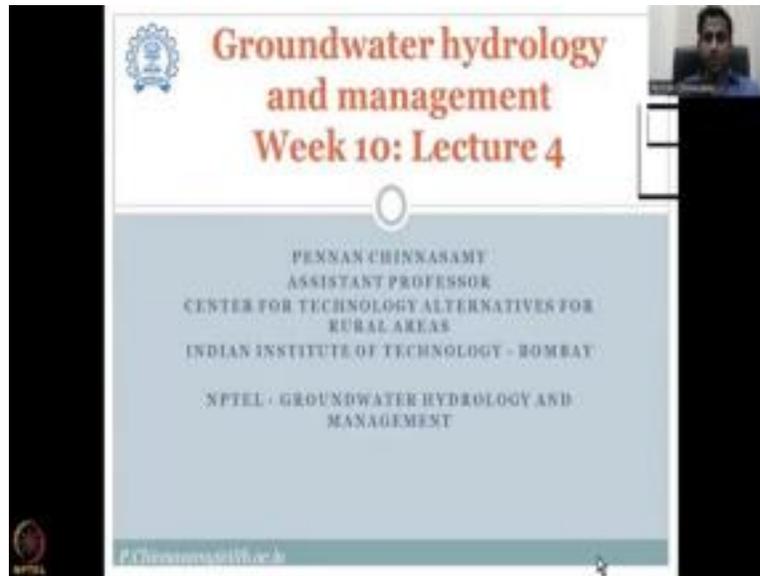


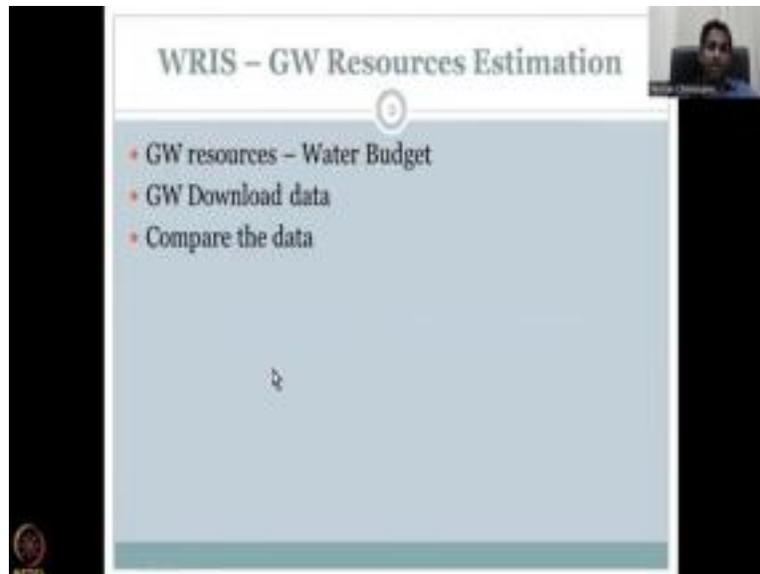
**Ground Water Hydrology and Management**  
**Professor Pennan Chinnasamy**  
**Centre for technology Alternative for Rural Areas**  
**Indian Institute of Technology, Bombay**  
**Week 10**  
**Lecture 4**  
**Groundwater Resources Data**

(Refer Slide Time: 00:16)



Hello, everyone, welcome to NPTEL course on Groundwater Hydrology and Management. This is week 10 lecture 4. In this week we have been looking at groundwater data, especially the data that helps us understand the groundwater hydrology and also make models and estimates water budgets for improving the groundwater resource management. We have looked at the aquifer types, the aquifer material, the groundwater level, and especially in the last class, we looked at how to differentiate the groundwater level between sites and download the data.

(Refer Slide Time: 01:16)



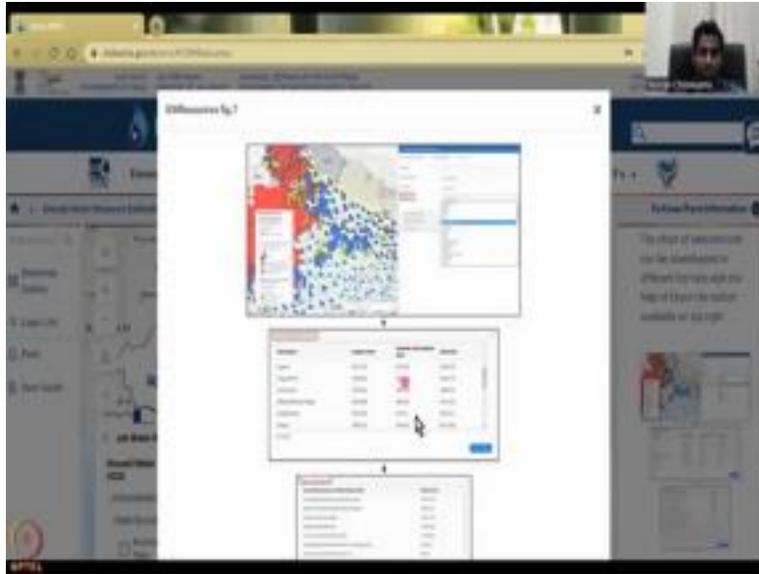
Moving on, we will be looking at the resource assessments that have been added into the WRIS website. So what we will be doing is we will be looking at groundwater resources water budget given by the government data, we will also look at groundwater download data for a particular region and compare the data. So there are two or multiple types of scientists or researchers who would like to look at groundwater. Some would look at very deep groundwater and see how it behaves. Whereas some would look at one particular well and see the trends how it goes. Well, others would like to look at the water budget for a region. And that is where this tab helps you in the assessment of groundwater resources. So let us start the tab that will share my screen.

(Refer Slide Time: 02:19)



So we are back. At the main page, we go to water data, go to groundwater data. We already saw





Now we are going to look at the groundwater resource estimation. I have clicked it and this page comes up. There are three different tabs within this major website for groundwater resources. You can see GW resources, and slowly as per your internet speed, the data comes up. You have groundwater resources, just the assessment of groundwater resources, see how the data is populating by use of Internet and then the download groundwater data compare. Let us start with the groundwater resources and understand what this data is.

Your left panel this panel what you see here always has your menu or your details about what this is you can bring it down to see if anything you would like to lead zoom in zoom out the minerals and also the tutorial. So I am just showing what are the groundwater tabs that they have and how you could use it for your understanding, you could see here you could make a graph. You could download the data you can populate the image make one image and then from the image you can take some data out for example like this just make an image and you can put it in a report. So most of these images are ready made for you in the webpage itself and you can quickly use it for your benefit in your reports and research work.

And there is other way where you can download data and do this research by yourself. You can see like different data you can download, you can compare etcetera. So now I am going to walk you through what each one is. So I am going to push this to the side I have looked at groundwater resources. And you could see the base map is similar to the previous base maps.

(Refer Slide Time: 05:05)



You can pick a background here, the background would be different. Let us give an example, you could see how the aerial view of the satellites is shown. I will go back to streets for the internet, best internet speed, so that is your base gallery. So the base map, which is behind the data set, what you can use. Then you have your layer list in the Layer list, because we have clicked groundwater resources, only one layer comes up, which is your groundwater resources. And then you can print User Guide is here. Now coming back, you can select a year for groundwater resources.

(Refer Slide Time: 05:50)



Let us select one year, the map just tells you different colors but we will get to that after we select one year. Let us say 2011 and the data populates our data is you can look at for an entire nation which is India or you can go to a particular state. Let us look at India first and when you come here, you could see that the different colors were they give net annual ground water availability.

So, this is how much water recharges annually and the net after all the other you know losses how much is available is the net. Then you have the annual groundwater draft, which is how much water is taken out and then which is in green color. And then the pink is annual groundwater irrigation so, how much water of the taken is used for irrigation, you could clearly see that these are volumes.

So, you can clearly see that off the ground water availability, most of the water is used for groundwater draft which has been taken so not, there is some difference between the blue and the green and that difference is the net storage or it goes as base flow. Now, there is not much difference between the green and the pink especially in irrigation states like for example, you have here Haryana, Punjab, Rajasthan those regions, you could see that the green and the pink are almost same level which means, how much ever you take water it is going to be used for groundwater irrigation.

So Tamil Nadu, Karnataka, Andhra, Telangana, all these places Maharashtra, where agriculture is very high, you could see that most of the groundwater is taken and used for irrigation.

(Refer Slide Time: 07:53)

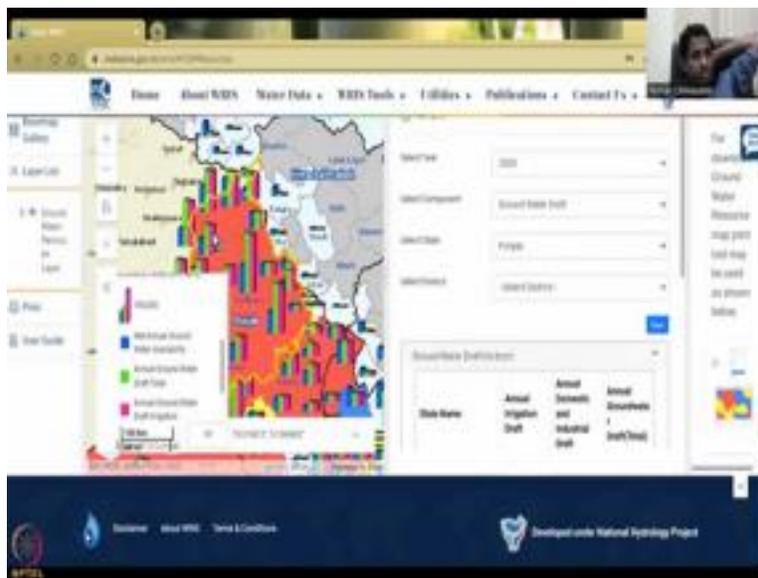


more water than the groundwater availability, then you are actually depleting your aquifer, which is red color over exploited. If you are taking around 100 percent, then it is critical and then the 70 critical is 70 to 90 percent.

For example, if I give you 100 rupees that is your annual groundwater availability and you take all the 100 out, then you are critically endangering this the groundwater. So, it is a critical state. Suppose, I give 100 and you ask for more 20 rupees give me more, then 120 is about the annual that I can give you which means that is over exploitation, you are over exploiting the situation. Semi critical is 70 to 90 percent because eventually the 70 90 percent can become the 90 percent or 100 percent so that is why it is called semi critical.

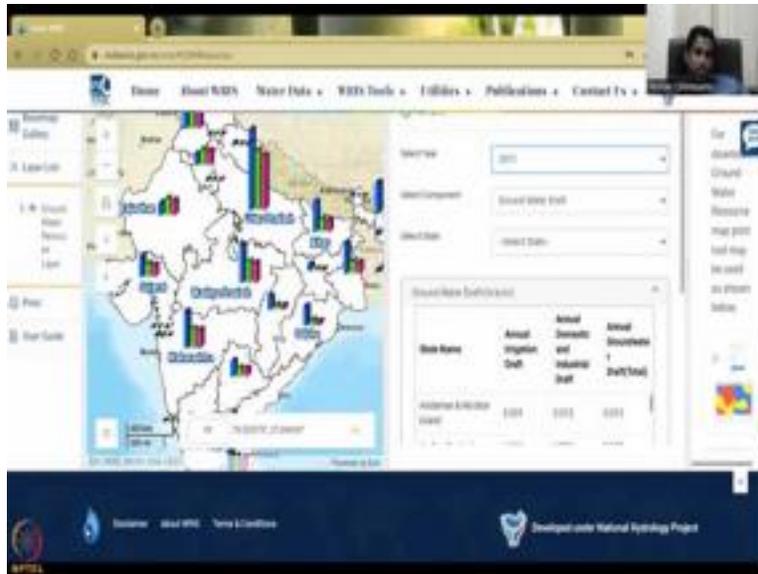
So if I give if I have 100 rupees for you, you only use 70 to 90 and then save the 10 rupees, then it is a semi critical, the safe is use 70 percent. And all these numbers are based on lot of statistics research, and they have come up as indicators. So, you can see the colorings here. Since we did not pick a district, the district income and you could see that the district is not populating. So let it go, I am going to clear it and just keep Maharashtra as a state if it is going to show me any data. And sometimes as I said, the data is still coming so let it not affect you.

(Refer Slide Time: 10:43)

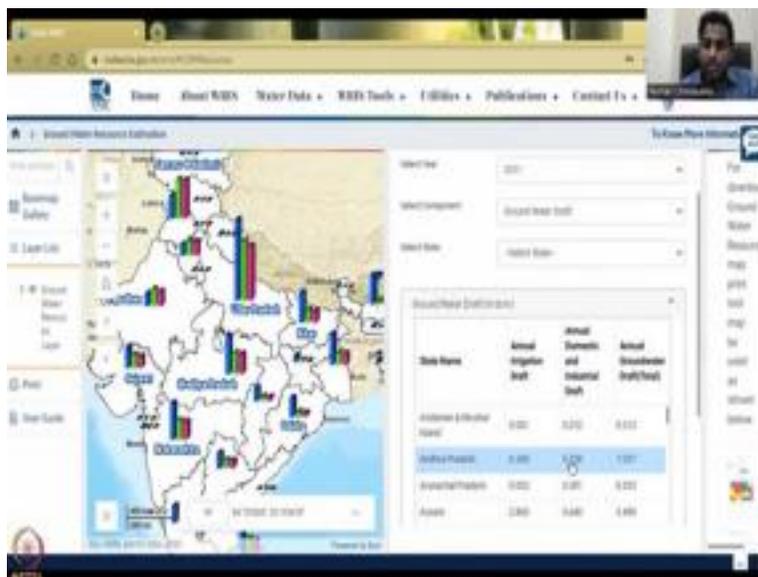


Just for the benefit of people let us do Punjab. And then see which districts so see all of all of them are red, and most of them are red. So you can see that they are using the blue is lower. , so the blue is lower than the green, which means of the annual recharge, you are extracting more than double here at least you can see here double, so more than 100 percent 120 percent 150





Let us look at 2011. So this is 2020. The data we saw, now I am switching to 2011. We could see like 10 years ago, still the situation was bad here, but the drafts were different how much water was taken, the volume was different. And that is where you could use this. You can download this data see download data. And then you could also look at further more details of the water budget. I will come to that in a few seconds. Then you can also make graphs and charts for your colorful presentations like this. They are still updating so you will have some delay in the data. So let us take Maharashtra again you could see that in 2011.  
(Refer Slide Time: 13:57)



Let us take the Andhra Pradesh because easier to see 6.29.7387. So the total annual groundwater draft was 7 billion cubic meters for the state of Andhra Pradesh in 2011. So how was that in 2020 do you think it is extended seven, let us think about the number. And now it is populating to Andhra Pradesh 2020 is 6.60 1.030. So the total draft has not changed much. This is because the irrigation pattern may not have changed much the domestic industrial use may not have changed much. For example, the industry may have changed but they do not give the numbers but for sure the population has increased but we do not have the population data. So that is why we do not see a big increase good. So this is how you could compare between years And then get the data.

(Refer Slide Time: 15:06)

Let us take one example in detail, so I am going to click Andhra Pradesh, you can click the state under population clicking the map sometimes will also zoom in, now it is zoomed in Andhra Pradesh and you can see that the districts are also turning colors. So, once this comes your district names are now populated see now you can select the district.

So, you have to select the state and then select the district to look at the district level changes. So, you can see here this part around Chittoor, Chennai is actually turning red, which means it is having more groundwater than the recharge. So, these are the district names you can see all these here and then you can download if you want. And then you could see individual so this is the state right this is the annual graph and then the initial graph.

I can also click on a particular district, the district will be selected here three column and then you have the blocks also. So these are the block names you can also zoom in to the block.

(Refer Slide Time: 16:26)

I will show you the first Amadalavasala block and there you are. So at a block level, you can look at it the groundwater draft, and then you can come down because now we have a selected for a small area. So you can look at what is the annual industry draft, what is the annual irrigation draft groundwater draft also for that particular block. So the idea here is the glad granularity can bring you down to the block level, you can start at India level, look at the data go to state go to district go to block. And each data you can download for a selected graph and you can also make a graph so here is how the graph looks like. And then where you can download it per se on how you want the data to be all this is free you don't have to pay anything you just have to download as a student. So you could actually go back and say clear so to go back here to say clear.

(Refer Slide Time: 17:26)

And let us say I am going to go back to Andhra Pradesh it will zoom in slowly and you see there are multiple districts and within the districts the blocks will come. So now my point is let us look at let us I am selecting this as my study area for now. Now, I am going to look at the groundwater draft in ham. So, the units would change because it is not billion cubic meters , it is ham. So, what do you see here is a different unit volume, same volume and you have the district name, the annual irrigation draft. So, you can look at which are the districts that are taking more water for irrigation, maybe it is a irrigated district, like for example, an agricultural district would be there, where it takes more water. So, you can have this as a irrigated district, then you can come down and pick and choose which ones you want.

So, you have the irrigation draft, which is the biggest and then you have the annual domestic and industrial draft and then you have the annual groundwater draft total. So, this is in your budget. So, let me type the budget.

(Refer Slide Time: 18:59)

So, what was the budget we had as storage is equals to so, the next step is the remaining water is equal to input minus draft or output, the input is your recharge and everything. So that is already given here in the day the data as annual available water and then the draft is your total draft which can be here as it is given here it is summation of irrigation it is a summation of irrigation and your domestic industrial etcetera. So, this is your draft and then you input is your recharge, you subtract it you will get the annual remaining which is your storage. So now I am going to

take one more district just to show the change.

(Refer Slide Time: 20:03)

Let us take one in Punjab. I have selected Punjab, Punjab is coming and you can see it is red color what was red you can bring out this legend that the dash marks, what does it say? The net available groundwater annual groundwater draft and how much is used for irrigation. All you have to say is the blue and the green, if the blue minus green is negative then you are depleting the aquifer. So let us look at it here I am going to take maybe in one district see what district we can take see the districts has not even changed. So we need to select this Punjab and now it will change see now it has changed in Punjab, Andana etcetera. So let us go to Dhuri I have selected Dhuri see it is selected. And you can come down to look at the details of a selected Dhuri.

So hectares meters this is an area times a length which is a volume. Not hectare per meter it is Hectare meters Ham. So, if you look at the annual domestic industrial draft it is 5617 whereas the irrigation is very high and the total is very high 337133. But your total replenishable is only 124192 which means you are taking a lot of groundwater data for irrigation because irrigation is the key resource here let me zoom out.

(Refer Slide Time: 22:16)

Saying please select the block still going Andhra Pradesh so sometimes there is some you know it does get stuck a little bit do not worry just use your you know whatever you get after you have these non water irrigation things. So here let us do it from here let us do Punjab a I am selecting Punjab and then your districts will populate. In Punjab I selected Ludhiana. So this district could

have come here already and it populates.

So what happens here is you are making some adjustments to your selection to look at how much water is available and how much groundwater can we take. So now it has come back up. Let us see where we have the data coming in. Again, it does get stuck, so do not worry about it. I am just going to refresh it so there is here it comes.

So we have looked at the groundwater draft per resource per district. And then we looked at what are the groundwater budgets. Now we look at it the same tab up we have download the GR data I am going to click it you can select a year say 2020 the recent ones. And then select we have looked at Andhra Pradesh, so let us say Andhra Pradesh, and then we did some district so you can download the whole state you can just give download data it will come. And now the district has come let us say Ananthapura, Chittur was what we saw such a Chittur, Tripalli Chittur that area and then you can download the data.

So you can download the data just straight away, just click it and then it will ask you or your academics, why you want to use it etcetera, it will be a budget. So all the water budgets that we spoke about in class, your hydrological budgets, everything can be done using this data. It will give you a net groundwater budget. So I will not just for the internet, I will not save it. The last one we want discuss today's compare, see, compare is pretty useful tool to look at two different years and see what has changed.

(Refer Slide Time: 26:12)

All I did is I click Compare on the top you can see here, so, select first year is 2011 on this side on the left side will be 2011. So, what is going to happen is the image is going to be divided into two 2020. And let us say Punjab and I hit compare. So, when you do a compare now, you see how much annual draft has changed this image can still remain as one of this draft, but you can see that from 0.7 the groundwater extraction has increased to one 1 billion cubic meters per year and then your annual irrigation draft has come down.

So, for some reason, your domestic and industrial draft has gone up your irrigation draft has come down. The total annual draft is almost equal or it I will say less just what by 1 billion cubic meter and rainfall recharge has come down. Therefore your recharge has come down your net ground storage will also be affected recharges from other sources, rainfall recharge, recharge from all sources, non monsoon, all these budgets, what I said in the previous lectures, how to establish the budgets and so all has been done here.

Then we have the annual total annual replenishable groundwater which is 22530 in 2011, and which is 22800.800. In 2020, you have the net groundwater availability is almost the same.

(Refer Slide Time: 28:04)

You can look at the next. So the projection us up to 2025. You can see how much water they are going to use in the next five years and ground water availability for future irrigation. In 2011 it was negative because the stage of development was very high, but in 2020, it is almost positive which is some better meant compared to the previous years. So, there is some thing about this 1.610 Then you have your stage of motor development as 172 versus 164. So it is above 100. If it

is above 100 percent it is red so that is why you have a red color in the zoning of Punjab.

So with this, I would like to stop today about this tab that we explained, which is getting the data on groundwater resources, which gives you the water budget, the hydrological water budget for groundwater resources, you can do it as a country, you can do it as a state, as a district, and even as a block. So you will have to be very careful to discuss all this because some people say I do not get data, there is no data, but government has put a very good website, please use a website, there are some internet issues. Sometimes the website does not work because of maintenance.

So do not lose hope. Just close it, refresh it as I have done it, or come back in a day or two. It was definitely work. Do not keep it to the last minute. It will not work so the you will have to spend a lot of time taking the data. So I am very slowly going in each tab by tab in the class. With this I will stop I will see you in the next class. Thank you.