Groundwater Hydrology and Management
Professor Pennan Cinnasamy
Center for Technology Alternatives for Rural Areas
Indian Institute of Technology, Bombay
Lecture 45
Groundwater Data – Government Sources 1

Hello everyone, welcome to NPTEL course on Groundwater Hydrology and Management. This is week 9 lecture 2. In this week we have been looking at the most important method of understanding how many layers are there under the ground, So, that we can construct an aquifer system called aquifer stratification, the number of layers can be averaged or assumed which is dominant and thereby reducing the number of layers for an active understanding of groundwater management.

We looked at the different methods in the last class to connect lithologs which is basically taking a sample out of the ground and connecting them by hand to look at what are the layers, we also looked at softwares that can do this work. Now, we have come to the important part of collecting data for your groundwater balance. Let us start with the groundwater exploration which is the basic of the groundwater estimation.

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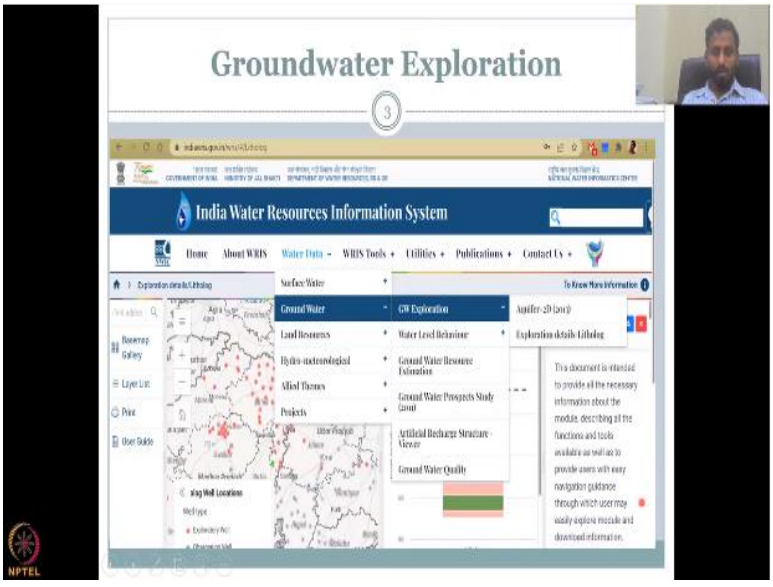

So, in today's lecture, I hope last time everyone had a chance to look at this website because I gave them the link and showed you how to go and access the different aspects.

Now, I will show you a live demo of what all things we will be covering. So, in today's lecture we will be covering the groundwater exploration and you have aquifer mapping and exploration details that lithology.

So, basically you will click the WRIS website go to groundwater and then you have multiple parameters to choose, since litholog is an exploration you will go to the exploration part and then when you click it goes to the exploration link. The water level behavior is actually the water level data and then the others are where groundwater recharge activities have been built and more prospect studies, potential groundwater recharge areas and then resource estimations.

I would like you to do these because now you have the real data, what you see here in the water level data would be in at least the 2020-2021 year, whereas the prospects are kind of 10 years old, So, you could actually go to these level data and other data and then you do the methodology that we learned in class to understand the groundwater head, contour maps and then which side the water is flowing all those things.

We can also look at groundwater quality which is not a very important part of this particular course but it is important to understand that without groundwater quality quantity is not to be sold separately, it has to go together. So, let me start with the groundwater exploration part, a live demo So, that you can see how this is being done.

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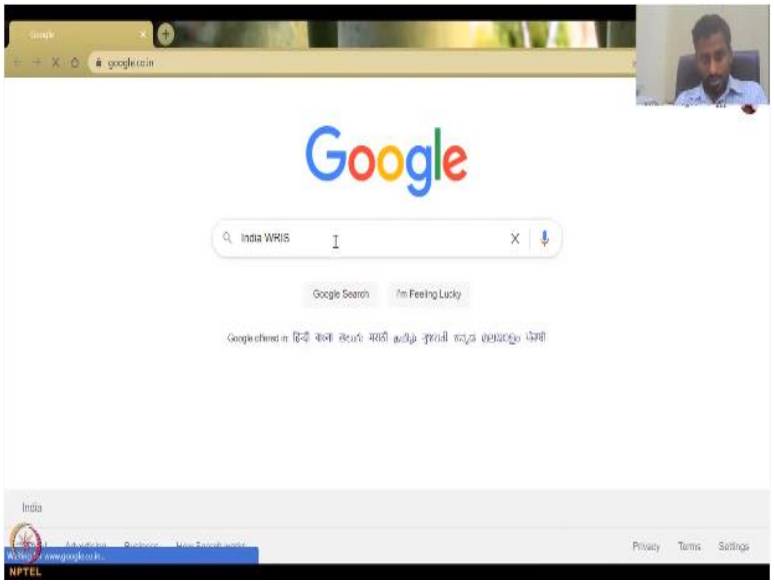

I am going to share my screen. So, I hope you can see my Google page, where you are going to search how to get the data for groundwater in India, again I am only focusing on groundwater in India and mostly we will be looking at rural regions but this data will get from everywhere, So, it is not only going to be rural regions, all the data would be available. So, let us type WRIS, what does WRIS indicate? It is Water Resource Information System, you can type the whole thing or just type WRIS, if needed you can put India on in front WRIS.

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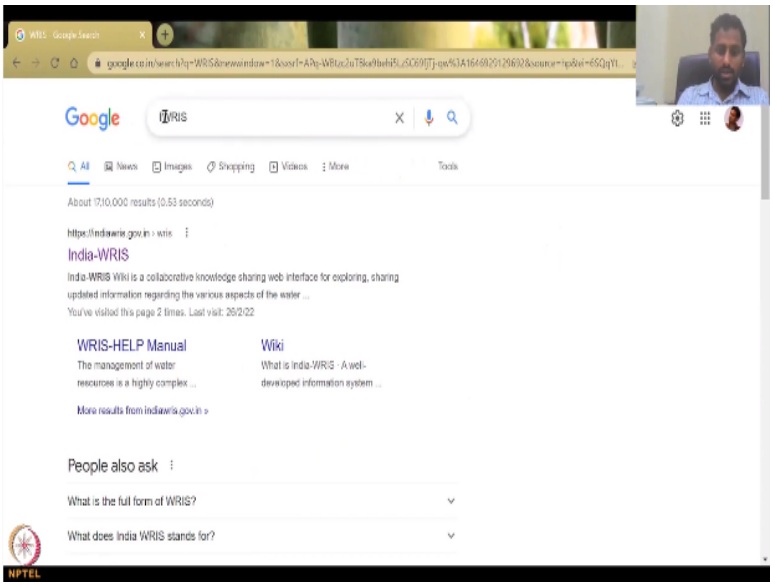

This government website would come, it might be different for others because you are using WRIS for rest or other Google search, So, it is better to also type the whole name which I will do now India Water Resources Information System, click enter, click enter you will get this, the first webpage, So, I am doing it again So, that you can understand. I will just start with WRIS, click enter your India WRIS website will come, the best part is just click India and WRIS and the first web page is your India Water Resource Information System click it.

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It will open in another tab depending on your browser but you will see a page like this, kindly be updated this page and how it works would always get changed because there is always updation, softwares are coming you have a better infrastructure for IT. So, this page would not look like the same for next two, three years but the WRIS is going to remain, you can see the logo India WRIS like a water drop and within the water drop is India's image.

You can go and learn more about who is running WRIS, what it means in the about section, home is coming back to the first page on all these different links, data all these things. There is actually an advanced level of this course where you can quickly look at this data and bring it to GIS, we would not cover that again we will look at what are the important data, where are the artificial structures so, that you can now go to those locations and find it in the map.

The whole point here is groundwater is depleting both quantity and quality, look at how bad the water situation is, so, it is important to have all these in a one website where you can download the data and construct your water balance and it is not just for ground water as the name suggests it is for all the water.

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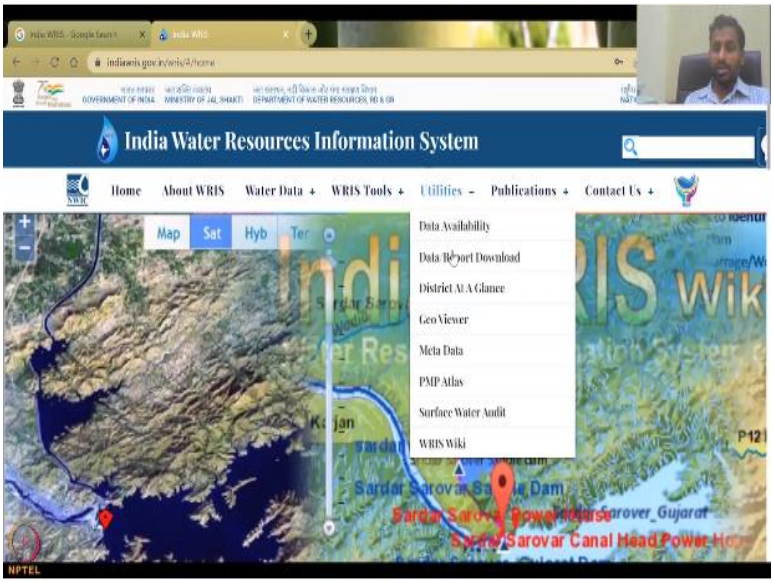

So, this is the water data link that you would click, if you go on each tab it will elongate based on if it has data or not there is a WRIS tool online, web editor, artificial structure editor entry where you can enter where you have created a ground water, check dam or a recharge pond, recharge infiltration pond etcetera.

In the utilities you have Data, GEO Viewer, reports etcetera and publications are there. So, we will not go into all these because we will only look at the data but you can also get as I am saying, there is much, much more that you can collect.

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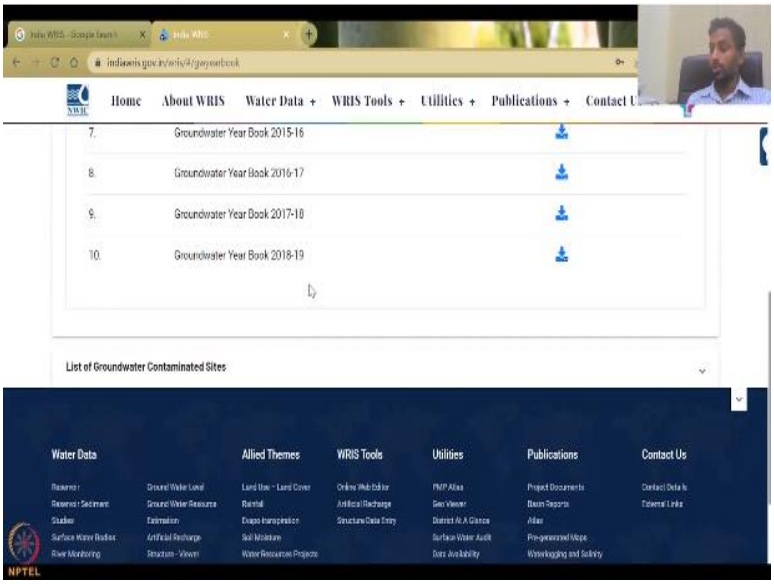

So, ground order reports are good in terms of the studies and yearbooks, if you look at the yearbook they have yearbooks from 2009, I showed you the last one was 2018-2019, you have 19-20 also I will show you how to search that also in this lecture. So, let us come back to the water data which we wanted to look surface water includes your storage, river, snow, glacial etcetera, again this is for the entire water balance if you want to create you can do that, your land resources are your land cover type, what is it forest, how much forest those kind of data is available.

Your hydro metrological would include your rainfall, evapotranspiration, soil moisture and agro climatic zones, then there are light themes, storm, flood inundation, pretty outdated in some reports but they keep as I said they are always constantly updating and, then there is projects water projects into basin transfer, irrigation sensors etcetera.

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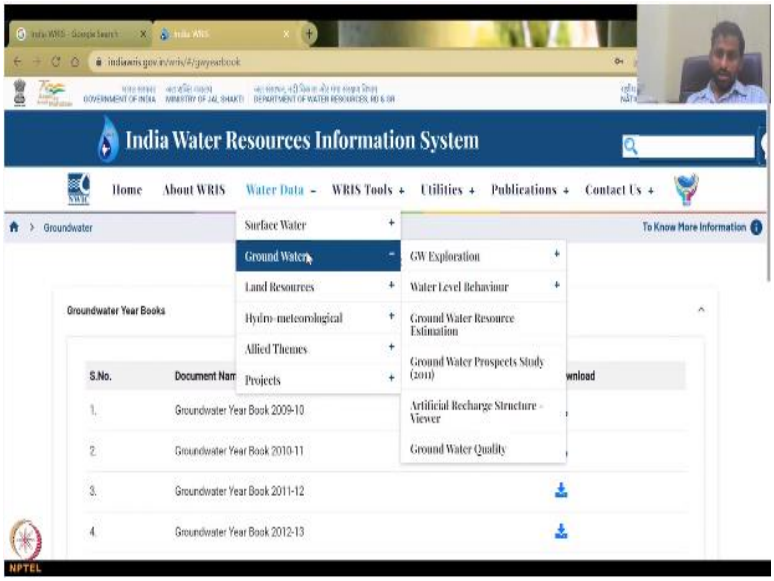

Let us go back to groundwater, in the groundwater the first one we would click is the groundwater exploration, see I am not clicking here there is no click button I am clicking it does not work, once you come here it automatically highlights and opens the groundwater all data.

So, just move your pointer, I hope you could see my pointer, let me see if I could put a spotlight, So, I put water data, I put groundwater and then I just move, I just bring my mouse to the right groundwater exploration happens do you want aquifer 2D or lithologs.

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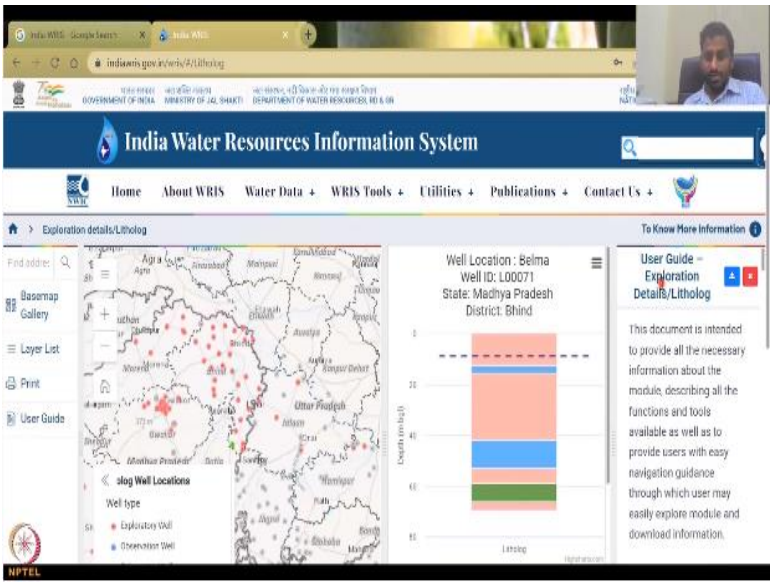

Since we are going to look at lithologs you just come down and then click the lithologs, So, this is the first data it just automatically pulls up Belma location 71, ID and then in Madhya Pradesh, Bhind. You can search an address here, let us search I put Thane and Thane Maharashtra comes up, I click Thane Maharashtra, the map will automatically shift to Thane Maharashtra.

The distance between these tabs depends on your browser, you can always change it, So, if you see the dotted lines, you can see the dotted lines go to the dotted line and you can pull or push the slider. So, how many windows are here, there is one window, two window, three window and four windows.

When you automatically come to litholog already a litholog will be populated, so, do not worry about it you will have four windows and some data like here what it means etcetera. Now, I would just slowly move this the first window here on the right is your guide or your documentation on how to use this etcetera, you can just click this you can download as a pdf for now since we need more to show you I am going to minimize this.

So, you see I am minimizing it then you can push this also to the side because I want you to show you the map and this data can remain. So, the search result has brought me to Thane here and you can go in or out of Thane. So, plus is zooming in and then minus is zooming out. Once you go in further you will see more of these wells coming up, if they are there, what it says here is you have to click on the map to get the lithology details.

So, if it is not here let us go back to your Madhya Pradesh, So, I am going to go back and your layer list would show you all the lithology well. So, you see here it is still loading and that is why you do not see any wells here of what the lithology is, so, it is still loading let it load and here you have the basic boundary, we do not have the basin boundary you can have the administrative boundary.

If we click on the arrow mark down there is more boundaries, I do not want state boundary, I do not want district boundary you can click the eye, like there is a line on the cross of the eye you do not see the district. For example, I am going to close this, now you can see all these uh major things are gone, only the small names remain.

So, I have opened it now the Maharashtra has come you can see and then you can click on the litholog if you want to see and your basin boundary is CWC. So, I am going to go back out and you can see now it is again started to move, here let us go to near Nashik. So, you can click and pull. So, I am zooming into Nashik and you can see that the litholog when locations are picking up, let it pick up and then I will go to one location and click as it says, please click on the map it says, now I click and it starts to blink, blue color.

So, once the blinking stops you can see that this will get populated and this is still running you can see that the black line is running, So, we need to give it some time for it to run and then you can look at it. So, once the data comes you can print it as just a normal print and take notes of it or you can download it as a CSV or PDF. In the layer list you also have other layers if you need, the base gallery is nothing but what type of background you want, so, these are all mostly GIS stuff you want to dry background imagery with labels etcetera.

If you have a slow network internet use this one streets, if you use imagery with labels then that is itself an image, so, it will take a lot of internet and it will slow down. So, make sure you understand that and take only what you want, like in terms of if you can understand this is Maharashtra and Nashik that is enough. So, you do not need much more than that.

This is called the legend basically it tells what type of well as I showed you in the last class, the red color means it is an exploratory well, the well we clicked is a exploratory one so, that is why it is red in color, you can close this or move it to the side, I will move it to the side so, that we can see the image looks like it is not pulling up, the litholog is not coming up maybe it does not have it for that area.

So, I am going to put back the Bhind area in Madhya Pradesh. So, there is a lot of logs, it is populating and once it comes you can get it here, sometimes if the data is not there it just goes on and on so, do not waste your time and sit there it will come it would not come. So, I am going to do that again. So, I am going to go to storage to stop it, I am just going to go here just coming back I am going to click.

I am going to click again see how slow it is not the internet low, sometimes a web page if it is too much data it does take slow, So, I am going to ground exploration, exploration details lithologs and it comes up again so, I just refresh the pages coming up. So, in the Bhind you could see that this is the default so, you can see it as I said I will move the right panel closely so, that I can move this one more and you can see all the logs and I am going to put down this well also because I do not want to see this legend I know that this is what it is right, so, I know all these things.

So, the cool thing here is you can see it is a mixture of wells, it is other wells, someone else as well we do not know, maybe it is a dug well used for farming and then you have exploratory wells in red color, the blue wells are observation wells, there is no observation wells here, but there is a piezometer, So, piezometer is also for observation. So, you can click it and it can pick it up but we are here to look at litholog,

So, let us click one litholog and it populates at once. So, as I said it may be an internet issue or mostly the data is not there so, it just goes on and on and on. So, wait for a good time like 1 minute, 2 minutes depending on your internet and if other logs are opening faster just go back and then and fix it.

So, what it gives you is some data, the well ID, which state, basin, base in the Ganges basin, what type of well it is, it is an exploratory well which is just for lithologs, year of observations 2004 they dug the well in 2004 and then distance of observation wells and you have year of drilling, year of drilling would be the year of observation for example, depth drilled is 80 meters, they went 80 meters below the ground level and you could see that 80 meters depth.

Depth of bedrock not in a because they did not do anything. So, coming back you could go here and look at the same well with all these locations. Now, let us look at a different world nearby just to see, see I have clicked it, it is saying just wait for it, it is coming up and as I said if it does not come up at once maybe there is no well there, data there.

So, I am moving, I clicked another one now you can see it is Amritpura, 006, Madhya Pradesh, district Bhind. So, do not waste too much time on it but some parameters are given, look at this one transmissivity is given, storage coefficient is given these were not available in the previous log. So, depending on the log and which year they took it there will be some more data, you have electrical conductivity, water quality is there, what type of material etcetera.

So, I am going to zoom out just to show you how many wells are there, how many blue wells are there for observation etcetera, and all the observation was mostly will have some data in it. So, it is not that they would not have data but they will have some data in it. So, now if I am happy with this data this is what I want, I will click on this view full screen download CSV etcetera.

So, let us say I am going to download as an image, I want to use it as an image, So, I will click this it will ask me who are you, why you want to use this or you can just go straight into my desktop.

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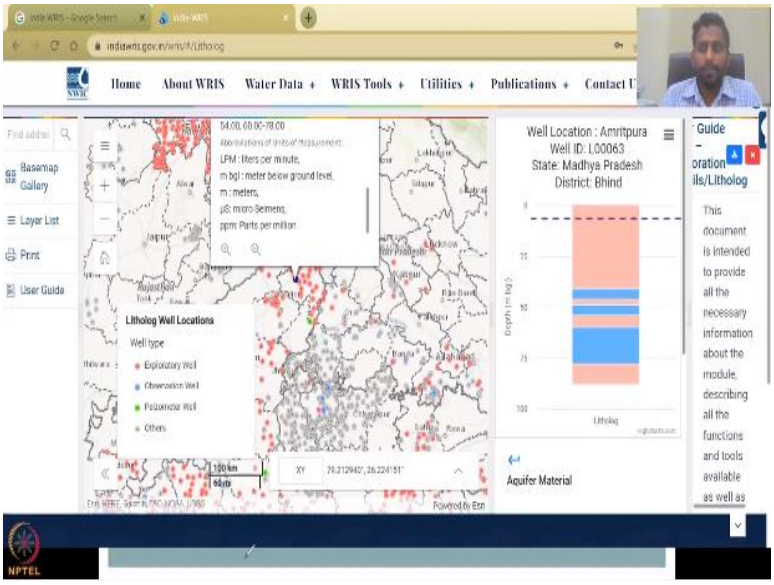

So, I am putting it into my library and I will open it just to show you, it is open I will just show you how it looks like. So, it looks like the same and has come and you have your depth, your ID and district all those stuff. So, let us come back to the initial one. Now, what we are going to do is we are going to see if there is enough data other data that we need for this litholog.

See you have you need a location to put on a map, how do you get that location? By having your x, y location. So, the lat long would be given here for example, so it might be

given here sometimes or in this data by the well ID, if it is not given it is fine, just click. So, you can click on that well and this gives you your lat, long you can see here the lat long is given here.

So, if I move my pointer to that blue point you can get your lat long which is x, y in the degrees, you can also change it to different units UTM for example, 24 hour, you can change it to BMS or a normal base map. So, however you would like it you could change it and take it as a location in your GIS MODFLOW any other model because the model needs which location are you putting this well and this is where the location is given.

If you do not want this log as I said you can move it to the side, you can take different boundary basins and other things which are necessary and you can print this also as a page. In the layerless base mapper also you can have for example I can have an imagery coming behind to show where on the land it is, is it on the high slope, low slope those kind of things.

So, I have shown you how to look at lithologs, what is the litholog, I have shown you how to generate a litholog data and to finish off today I will also show you what is aquifer 2D mapping which is a very prestigious project by the Indian government to map all the aquifers in 2D which is an x, y plane not a depth but at least in the 2D.

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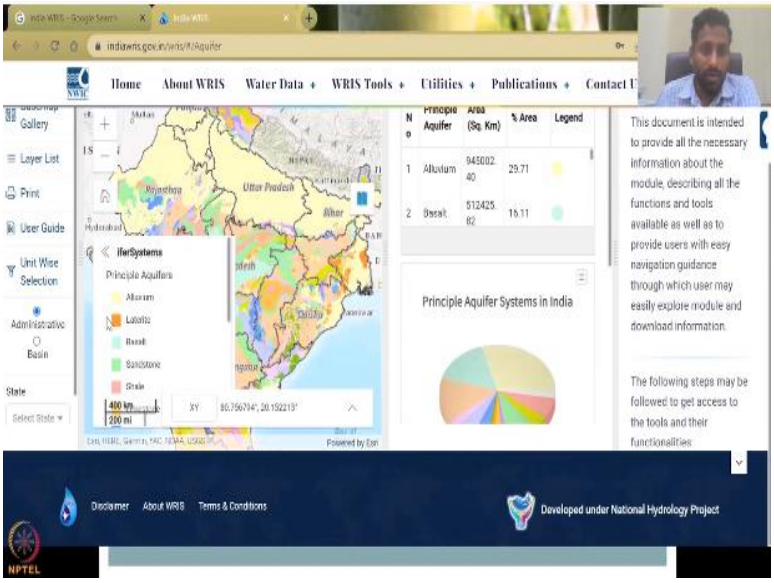

This is a very informative data and you could see that you have the principal aquifers which is the dominant activist alluvium, laterite etcetera. So, we have used this image also in class, you would have noticed but what is important is you can zoom in, you can zoom in and then you can click on what layers you want to see for example, I can close all the other things just for the bandwidth and I can show the aquifer system principle aquifer or not but also I can show you the aquifer depth.

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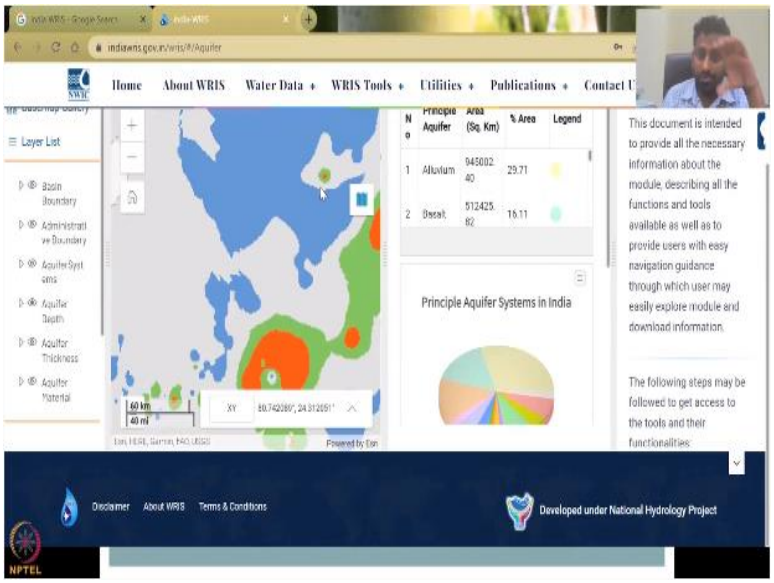

So, this is the how deep the aquifer is in these locations, you can click here to show the depth which means in Haryana, we are in Haryana, this is not Haryana but they have labeled it as Haryana which is fine, it is always the same color. So, the color is same. So, sometimes this issue happens, they will pick a color and other things and they will use it for one location but it is actually for all of India.

So, you can see that blue color means below 25 meters, So, what is very concerning the red color. So, let us go back out and see if it populates for the entire country, might take some time. So, it is only three, four states or some states they have. Let us look for Tamil Nadu they have, So, let me close other things just for the bandwidth and go to Tamil Nadu to see if it populates and you could see that this is the legend, it says greater than 150 is red.

So, you can also get the legend from here on the side. So, which other states can we see let me see if we could yeah so, it is coming now. So, you see Tamil Nadu has come up and what you see is Tamil Nadu's color is given by not this legend but here come down you will get it here it is less than 40 is shallow always look is the legend correct. So, Tamil Nadu is given as less than 40 shallow greater than, 150 meters is red.

So, we have lots of pockets here and for example in Chennai it is but Pondicherry is kind of a very developing city and other locations, you have good groundwater depletion. So, this is how you could actually look at how deep the water level is by a static map, So, with this I will go back to our slide, here we are, we have finished the groundwater exploration I have shown you in the next class I will show you about groundwater levels, water levels that will be a class by its own. So, I will take one or two lectures on that how to look at the data, how to download the data and then use it for your system.

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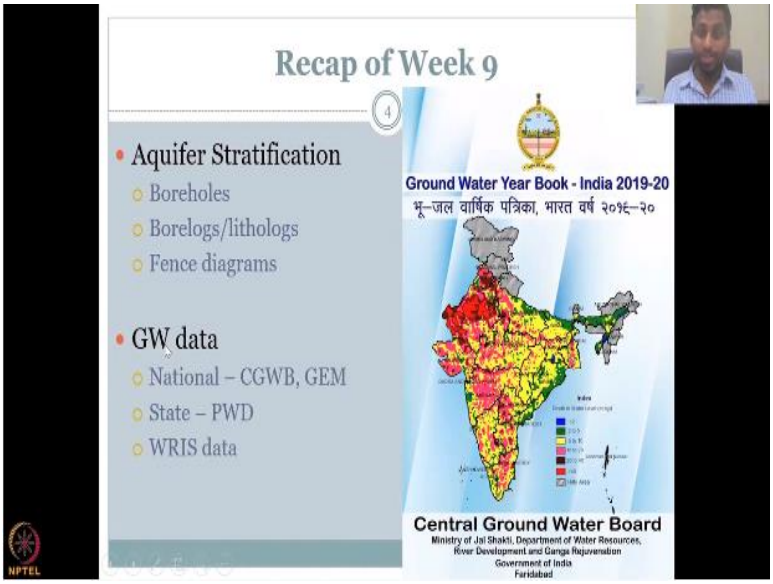

So, with this I will do a recap before we finish off, in this week we looked at aquifer stratification where boreholes are dug, how they are dug we looked at and then we looked at borelogs and lithologs, then we looked at fence diagrams being constructed using the borelogs and lithologs, we looked at groundwater data National CGWB and GEM system, we discussed that and said that state and PWD are available.

We looked at the WRIS data set, at least one for lithologs, with this I would sign off this week's lecture, I will see you next week where we will bring more on the CGWB and other data and then we will construct a conceptual model, what is the conception model. I will see you in the next class thank you.