is given up here. So, let me quickly open it and I am sharing my screen now. So, in this plugin what do you see is that in a tutorial it says about the plugin tab the coordinates and external plugins.

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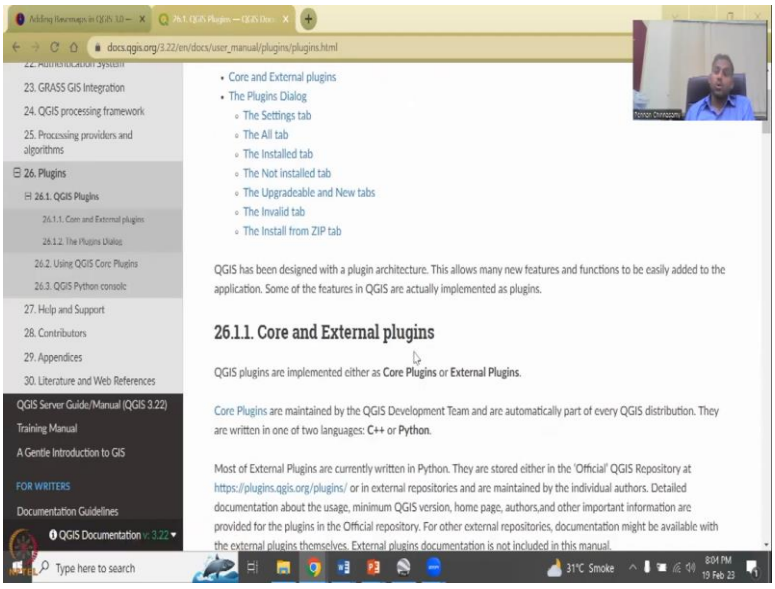

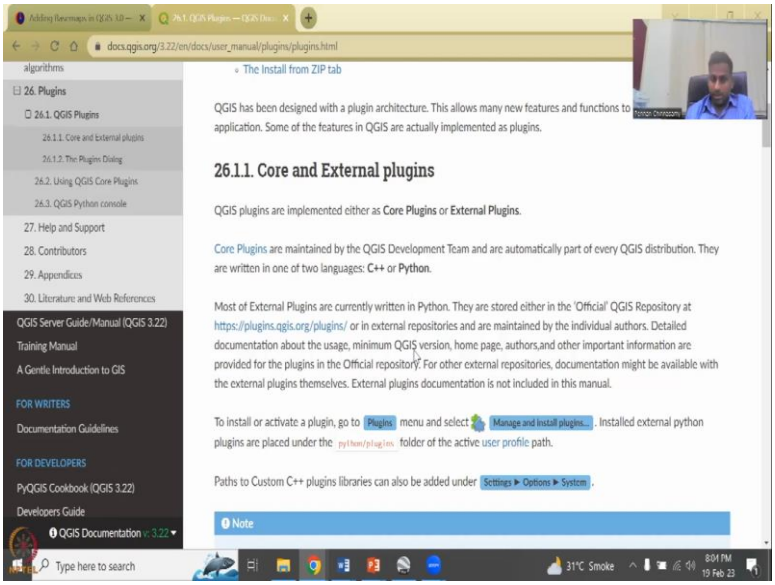

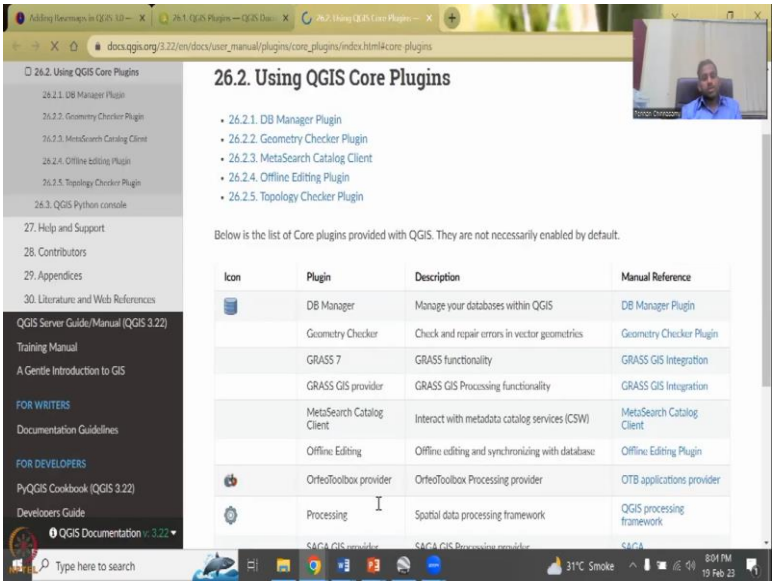

Core means some tool sets, toolboxes that are always in QGIS, you will always be using it. They are written in one or two languages either C plus plus or Python , mostly it is in the Python programming language. And it is a core development team that has created the core plugins.

If you click the core plugins, you will find what the core plugins are it is basically database manager, GRASS, offline, tools, processing SAGA, Topology Checker, etcetera, etcetera. Then as I said you have an option of including or using the tools that have been created by volunteers and users just like you and me.

So, they would have stored it in a GitHub or some other cloud space and then merge it with the QGIS catalog and all you can do is, if you like the tool or if you heard good things about

the tool, you can import it into your QGIS and run it. So, that is what we will be doing today. We will be looking at a particular QGIS plugin and then accessing the benefits of this plugin by using a database.

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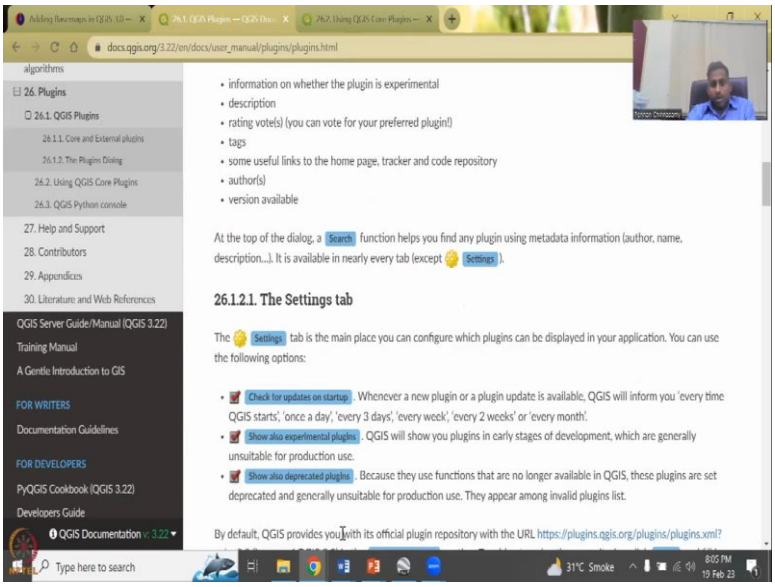

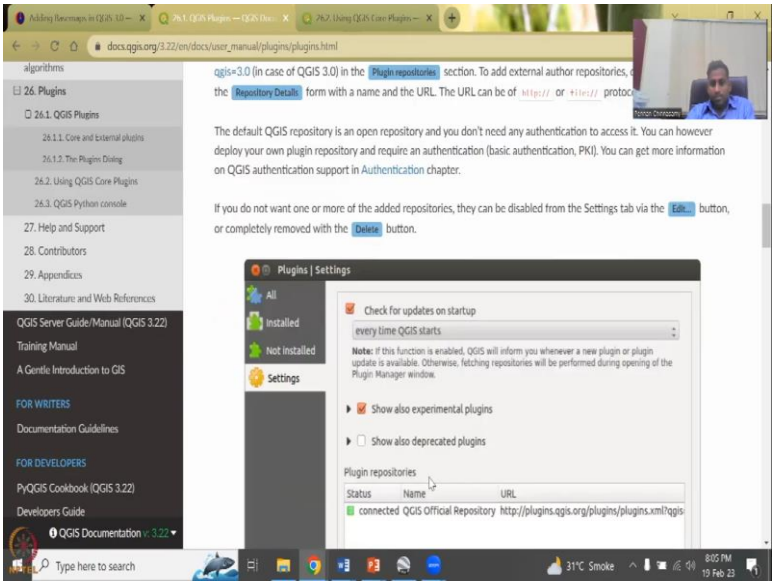

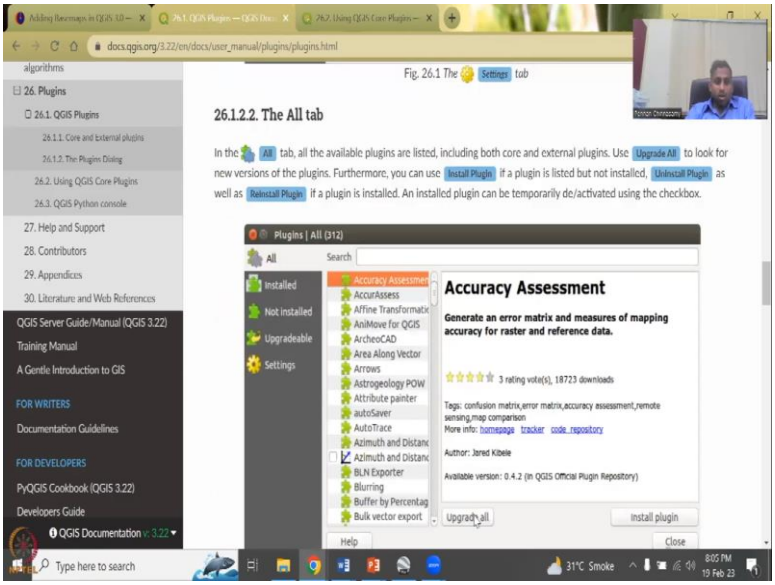

So, there is a settings tab, there is a updated tab to show how much are updated and then all tab, we will go through all this in a quick example mode. So, let me share my QGIS. While my QGIS is opening I will also like to mention to you that some of these plugins work and some they do not work because they are created for a particular purpose, for a particular region and it requires you to have login to some systems, for example an account.

So, you will have to read more about it and sometimes they have bugs. So, that bugs means as not viruses but it does not work after some time or it runs in a loop and that is why they are not part of the core plugs, core tools. These are good tools but they are not core. So, I would recommend you to read about them, look at them in the literature they have been used widely and if so, you can use it for understanding the usefulness of these tools.

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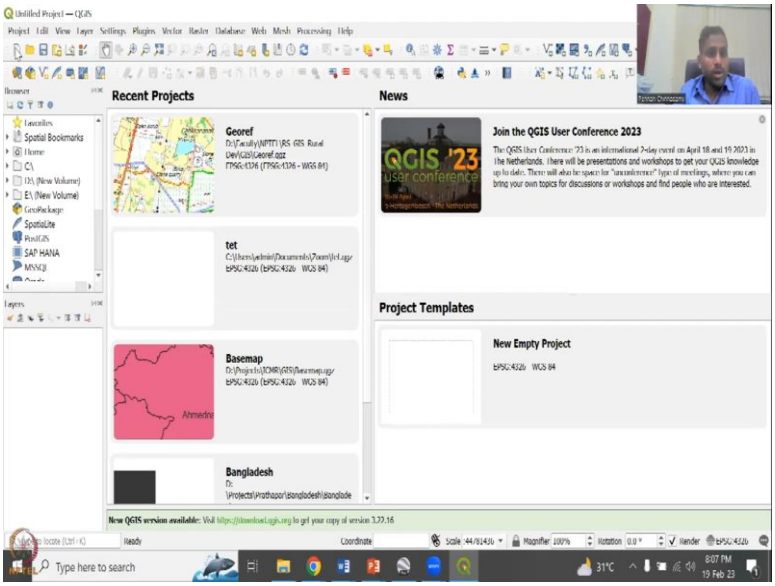

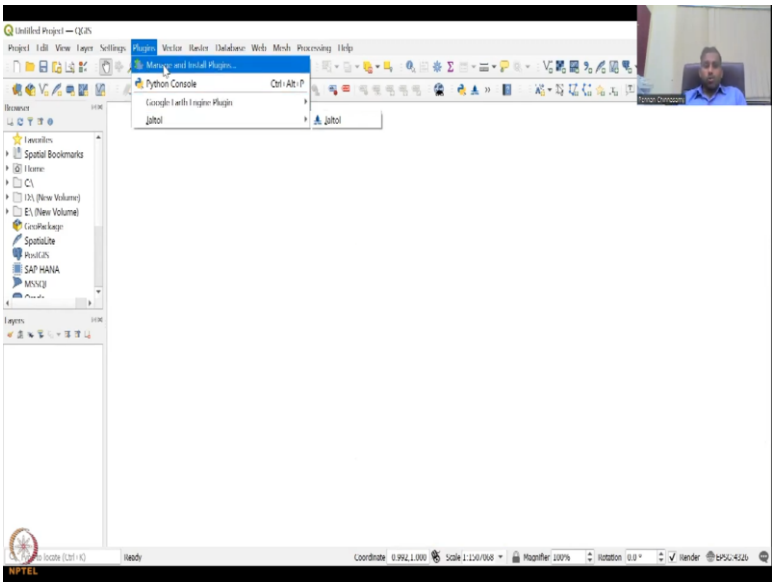

So, let me open the QGIS or share my QGIS page and we will open a new template and go to plugin. So, first, if I click plugin, I already have some plugins, for example, Google Earth engine plugin and Jaltol plugin. So, first I want to teach you about the Python console.

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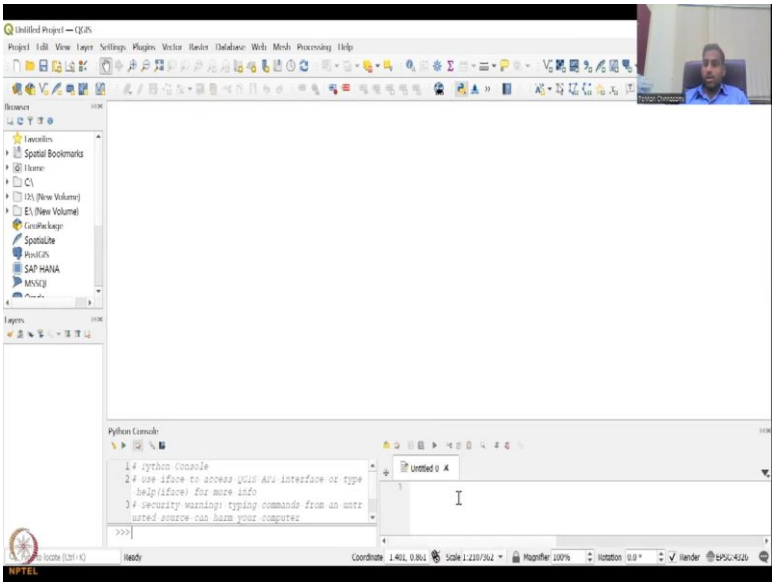

So, this is where you can run a code from Python about a tool and execute it. You can do an editor. Click on the editing tool and then you can edit the tool, copy the code, paste it, run it and then it comes to here and then you run it. So, for now, we are now, going to use the Python. It is kind of advanced.

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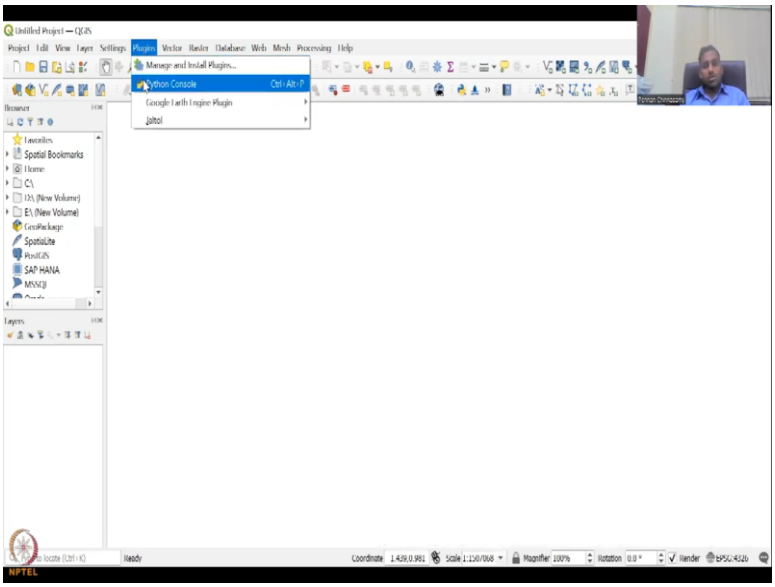

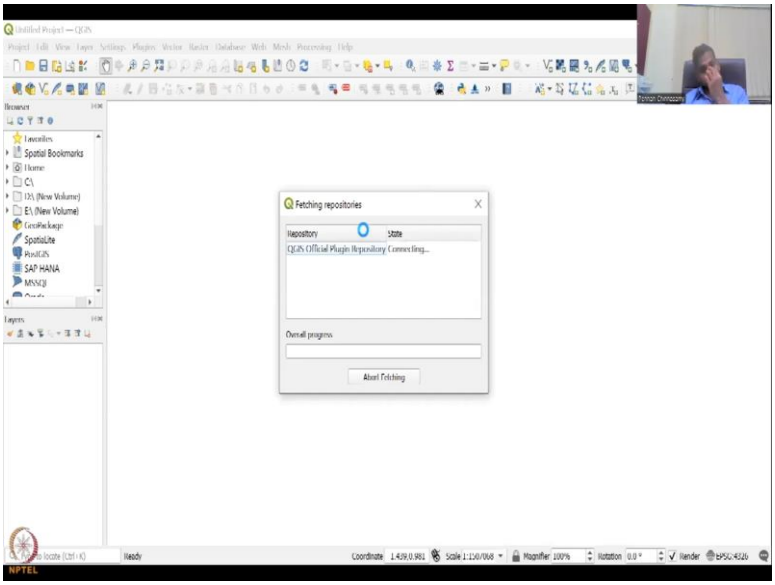

So, we will be using the manage and install plugins. Once you click it, you will find this opening out, it is called fetching repositories or database of tools.

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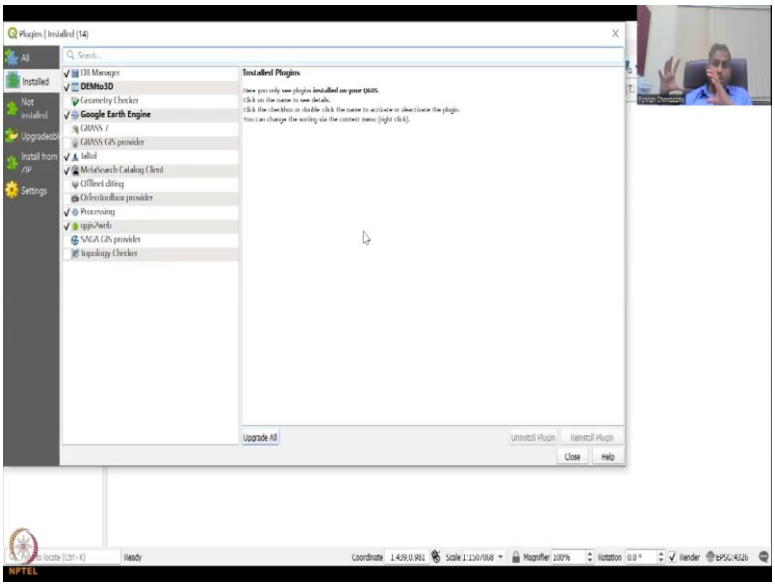

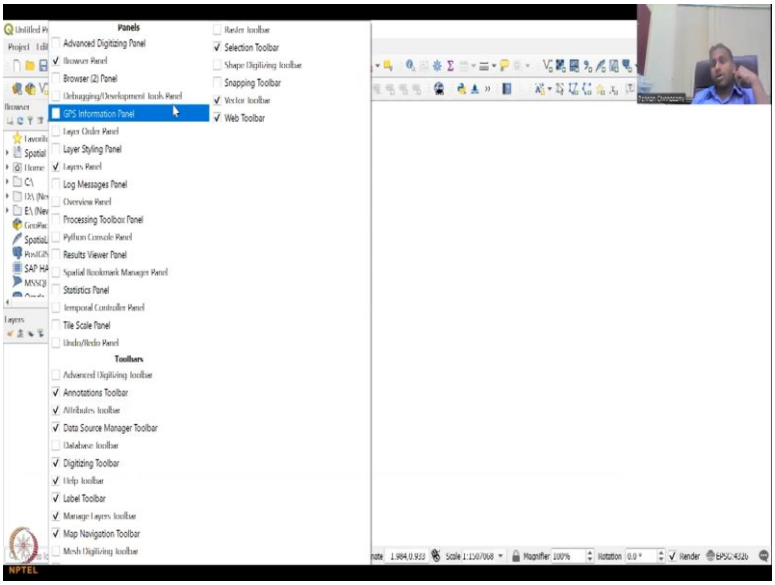

As I said there is one Cloud space where all the tools are being linked to and each time you open QGIS and open this manage toolbox, it will run and bring it, only when you opening it new. For example, if I close it and then run it again, it would not take that much time. It pops up, it does not wait for the repository because you just updated it. But when you close the QGIS and then open, reopen it again then it will check for new updates and then link it.

So, what it first goes is into the installed box. So, how many plugins have I already installed, looks like I have a couple of toolboxes installed or plugins installed, is a kind of apps in terms of your mobile phone and apps Play Store. So, this is your Play Store for downloading new apps and as apps sometimes work, sometimes need updates, the same thing goes for plugins.

They are not the core. So, every phone has core apps. Let us say my camera is a core app, my messaging, my phone call is a core app, you will not throw it out and you cannot delete it. So, like that, you cannot delete some of these apps. For example, I do not know, I do not want to or I cannot delete this toolbox or this add new toolbox, you cannot delete it. You can remove it from the toolbar, so that you can have more space but you cannot delete it.

It is all, toolbars are all with inside the toolbars, these are core tools. So, let it always be there. So, in the plugins, manage and install plugins, there are core which are not going to be visible here these are only additional plugins. So, apps are additional and sometimes you will install, reinstall all this happens in this.

So, this is like a settings for your QGIS app. So, now, what you can do is you can see like how many I already have. I know some of them are not working. So, I would not put a tick

box on them because it is taking my space on the top or just taking slow because it takes time to install.

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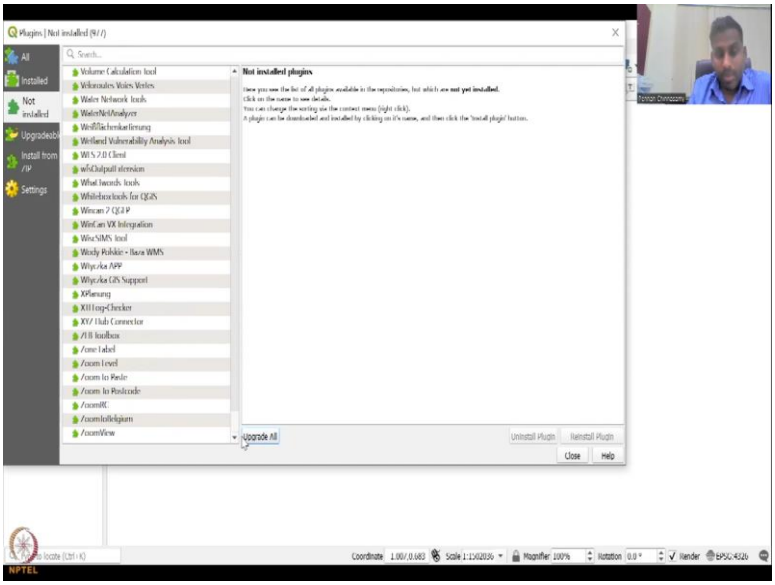

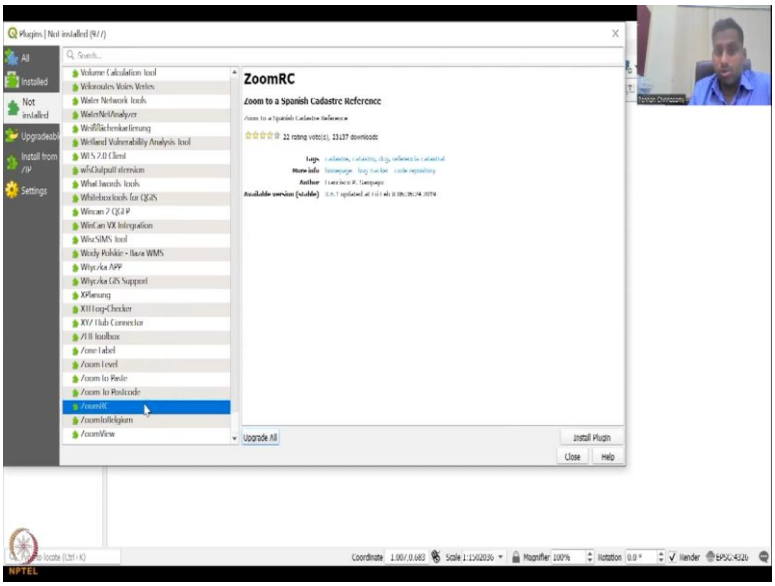

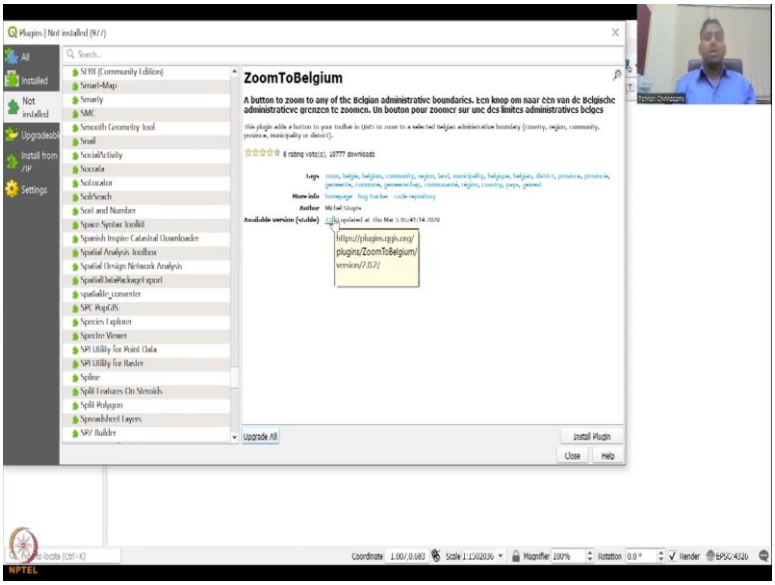

Not install is what are the remaining plugins that are not installed. As I said, these plugins get updated regularly. So, let us look at how many plugins are there. There is a lot and it depends on what are you going to use it for and different languages and setting. We will go through some of these plugins to just see what they are and how they are done.

There is always like a stable version, release, some PDFs about where you can find the reports, how many people have downloaded it. So, 10,000 downloads, eight votes have been given. Same like a shopping app, if you go to an app, you will see how many people have downloaded it, some reviews, here you do not see the reviews, you can also see the star rating, etcetera.

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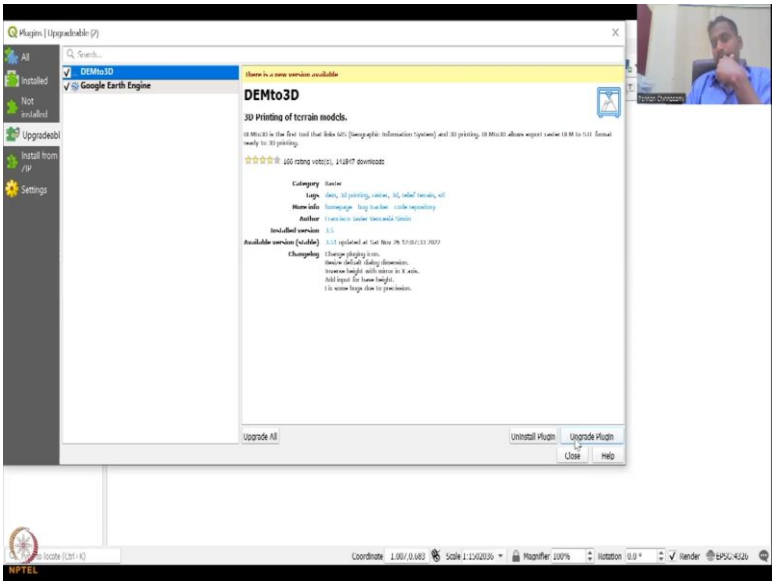

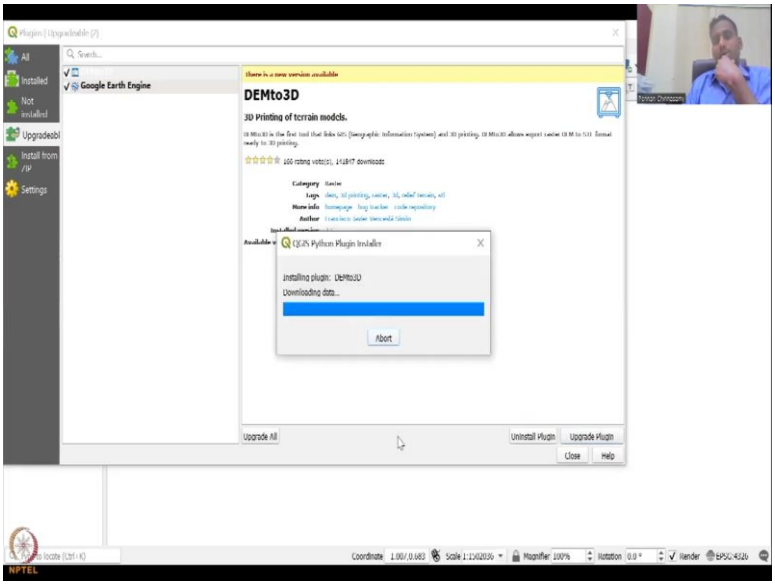

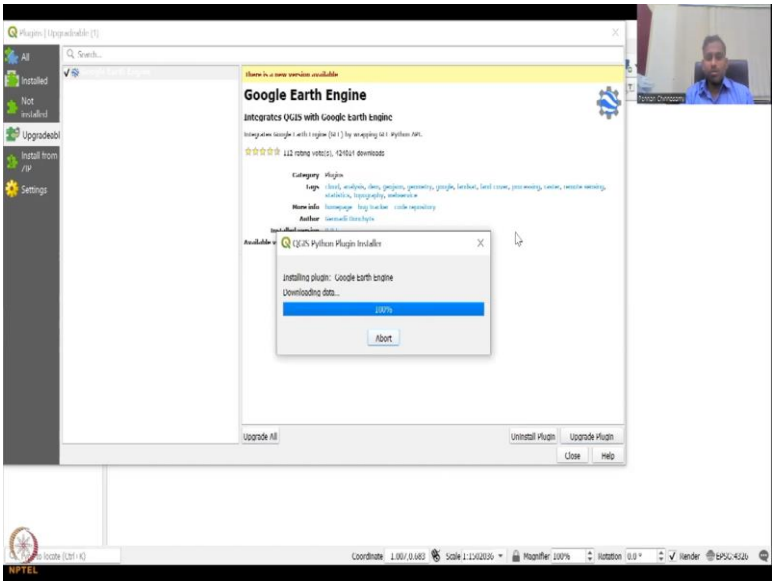

So, this is upgradable. So, within my apps or plugins that I already have, there are some that can be upgraded. So, let us upgrade the plugin. So, once you upgrade it, it says downloading the data to upgrade and then it is upgrade, that is it. It is done. So, now, that part is gone. So, then Google Earth engine, let me upgrade that plugin also. And it says there is a newer version.

So, it is getting updated which is good and then you can upgrade. You can also uninstall and reinstall a new plugin. It says not responding, maybe some there is some bug and or maybe they do not have the updated version. So, let it run for some time but meantime let me open another QGIS also.

So, the best way is to always check for updates online or it may pop up saying that there is an update when we ran the software. And those kind of updates we can use for the plugins. So, now moving on we will. So, let me reshare the screen again for some reason it had closed but it is okay.

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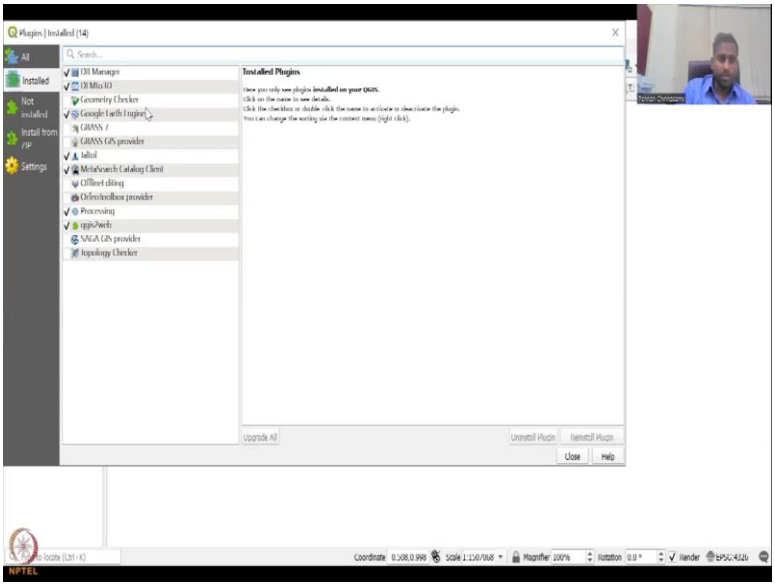

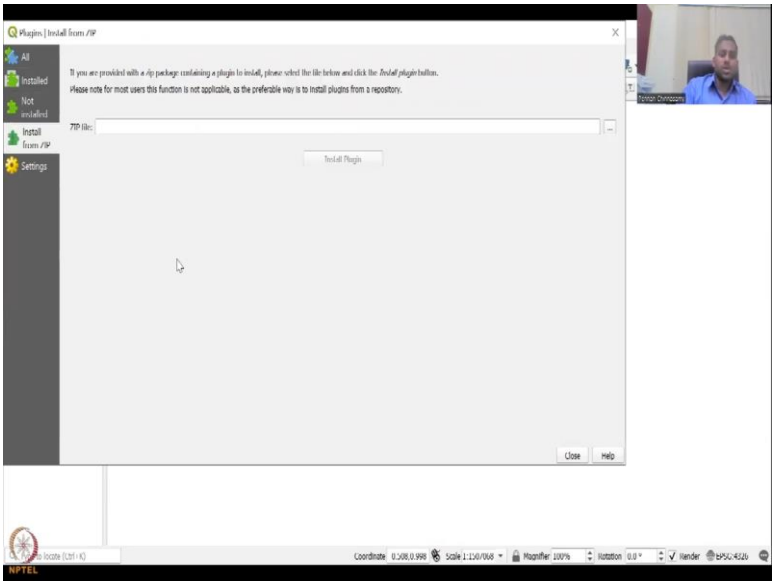

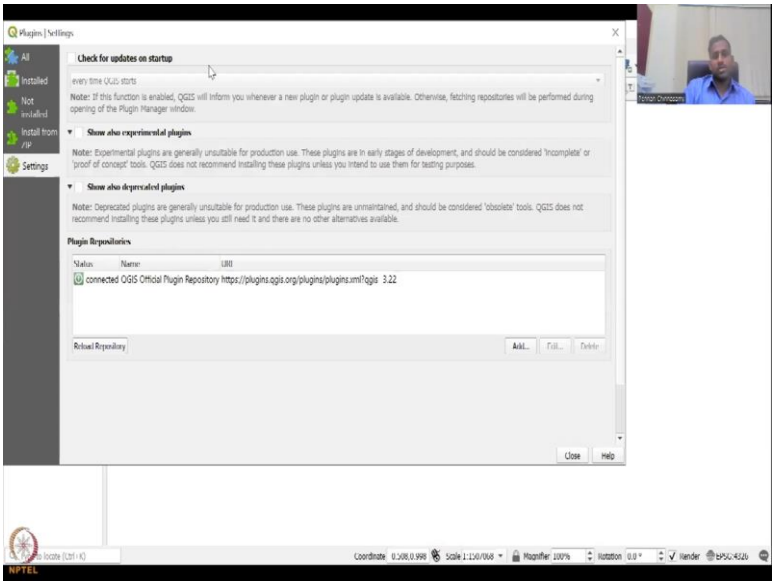

Now, we have a new template, new plugin, go to manage. So, you see all my other tools have been gone because I had updated them and you can easily use them. Then there is not install, install from zip. If you want to install a zip location and settings, check updates on startup, if you want to check updates on startup every time.

Do not do it because it will just take more time. If you want a particular update go to the app read it and then update it. If you do this, every time you start QGIS, it will check for updates. And then show experimental plugins, depricated plugins. Do not do. Only if you need, you can do otherwise do not do it. And this is a default plug-in repository or the data bank of all the plugins where when you want to install it, it goes there. Suppose, this is not readable, you have to edit it or reload the repository.

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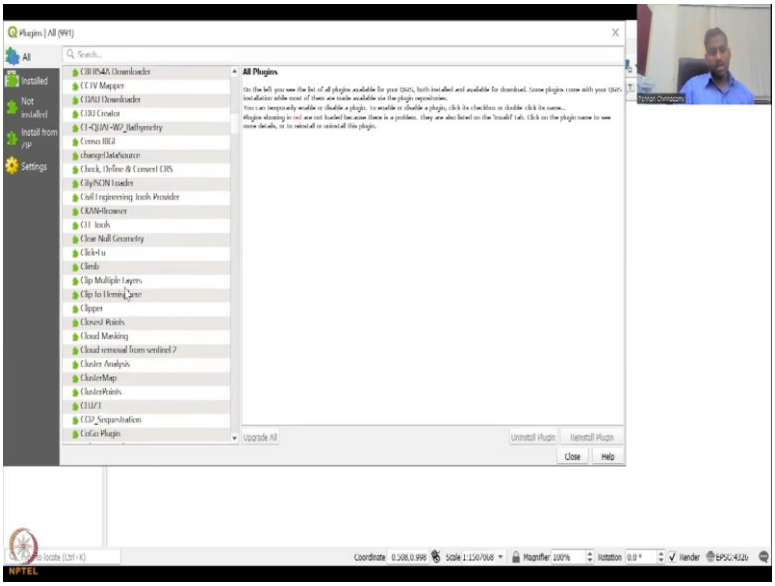

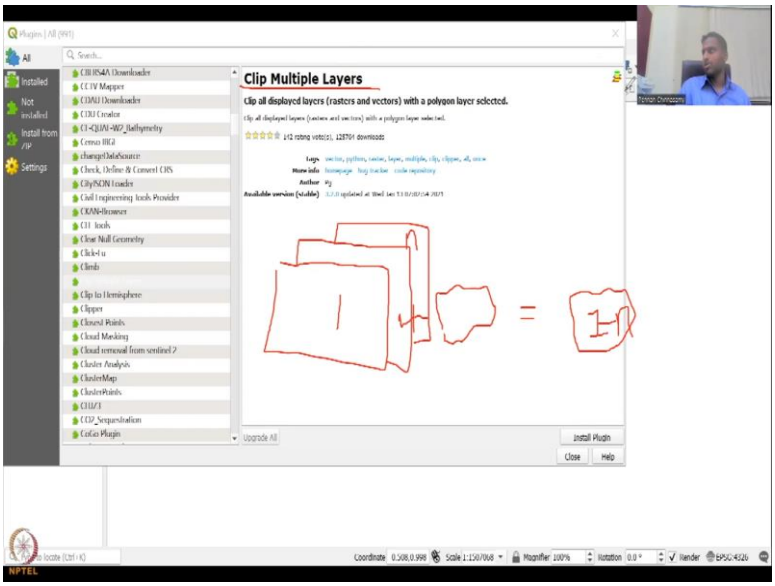

So, now, I come to all and these are all the plugins that are available. Let us say clip multiple layers. It says first. It is very very simple to read. So, it is just clip all display layers rastess and vectors with a polygon layer selected. For example, this is like a toolbox. So, let me draw and show you what it means, so that you can understand more about a plugin.

Suppose, you have one layer and then you have a tool to clip. So, the output would be the same with one layer. So, this is one layer you clip it into this. You clip it using the clip tool and then this shape file, you get this inside is 1. But now, if you have multiple layers, if you have multiples layers, let us say 1 to n.

So, what happens is when you clip this using this clip multiple layers, you will get 1 to n multiple layers within a single button. So, you do not have to do it again and again and again. Just select all the layers, select one clip mask, clip tool you select and click, it will automatically clip everything.

You do not have to let us say you have a land boundary, water boundary, soil type, agricultural type, everything has different different layers, five layers. All these five layers will be totally clipped into one parcel by just this toolbox. So, it is a very very useful toolbox. They are given an icon also here which kind of relates to what the tool is about. So, now, let us go into what we came here for. I will show you that screen, so that we can see in the presentation what we are going to look at.

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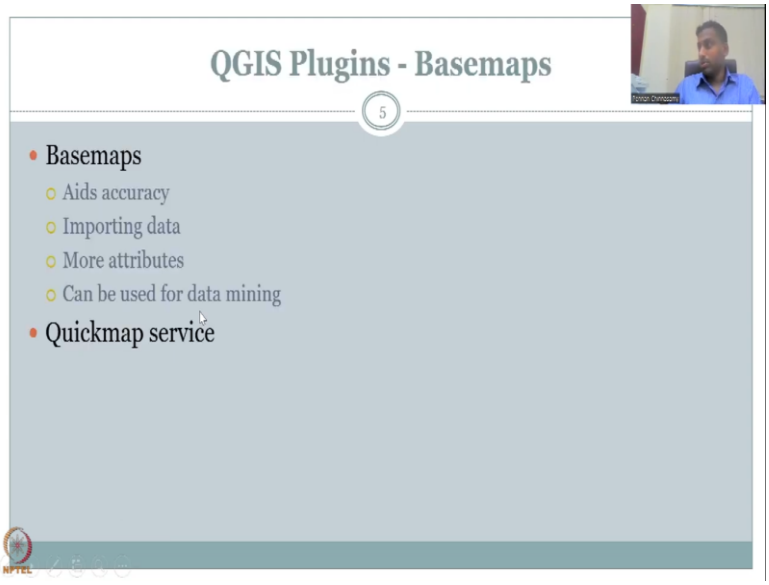

We are going to use the basemaps. So, basemap is, suppose, you have data, behind the base, behind the data there is some basemap that is similar to Google Earth Pro maps. In the Google Earth Pro, you have basemaps loaded and that is why you can easily quickly take out information. So, that is what we are going to use now. Right now, until date we have been only using the boundary of India as the basemap.

Now, we are going to use some data. So, what does a basemap help in? It provides aids accuracy because if you say there is a land and you cut the land from multiple layers and bring it into the QGIS map, unless you have a basemap to authenticate that yes, both the layers are in the same location, you are correct otherwise you are wrong.

For example, you clipped Karnataka boundary and then when you bring it into the India boundary, if the Karnataka boundary is going into the ocean a little bit it is wrong. So, you will have to make sure that the boundaries are correct. So, that is the aids accuracy. It helps in importing data. So, from the basemap and the shape file you have, you can extract data. So, the basemap might be the global coverage. You do not need the global data.

But only for your area you can zoom in and take the data out. More attributes can be collected. Suppose, your data has only state names, country name and then some major roads but your basemap has the names in a different language, suppose, Hindi, Tamil and then you can take the name out of Tamil and put it into the database.

Then you can also see can be used for data mining. This is where some tricky tricky things that are very sensitive may not be put on the big open source maps but in the paper maps and basemaps they might be available. Location of schools, angawadis these maps or the paper maps can be used as a basemap, then from your data you can add into the database.

Of these tools, one widely used tool is called the quick map service. Let me look open the QGIS and let us install it live. What we will do is we will install the QGIS plugin, show you how to install it and then run it. Now, you can see it.

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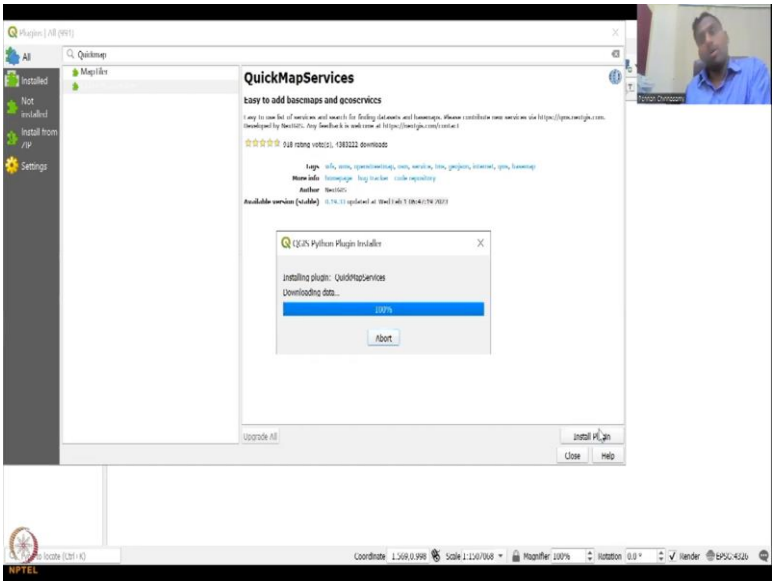

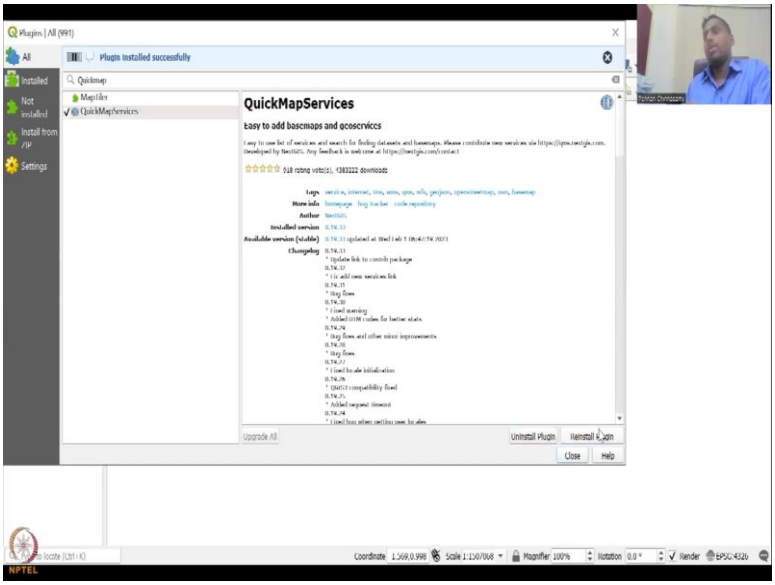
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QuickMapServices
Easy to add basemaps and qcoscrices
Uninstall Plugin
Reinstall Plugin
Close
Help
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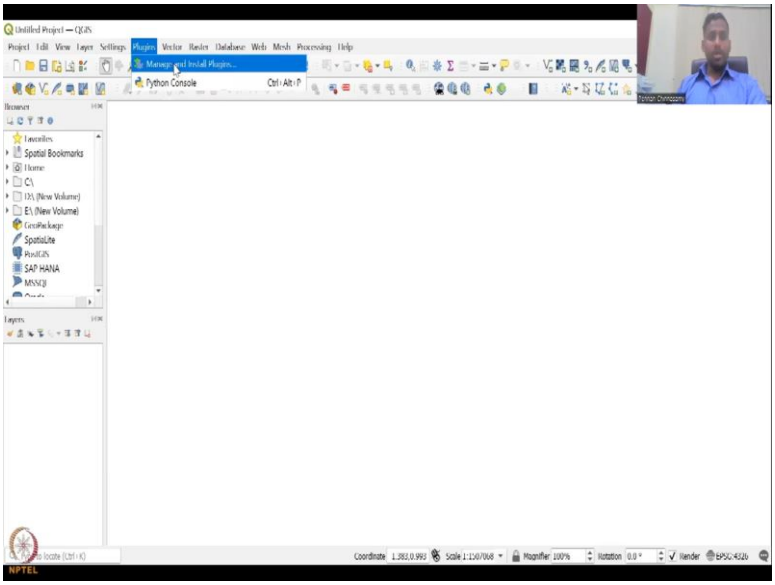
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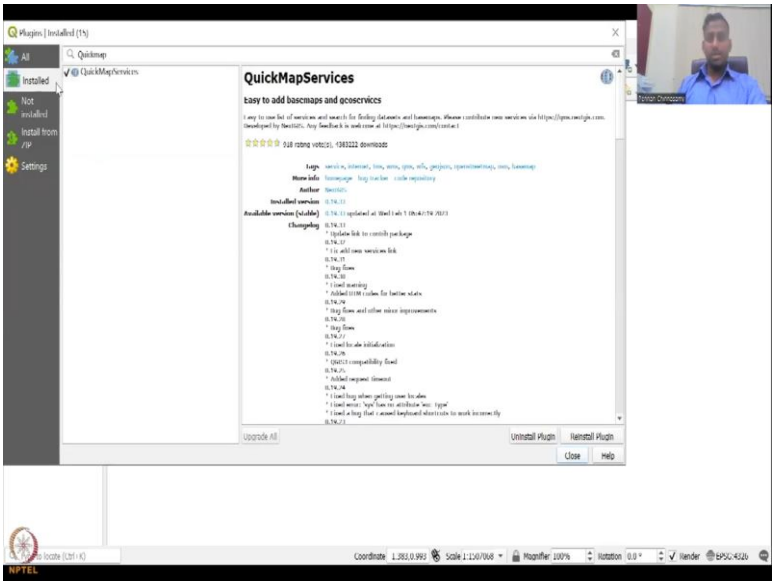
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Reinstall Plugin
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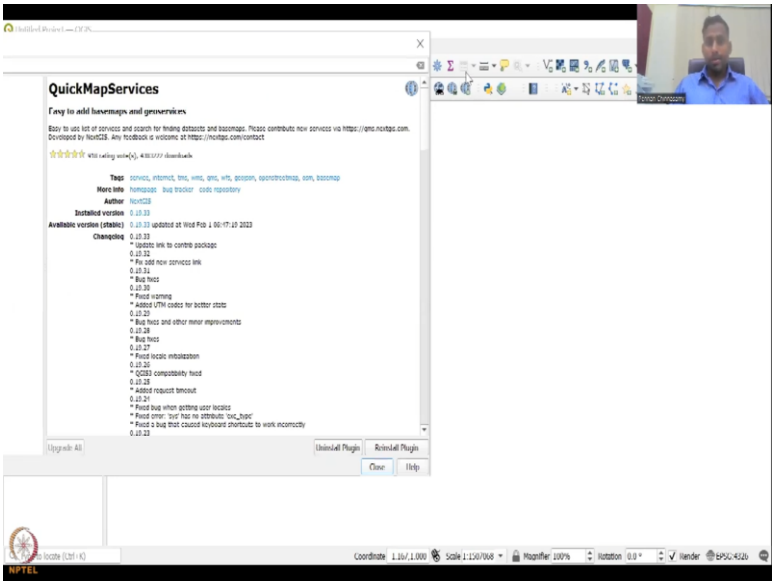
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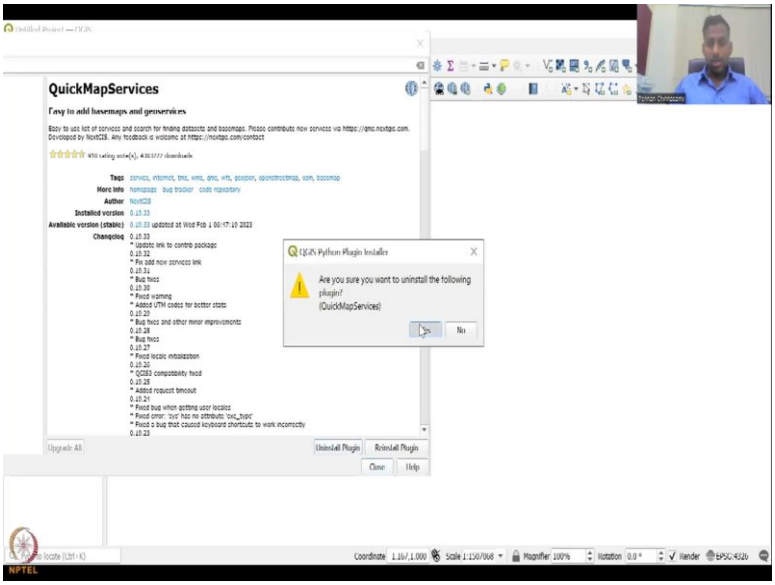
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(QuickMapServices)
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Reinstall Plugin
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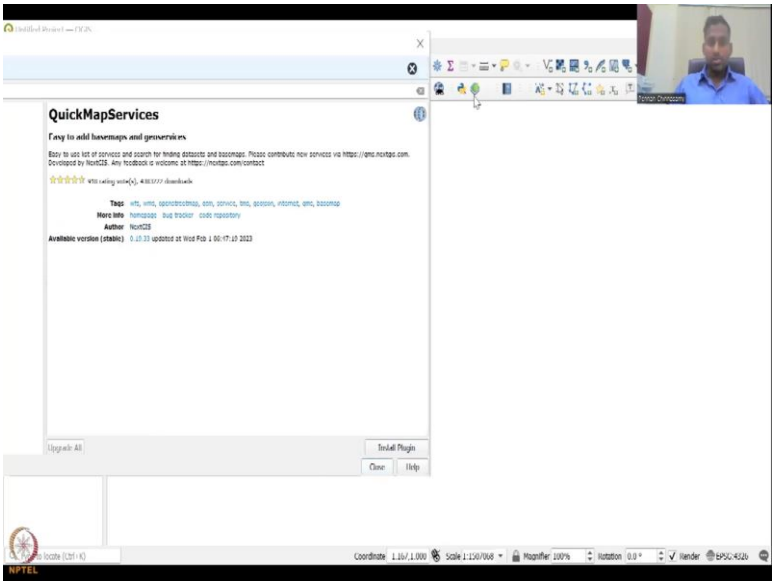
Help


QuickMapServices
Easy to add basemaps and geoservices
Install Plugin
Close
Help

So, go to plugin, manage and install plugins. Here in the search box you can type quick map services. Let us read through it. It is easy to add basemap and geo services, easy to use list of services and search for finding database, datasets, basemaps and then you can contribute new services also here. Which means you can also give some links to new new data.

For example, you ISRO data is there, maybe it is not linked to this database and you can link it, just by writing some codes. You can also give a feedback to this contact list. So, 918 votes, really high votes, more than 4 million downloads which is pretty big and a lot of updates have been done. So, very recently they have done an updated also or just two weeks before.

So, let us install the plugin it is very simple to install. When you click install, it installs. There is no paid, payment, there is no membership. So, it is all free open source. That is the beauty of using QGIS. It gets installed. So, now, if you see, all these have been installed. And it says the install plugin goes off. Now, it says reinstall or uninstall.

Uninstall is if you want to uninstall the plugin, reinstall it sometimes when it installs, maybe some errors script and your memory did not work properly and so it did not open properly. So, you can actually reinstall it, if you need. But let us go to install services and only one tool is there. So, we can close.

Let us see if it has come up, plug in and then in the manage again you open. Yes, it is installed, very good and the symbol is there. So, the symbol is very different. So, this is the symbol for quick map service. Some plugins you will see them open out here but some others will occupy the toolbar. So, you should know where and how the toolbar looks like.

For example, if you go to manage tool and then if you see this logo, if you see this icon that is what the icon is going to be. So, now, you can see this icon right here. I am putting it side by side, so you can see that it has populated. So, let us uninstall the plugin. Yes and you will see that these will vanish. So, now, it is gone. Now, I am going to install the plugin and then it has come up. So, I am going to close it.

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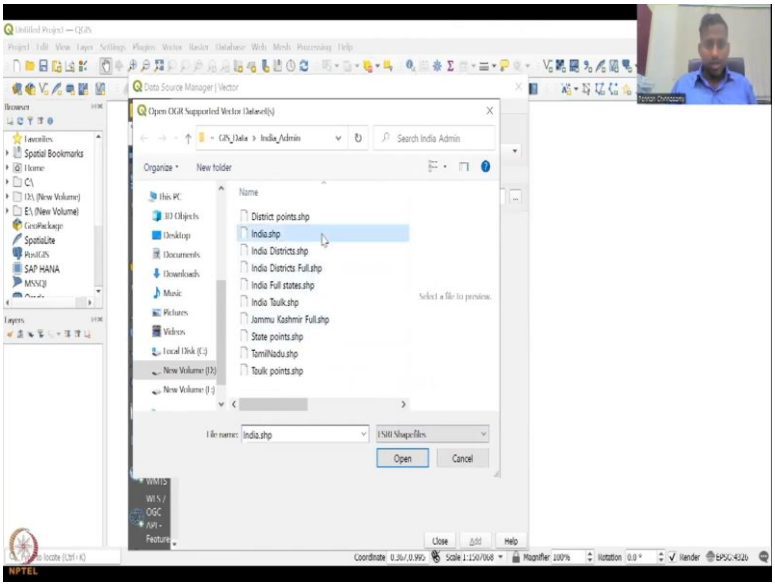

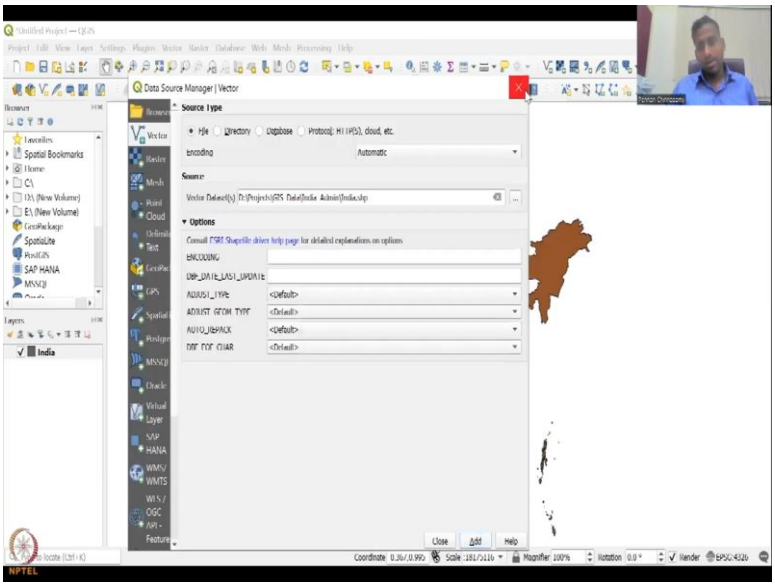

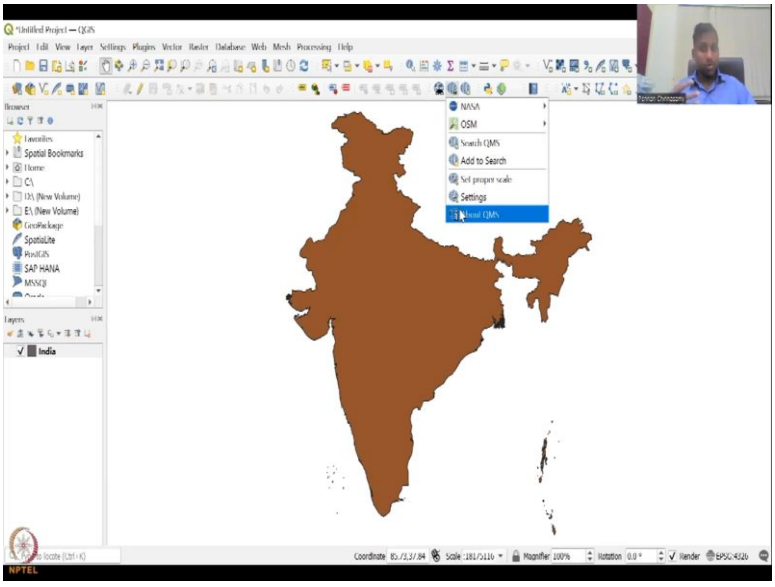

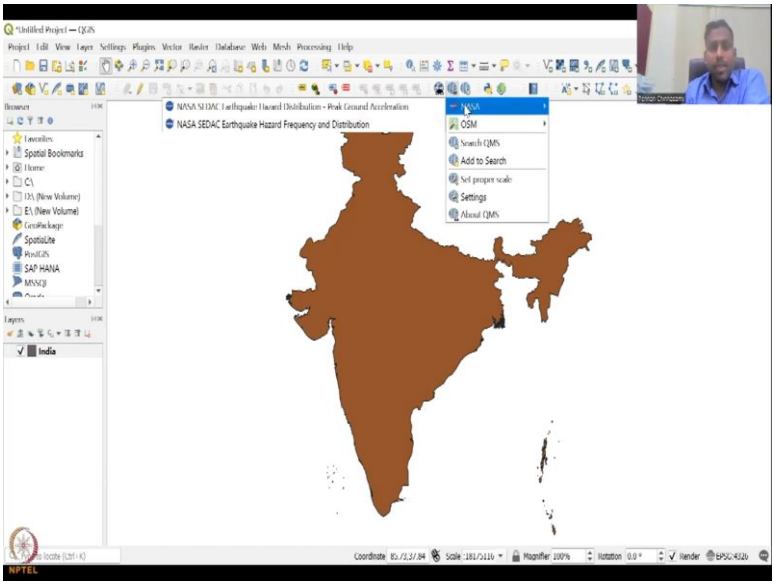
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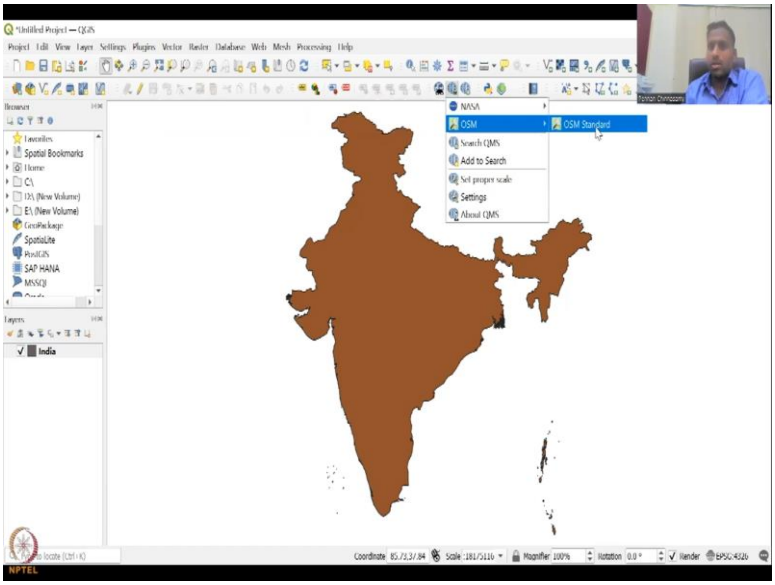
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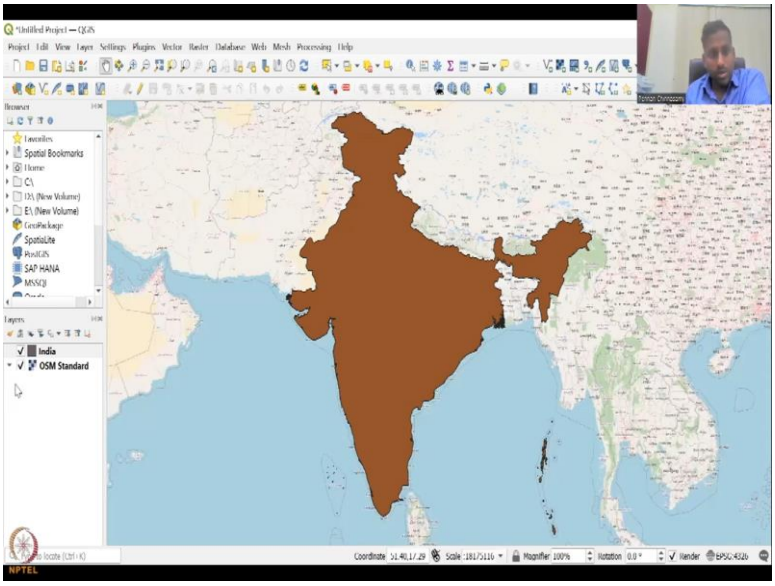
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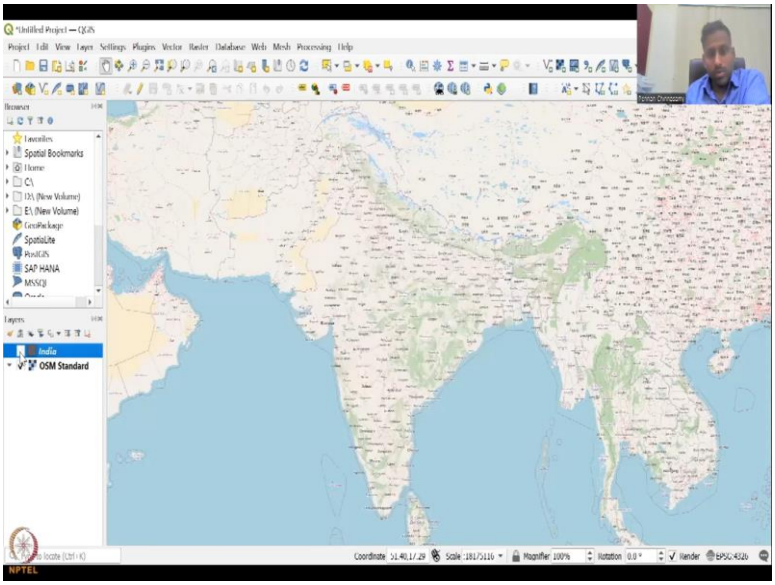
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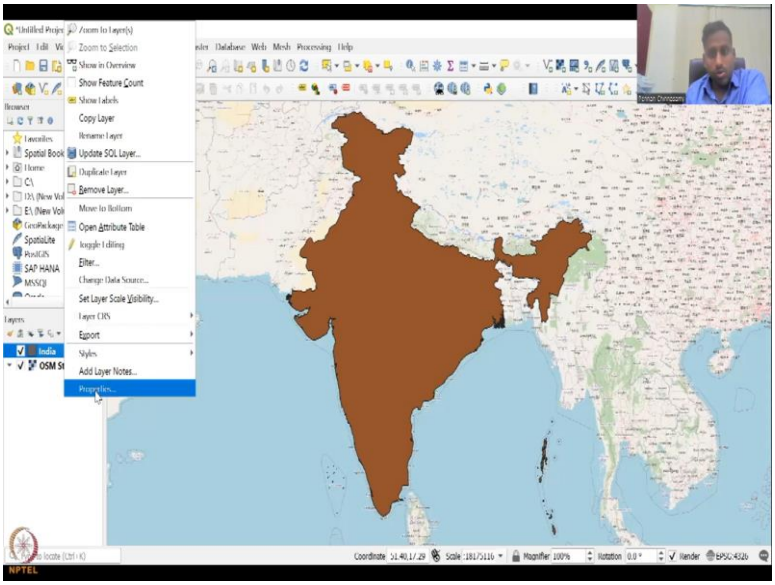
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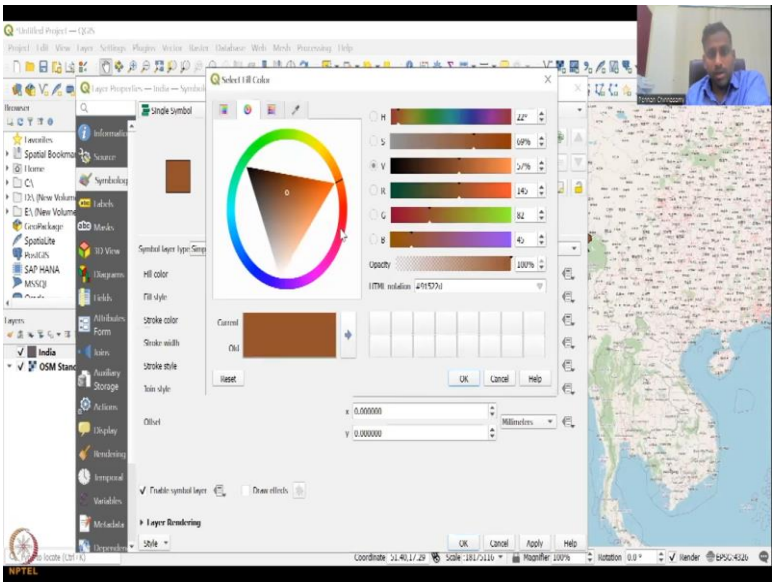
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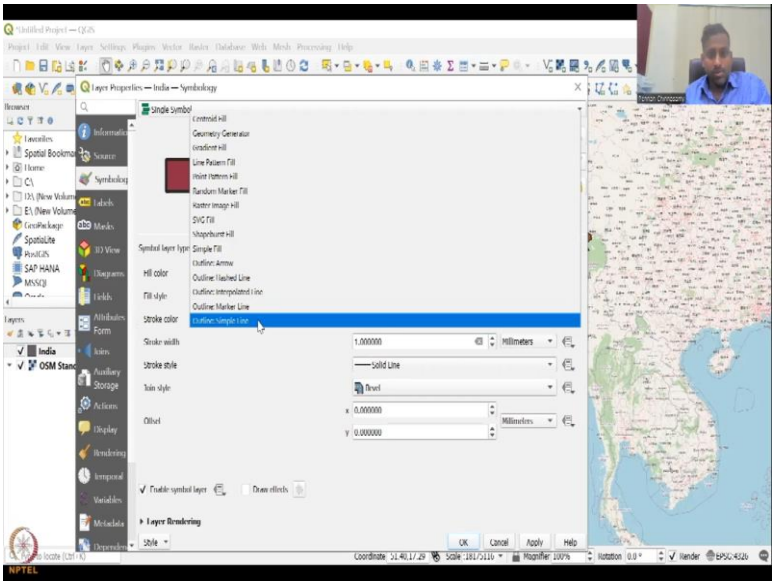

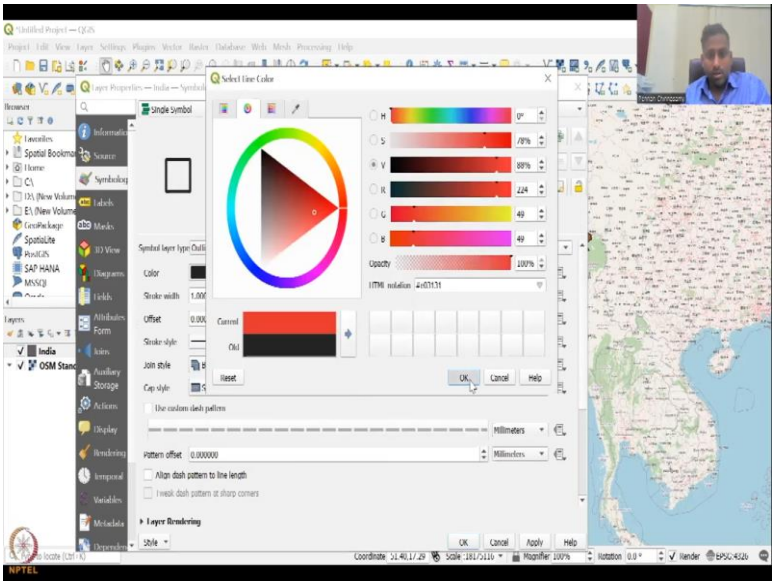

So, now, to start up, let us fire up a database, a vector file. Let us say I would like to see the India file, shape file. So, I am going to say India shape file, open and and now it has been added. So, to this we are going to add the base file, basemaps. So, these are quick map services, meta search and search QMS. I am going to do the quick map service.

And then it asks me what basemap you want. So, if you remember, while installing it said that you can also install and give maps into this service. So, if we are an advanced level and we know that the map is accurate, we can also install it into this package. For now, we are not going to install, we are a user, we are not a contributor, we will be a user.

So, let us say the NASA. You have earthquake hazard distribution peak ground acceleration map or earthquake hazard distribution. These are the two data sets. Basemaps that are

available from NASA but OSM has OSM standard map. So, let me click OSM standard map. You will see that it has been populated in the layers list and in the behind also.

So, I am going to make India a little bit just the outline. So, go to properties, simple fill. I want the fill color to be maybe red and I can say okay and the stroke or thickness could be one. I do not want fill, just simple outline, black, red, one millimeter thickness, apply.

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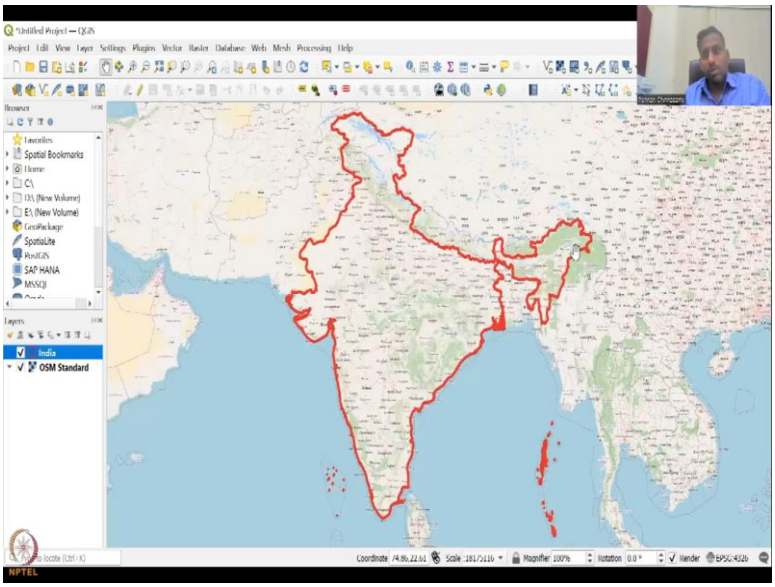

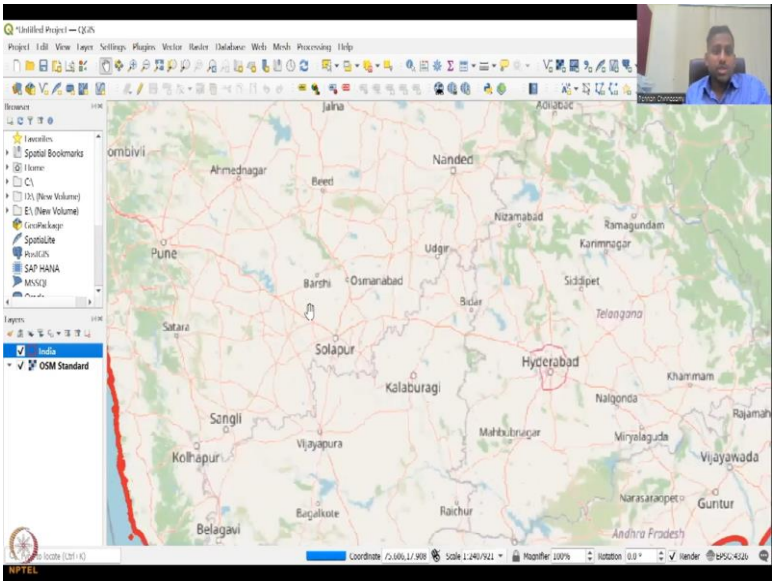

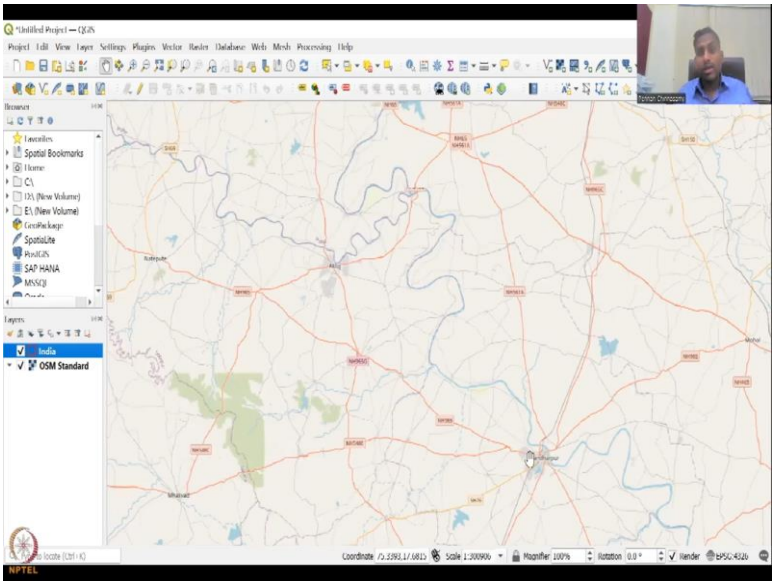

So, now, you can see the boundary and behind that you could see the values. The basemap which has been generated from OSM openstreet maps. So, you can see that lot of roads, streets are coming up, basically from the open street map database. This was not available for us.

So, now we can draw and and extract out like we did in the layer analysis. Like for example, here we used and say shape file and then we traced along this and said this is a road. Now, we can trace along this and say this is a river, etcetera. So, this is one basemap that we can use also to see if my our boundaries are correct. So, you can see that here there is an OSM standard map.

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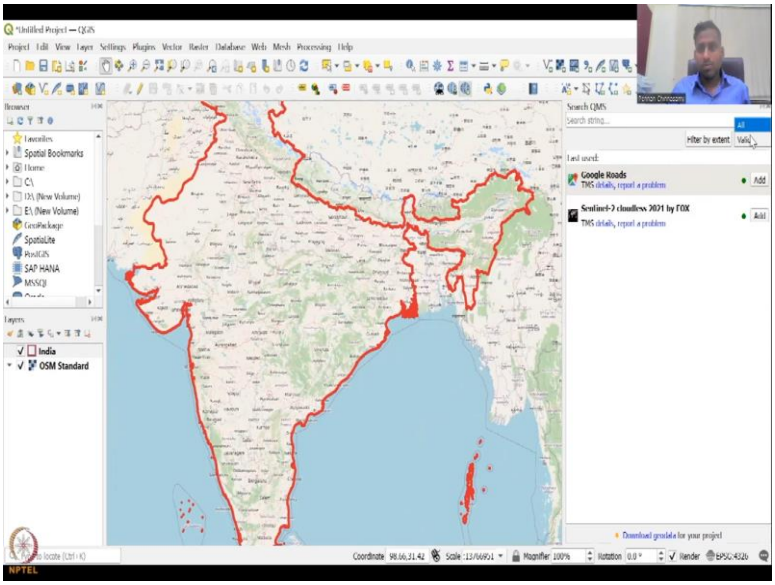

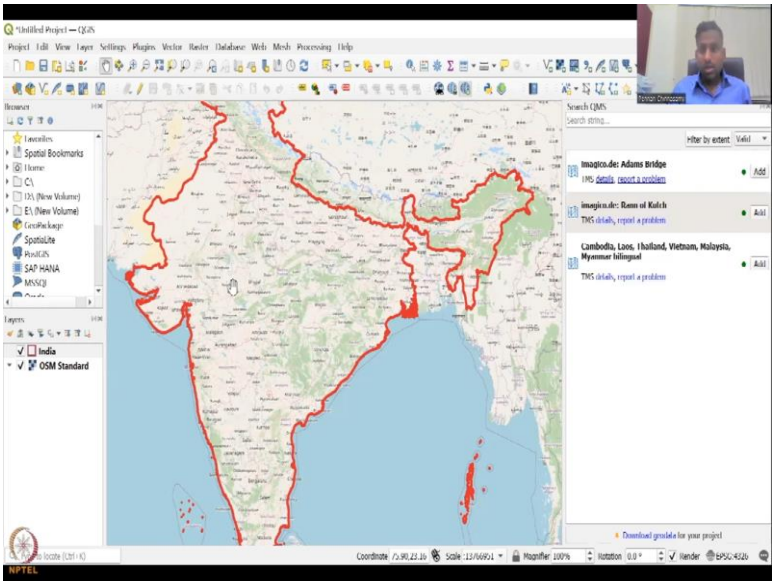

Now, you can click the second part which is the search. If you click the search then you can see that some data sets are coming up and you could see that you can see valid and then everything can come up or just a valid ones, filter by extent. it is going to filter like within this database how many data assets are coming. So, you have someone populating from Imagico.de and then some maps which are about Adam's Bridge.

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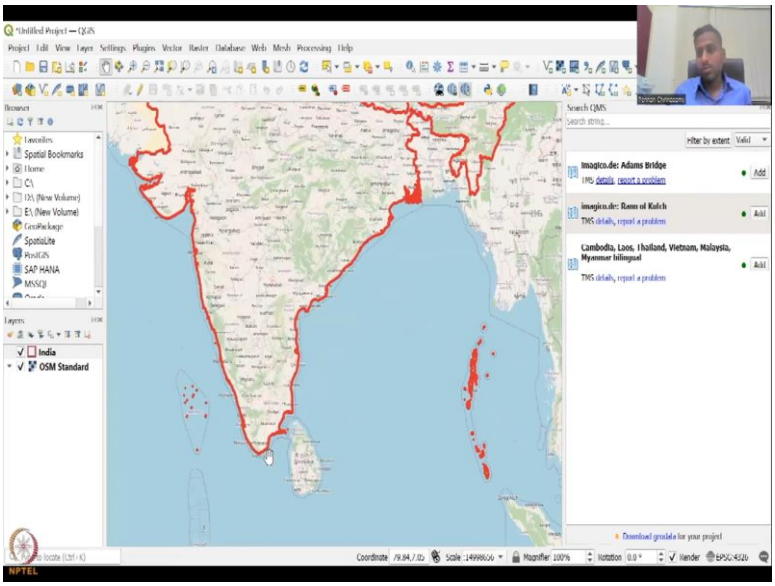

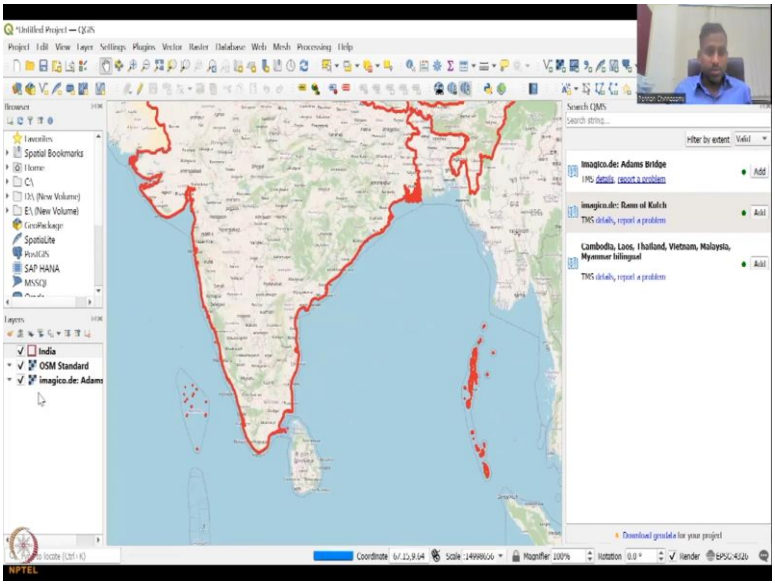

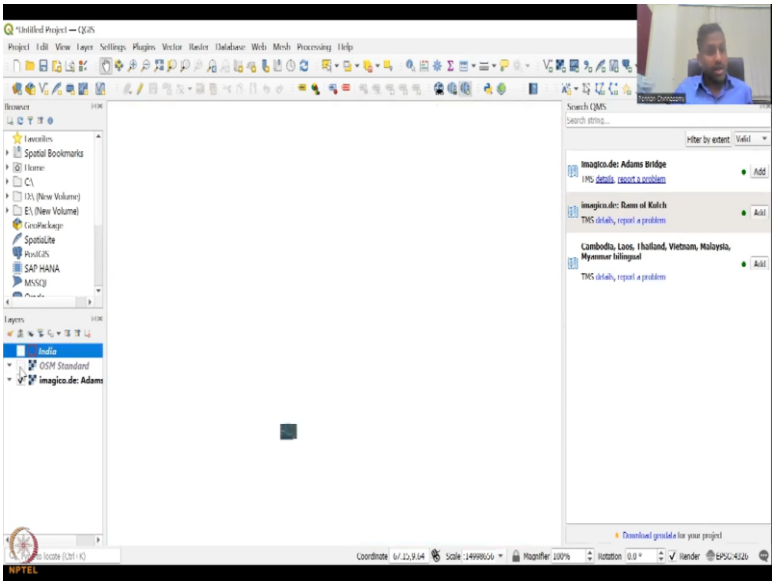

So, Adam's Bridge is here. This is called Adams Bridge by some people. So, let us say I am adding it. If you add it, again it comes up here. I am going to take these other layers out. And as I said the Adams Bridge is between Sri Lanka and Tamil Nadu. Tamil Nadu. So, let us go to Tamil Nadu and then see how it looks like.

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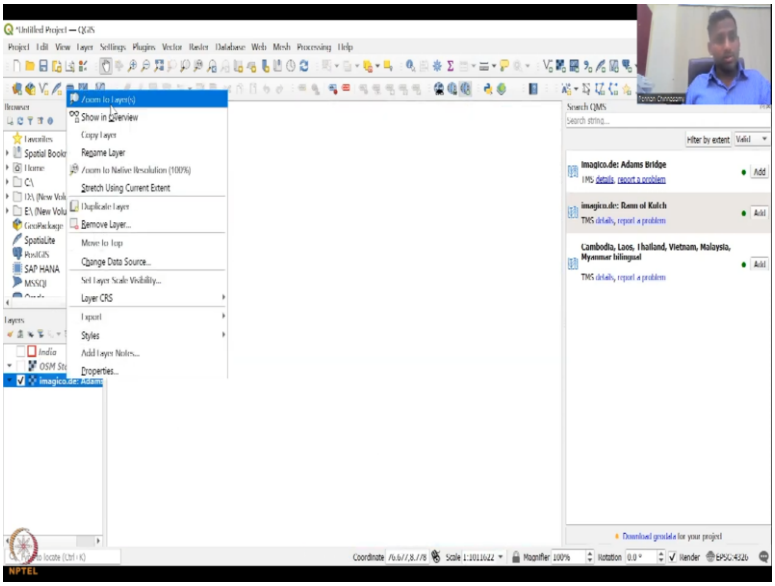

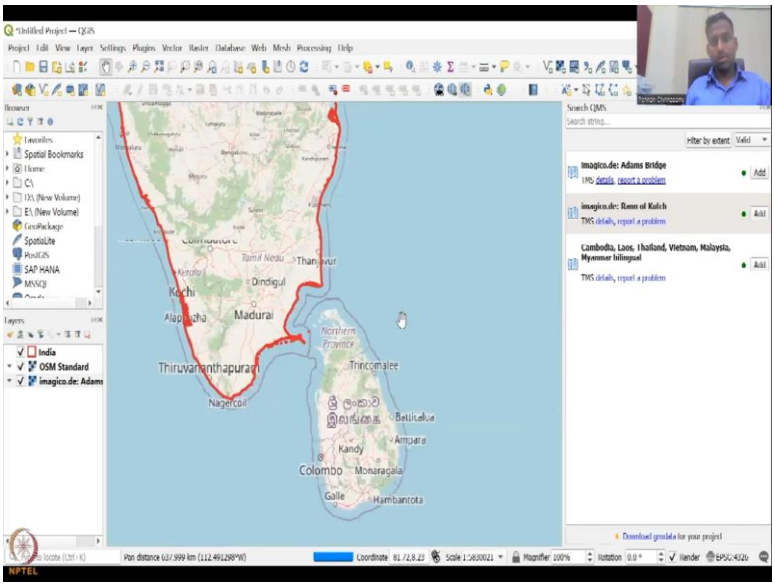

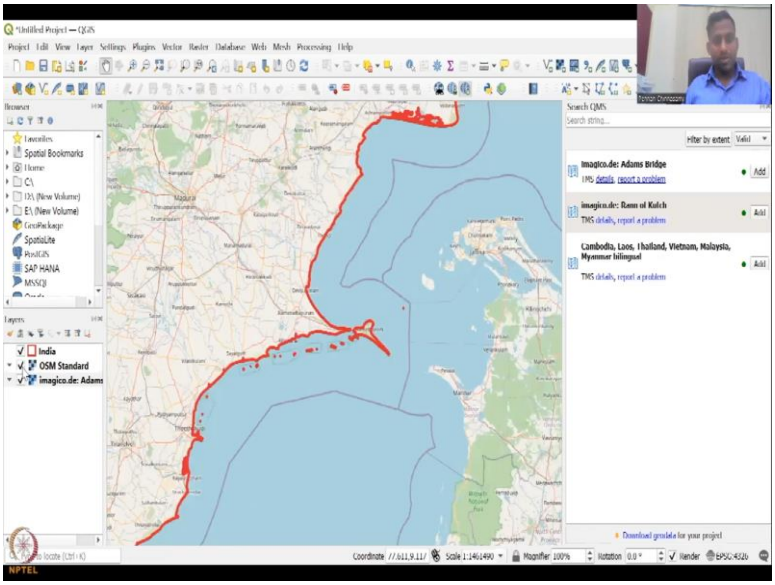

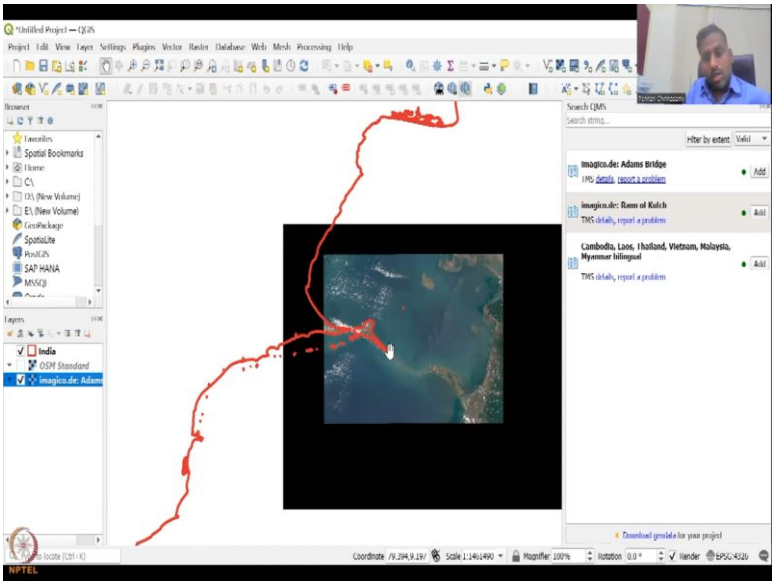

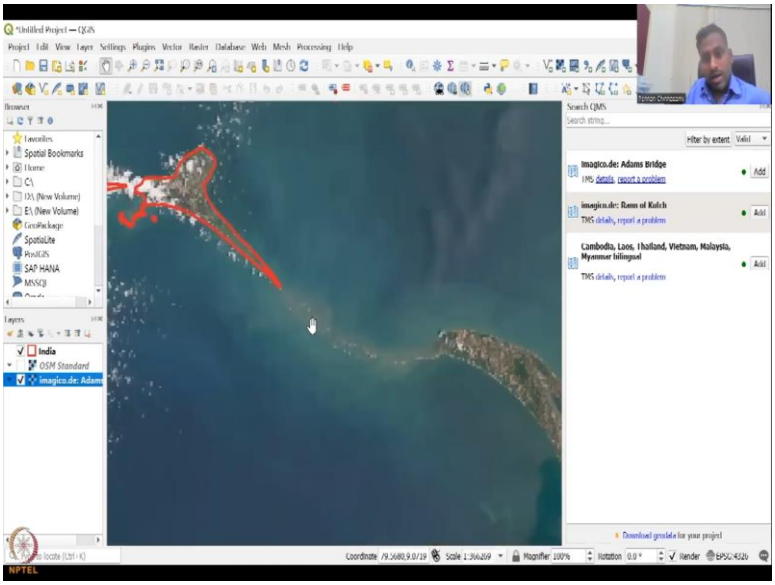

This Zoom to layer, maybe, let us put this back. So, I am going to take the OSM off and then just keep the imagico.de Adams Bridge. So, now, you could see that the Danish Kodi and Sri Lanka part is connected by the Adams Bridge or Ram Setu palam bridge and then that has been done.

So, this is a database basemap that can be added. You do not have to download it. All you did is just the plugin and then it came up. So, you can say Google with correct spellings and then all the Google plugins will come up. It is searching let it search for some time, see all.

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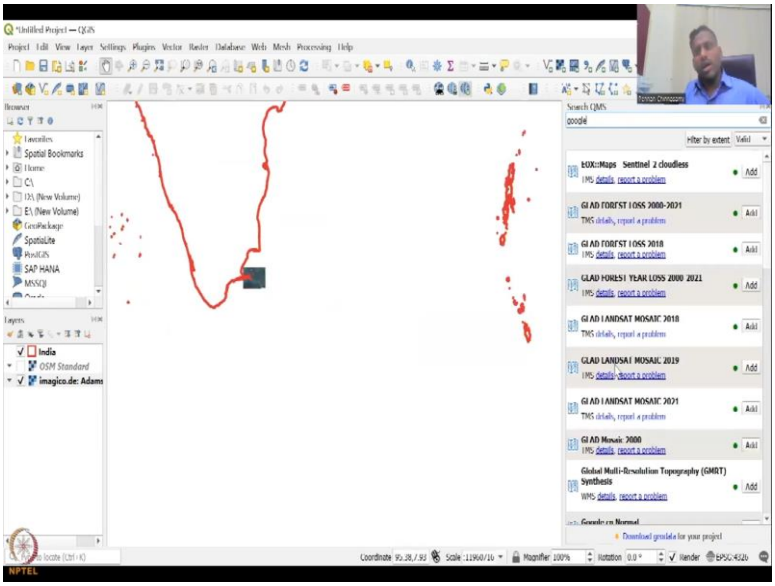

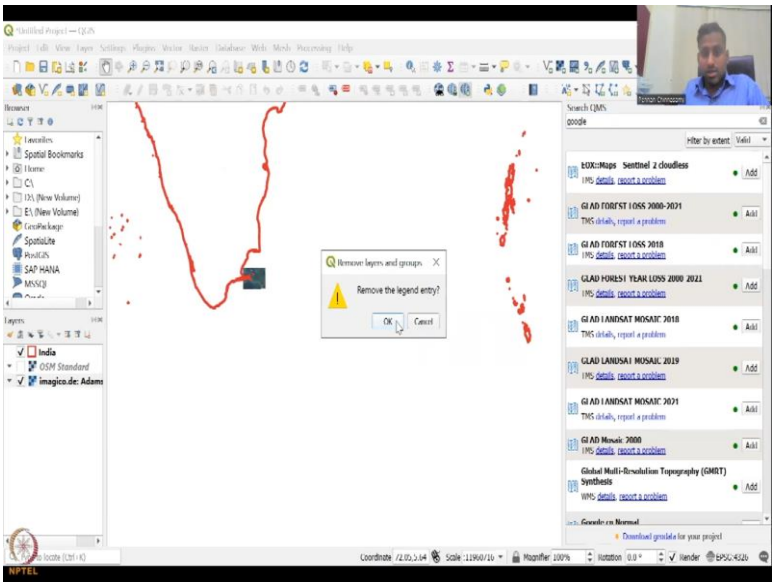

So, initially you had only two, three but now you could see how much how much more have come up. So, you just have to search. There is there is many many many basemap layers. So, this is cloudless sentinel 2 data. I am going to add a sentinel 2 data.

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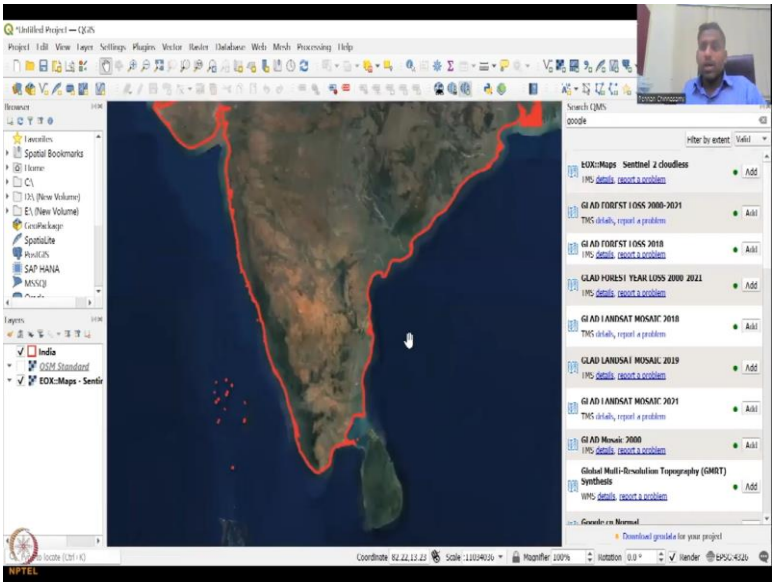

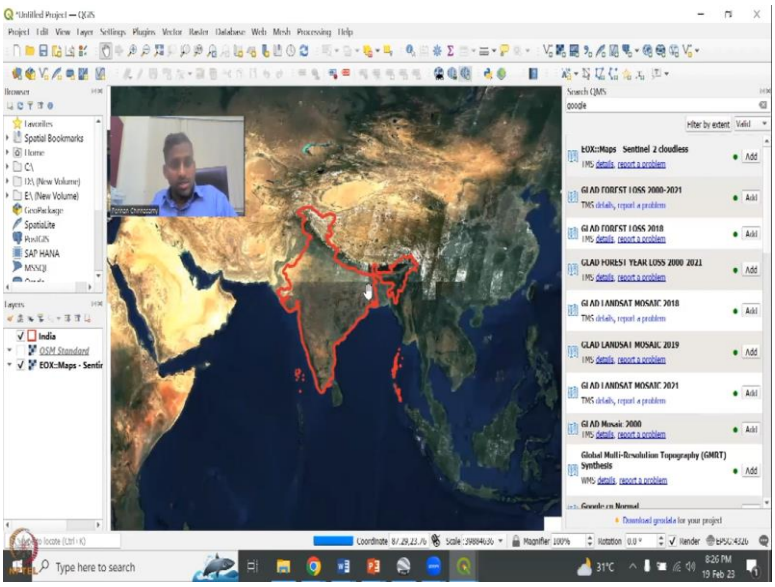

You see. So, without cloud cover. So, it has picked a date where there is no cloud cover and you can click on the details to find, another screen has opened. So, let me share that screen. So, it is opening up and saying that what it means. So, you can see here. So, this is what the link has been opening up, when I click the QGIS map.

So, I click the details then it went to that. So, that is one layer which is very good. It happens throughout the world, it does have data. So, but it is a large data set. So, it is taking some time, see. And Sentinel is very very high resolution, 10 meters in some locations. So, you will see it.

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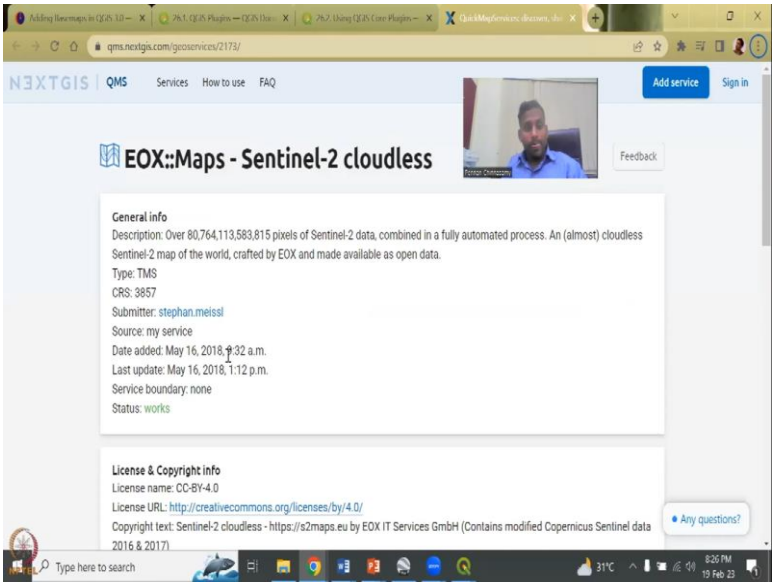

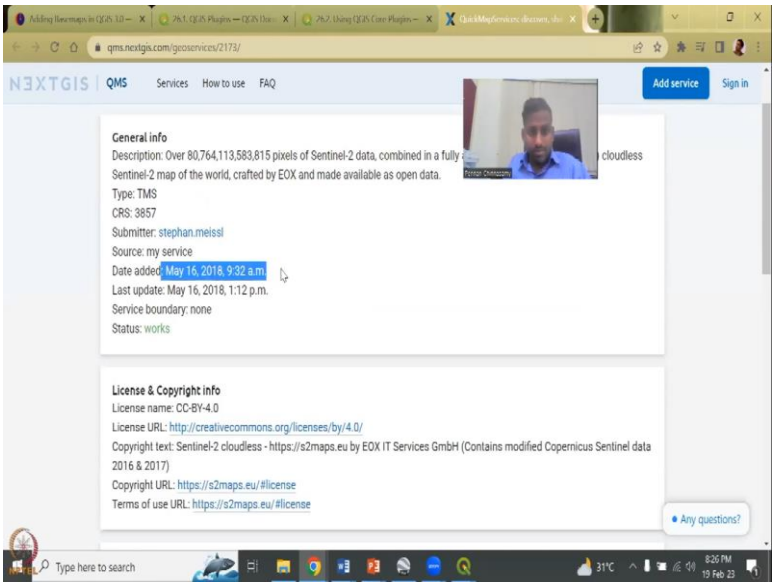

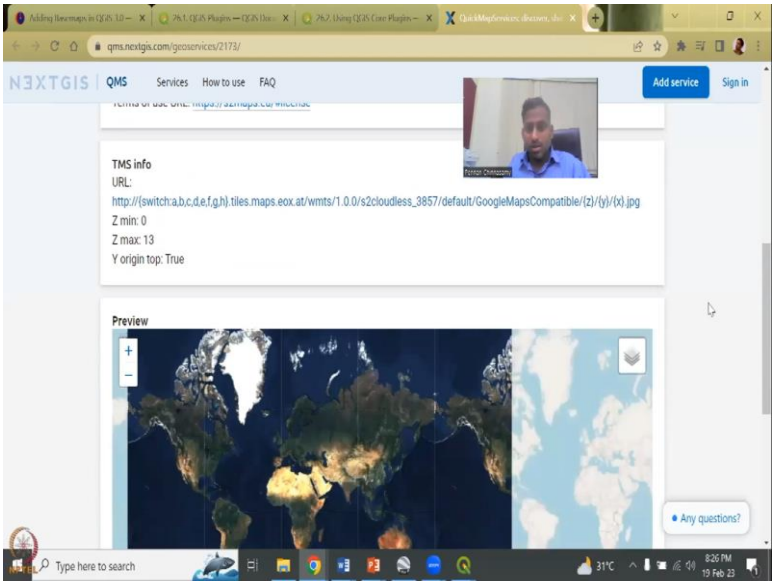

So, this is the EOX cloudless map. So, when I click the details, it came to here and you can see that what date the map was added, 2018. So, when it was taken, the copyright, extension. So, this was the map that goes into the basemap. So, 2018 map has been updated. So, May 16th was the map.

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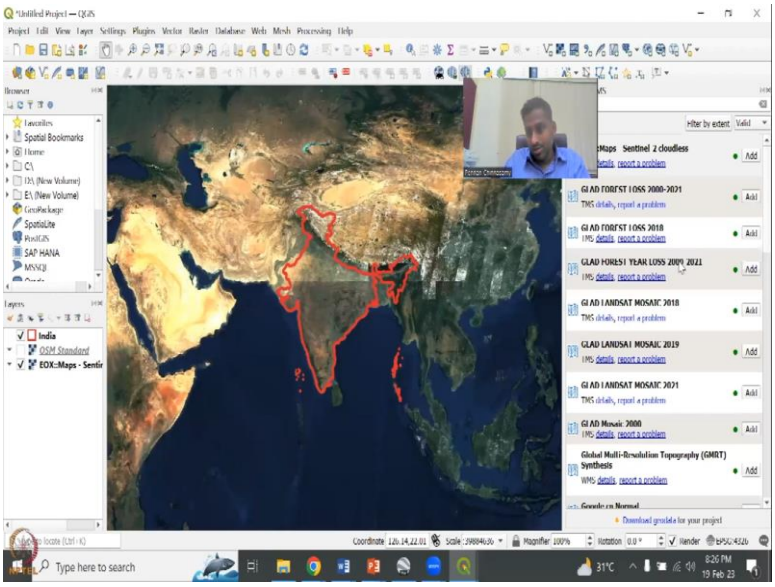

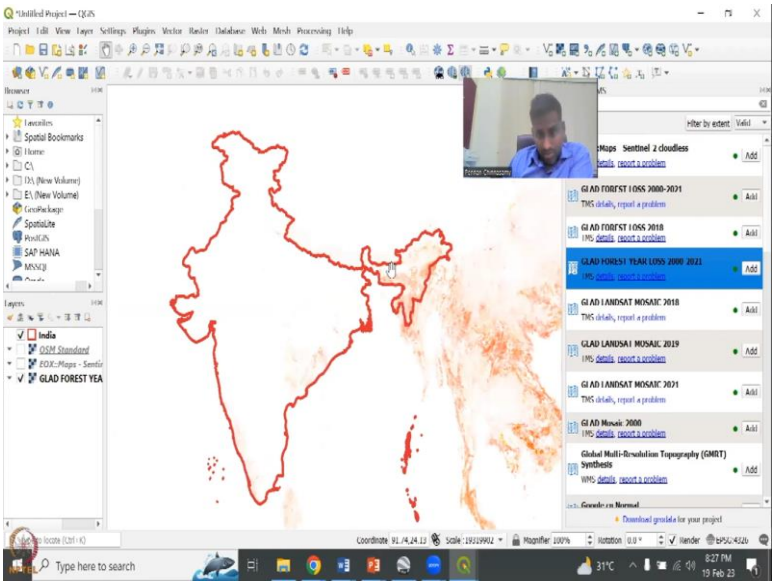

So, let us go back to the map and then let us say glad forest year loss 2000 to 2021. So, within the Indian Boundary, if I am going to add this basemap, you are going to see where the forest loss has been high. Red color means forest loss. So, that is normally the terminology that is used and you can see it from the details here, we use this one, 2000 2021.

Let it open up while we are going back to this map. So, now, it has been generated, you can see a lot of forest loss here and this also says data forest loss earth engine partners 2013. The date has been done. Date added 2020, last updated 2022. So, but the data is from 2000 to 2021 and then it says.

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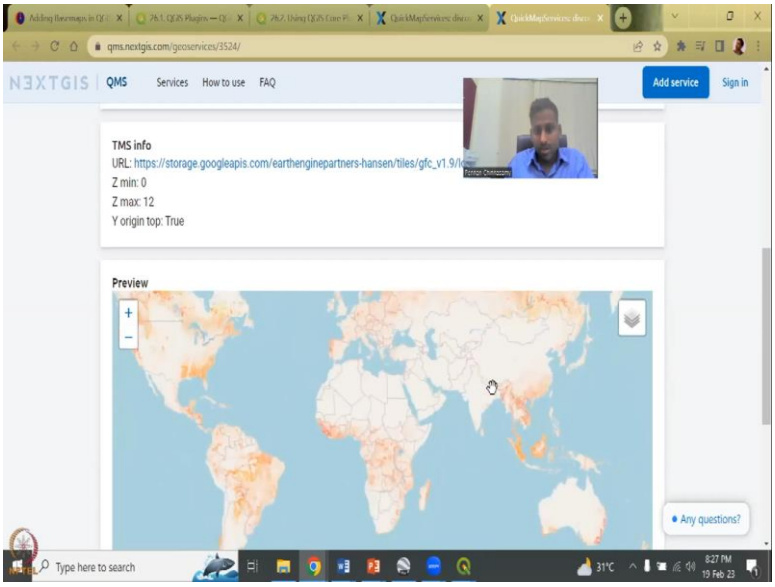

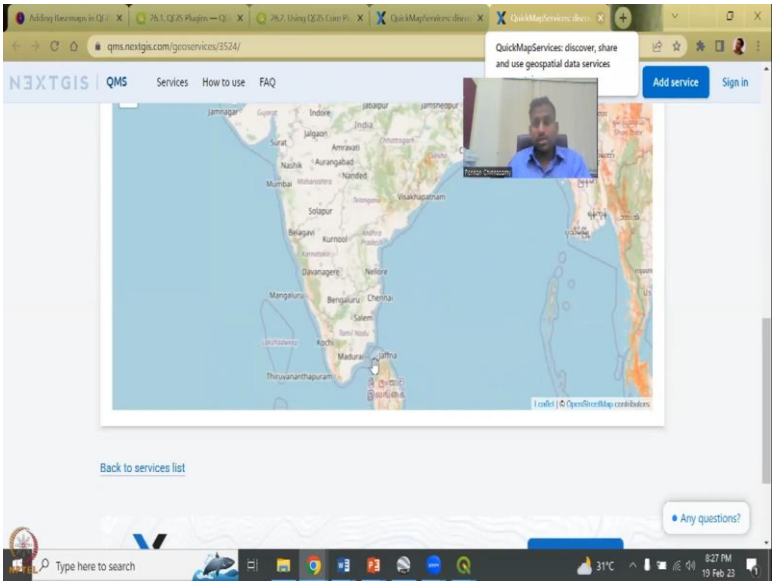

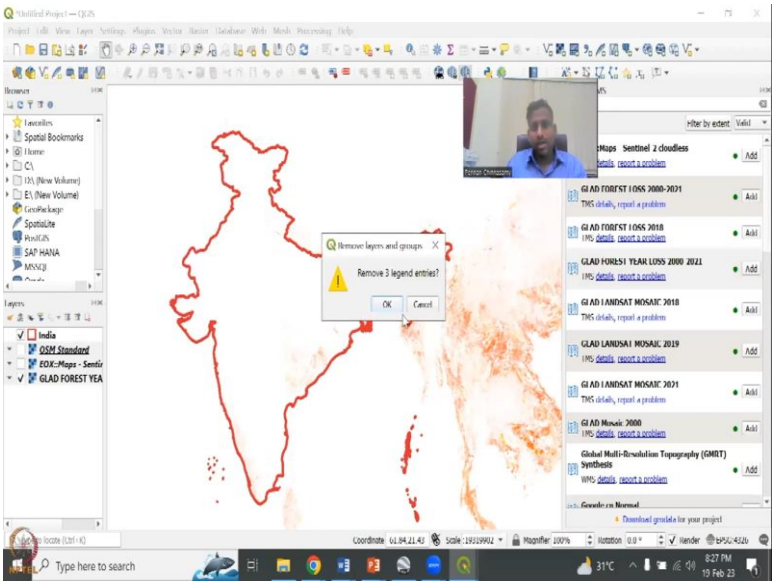

So, basically this is the same map. This map which has been the red color showing that there is loss of forest cover. So, green means it is gaining, red means it is losing. So, here you can only see the loss because the term we are using is loss. So, that is one if we do not need it, we can remove it. All these as I said we can move in the layers and say okay.

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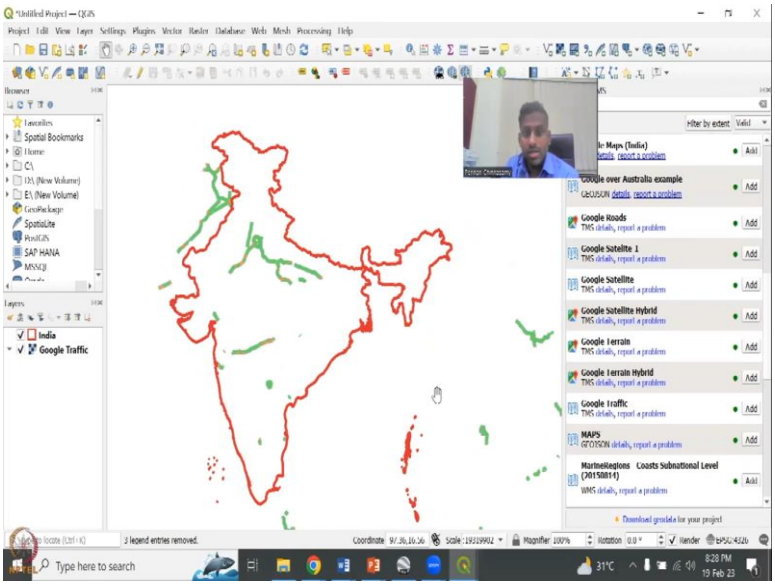

So, all these are Google, one thing that we can use is Google traffic. You do not see that as a map, let us use it. So, these are the high traffic regions and and low traffic regions, getting populated along the map. It will take some time because all throughout India it may be looking at. And maybe it is not only populated along the major highways. So, let us come down and see what else we can see that we can use. Google, all these are Google, there is some space spanish data set, etcetera. Let us see if there is some ISRO database.

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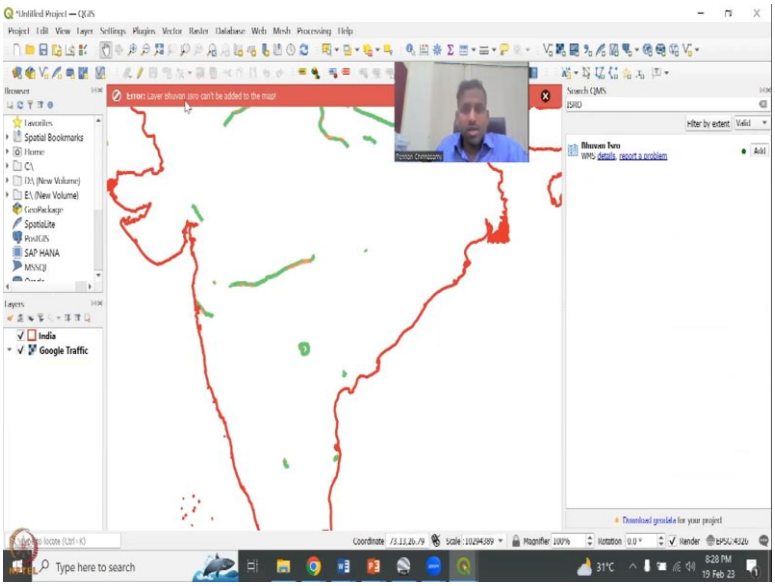

Yes, there is a Bhuvan ISRO database. So, we can add it. So, instead of going to Bhuvan, taking this shape file going to Bhuvan we can quickly analyze it here. So, you see there is a layer it cannot be added to the map. There is some errors, some plug-in extension may not have been there. So, we can take it off. So, these are the maps that we have used.

Let us use one more. Night, light, we do not have it. Grace is a groundwater satellite. We do not have it. So, this is how you can search for some satellites and use it. Let us say NASA. Let us say what NASA has in terms of database for India. Plenty, plenty of NASA. So, there is fires, the past seven days. So, if you are looking at stubble burning and fires, you can look at that, hot spots, fires, aqua hot spots, global multi-resolution, topography synthesis, a lot of these things are there.

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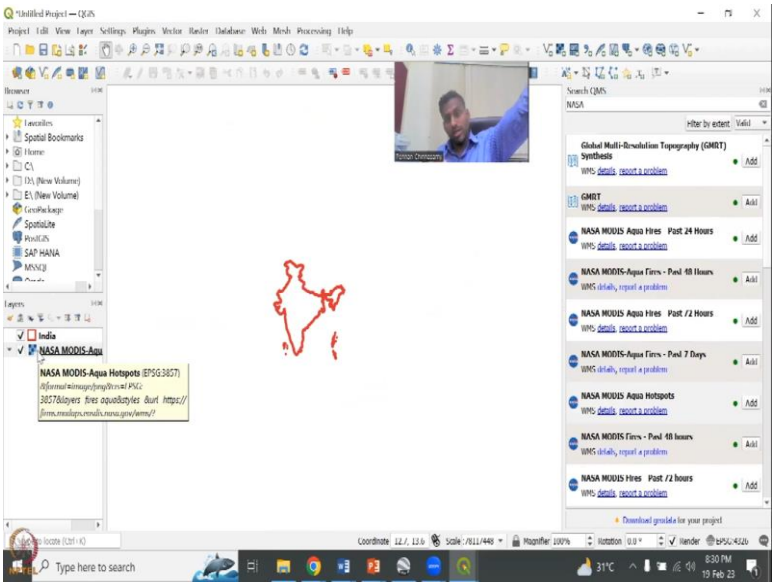

Let us say just add the aqua and then let me take off the the traffic and then we have to say okay, then the red mark. I will click okay. So, sometimes the data might not load because it is for pan world or it just takes a long time to load. Remember, this is a plugin that talks to the data source and brings the data source. So, it may take some time for downloading the data but I would like to finish with just the one data that we can use and mostly it is Google Bing Maps are there like Microsoft. Google is there.

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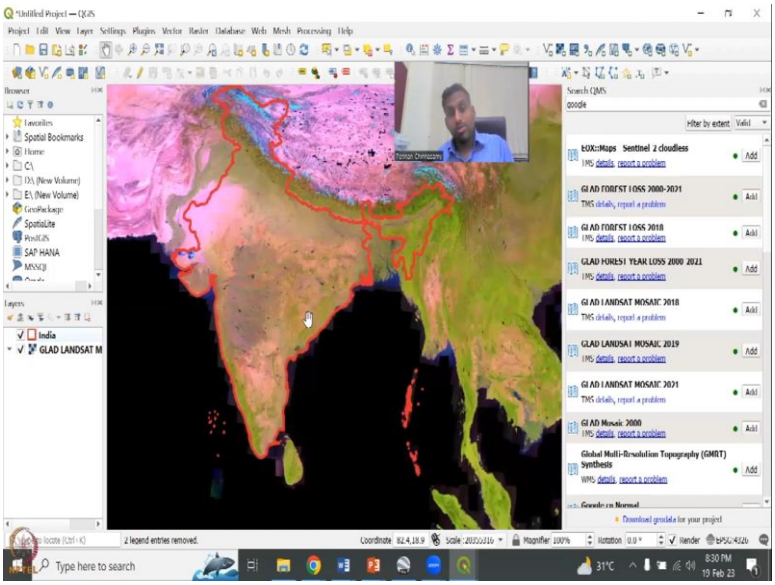

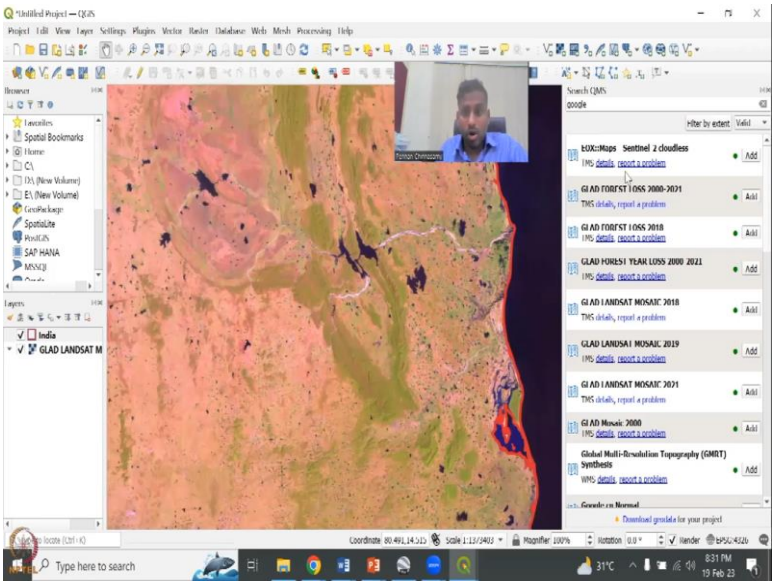

So, let us just use the Google Landsat Mosaic. Mosaic is a satellite that has been Mosaic together to give the overall image and there it is beautiful landsat Mosaic is coming. So, I am going to remove the other layers just for memory and you could see that beautifully the map is getting populated. Very very high resolution imagery that you are looking at.

What the color means etcetera. You can collect click on the details and go to the map and look at it. So, this is about adding plugins and through plugins a basemap, a basemap behind your map that helps you visualize your content. So, my content is this India shape file but I want to visualize other data with it.

So, what I do is I can add basemaps readily. Instead of going and downloading the data and putting it in, you can just click these buttons, add, and then it quickly adds. For this you need to install the plugin which I showed in today's lecture. So, if you go into the village areas with the village boundary, you can definitely see how the water bodies have been changing.

The green color reflecting the good crop growth and crop type, you can also see in NDVI which is a indicator of water and vegetation and then NDWI for water. So, there is no results for that but NDVI we do have some normalized indicators. So, we will leave it here. But mostly the Google images are pretty good in terms of Glad Landsat Mosaics and then satellite hybrid models, maps, etcetera. I will close here and continue in the next class. I will see you in the next class. Thank you.