

Rural Water Resources Management
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Week 08 - Lecture 01
Rural Water Management Issues: Capacity Building

Hello everyone, welcome to Rural Water Resource Management. This is NPTEL course, week 8, lecture 1. We have been looking at what are the methods in which rural water resources can be managed and in particular rural water resource management India.

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ReCap of Week 7 and link to Week 8

- Week 7
 - Hydrological Water Balance
 - Units for analysis and Area for analysis
 - Watershed area
- Week 8
 - Rural water management issues
 - Specifics on how to improve water management
 - Capacity building
 - Infrastructure related issues
 - Maintenance and Ownership issues
 - Data issues

From a field hydrologist perspective

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In week 7 on what we looked at is the hydrological water balance, we define the unit of analysis, which is the watershed and how to determine the area. If you remember we had the water balance equations however, the equations have to be placed within a boundary. And that boundary is known as the watershed boundary, which is our unit for analysis. We looked at what are the methods in which we could determine the watershed area?

And what are the key points in setting up a watershed area or a boundary. And then we looked at how we could quickly assess the watershed area or quantify the watershed area. In particular, we looked at how GIS can help in watershed area delineation and calculation. Even though watershed area using GIS is the best one of the best methods, due to the focus of the course, we did not get into GIS methods because that itself is a course on its own GIS and how to use mapping tool et cetera.

So, with that understanding, we are moving into week 8, where we look at rural water management issues. So, in order to manage rural water, it is very important to sensitize

ourselves on what are the issues to be claimed that there is no issues then there is a problem. And that is what we need to avoid in this course. And look at how we build narrative on rural water management. So, we start with water is important.

What are the water issues and the specific issues for water management? And then we build on what are the methods for rural water resource management. So, specifics on how to improve water management will be discussed this week. issues on capacity building. And why is it present in some regions and absent in other regions will be discussed. We will define what is capacity building.

And when I said the previous point specifics on how to improve water management, there are management plans, but they are not efficient enough. Or they are not holistic enough, which means bringing all the components of water together. So, we will look at how we could purchase that infrastructure related issues, we will look into some major infrastructure related issues that either are absent or not take into account of and we will then get into maintenance and ownership issues.

So, how do you maintain these units is a question. And then how do you take ownership for each and every aspect? Is a question. So, we will discuss all these in detail. And most important is the data issues. In order to manage a water resource we need to monitor it. And then the monitoring is based on the data that is collected. If we do not have monitoring, you cannot manage it well that is a very strong philosophy that I believe in.

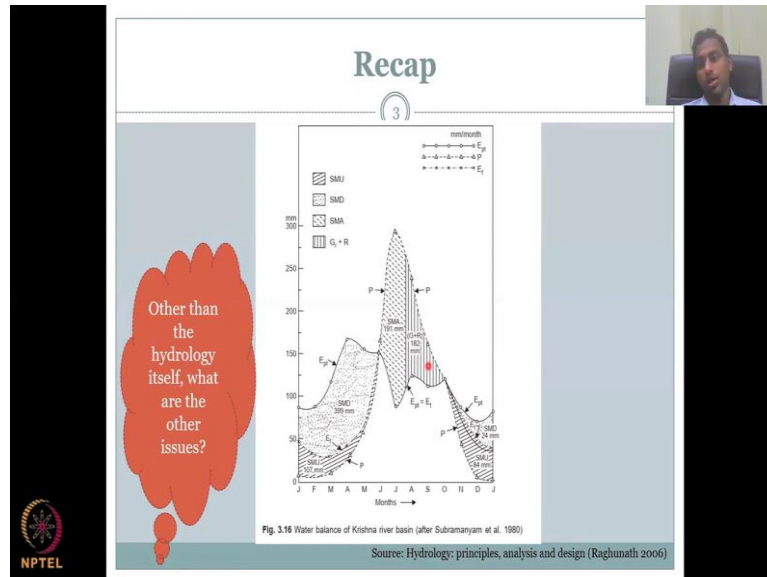
How do you manage something? How do you quantify something if you are not measuring it, So, once you monitor you measure and then from measuring you become a more efficient in management. All this is from a field hydrologist perspective, which means I am a field hydrologist. I work on the field. I collect data from the field. So, maybe some can call me I am biased to data.

But the understanding is you need to know how much water is just thinking looking at rainfall and assuming groundwater level is not going to work. In those days. Maybe the demand on water was so less, so monitoring and data collection was not needed. But right now and in the future scenarios, water is one of the most if not the most important resource of the planet.

Remember that people are going to outside solar within the solar system, they are going to outside planets in search of water because that is the dominant that drives life form. So, my

course would be from a field hydrologist perspective, which means, how do you measure on the field? Why is measurement needed? And from the field how do you convert it into a desktop database and from the database into a model and then from model to management plans or advisories.

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A small recap of the last figure that we saw. In figure 7 in figure7, what we looked at is what are the water balance components and in which months or seasons do the soil moisture which means your plants are consuming more water you need to give some other additional resources for plant growth and where are the months for example, where soil moisture accumulation is happening and groundwater recharge is happening.

This is when the rainfall is more than the plant can take. So, the excess water would go in. So, other than the hydrology itself, which is captured well in this graph of rainfall and plant water dynamics or plant water requirement, what are the other major issues that can affect water management? Because in the rural setting, we say that, well, water management is important agricultural crop is important.

Storing groundwater is important and recharge is important. However, if we do not quantify the other aspects driving these changes, which are not readily graspable like this, then we are losing on key information that can change the story of water management. So, that is what we will be looking into this week.

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Rural water management for water security

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- Drinking water: Is safe and equitable water available for all? Is it affordable?
- Economy: Is adequate water available to sustain their livelihoods?
- Ecosystems: Is adequate water available for biotic and abiotic systems in the region and aids for sustaining nature?
- Resilience: Is enough water available during climate change extremes ?

Source: UN Water 2013

Rural water management for water security is important. So, water is not only domestic use, which we think water is not only your crops and agricultural activity, there are much more things that need to be taken into account. And once you have enough accountability and water available for every key priority, then it becomes a fully water secured system. So, how do you manage your water for water security is the key for rural water management.

So, this is the UN's diagrammatic representation of how water security can be achieved are the key players for achieving what a security we have is the capacity of population to safeguard sustainable access to adequate quantities of acceptable quality of water here we are not looking at water quality, because water quality concerns are big and without data it is very difficult even debate on water quality.

So, right now we just look at quantity and what this UN water body, which is a vertical in the United Nations system, just for water. So, how they manage water, what is water? How do they promote water security? So, all these aspects are discussed in the UN water vertical. And according to them, water security is the capacity of population to safeguard sustainable access to adequate. So, it is about how people can access water safe and guaranteed access.

So, they say that it is for all these 4 key sectors and it starts with your drinking water is safe and equitable water available for all is it affordable, safe means is the water clean, good quality? And is it equitable water wealth, not like one portion of the population gets more water than the others? Because it is all of us are human beings. We all need X amount of water per day. So, saying that only one population gets more water is not correct.

So, that is where this equitable water comes the separation could be within the village within a street within the nation. So, how water is being separated is a big, big question. So, is safe and equitable water available for all that defines drinking water security? So, you can put a tick mark saying yes, water is secure in this region and is it affordable? So, you might have water and a very clean water but if you will build them really, really expensively then it is not going to be sustainable.

And that does not count into water security for example, you are in bottled waters not all people can bring bottled waters nowadays you see what waters are much cheaper than initial days because the players are more those days only 2-3 companies were there now multiple companies are there just go to the train station you will see different bottles of water and prices very lower compared to the previous years but still it is not affordable.

You cannot drink a 6-7 liters a day just buying water from these players. So, think about that and is it affordable is a big question economy is adequate water available to sustain livelihoods of rural people. So, economic activities also go around water for example your agriculture your clothing industry, dyeing industry your other industries that car user use lot of water, paper industry et cetera are there enough water for food energy production, it could be hydropower or even your whole plants where water is needed as a coolant industries transport tourism et cetera.

So, all these economic activities which are needing the water is there enough water is a question and that defines water security. If you say that only some sectors are gaining water and some sectors are losing miserably then that is not water security. Ecosystems, we have already defined ecosystem I will define it or refresh it again. So, ecosystem consists of the entire area or location where you have good interactions between the biotic which is your biological activity and abiotic together is called ecosystem.

So, ecosystem is a kind of a system an area as I defined it. So, the last what is the ecosystem of this area. So, I will say that there is rocks and within the rocks there is rabbits, worms, and then trees grow. And then there is a river running around which all contribute to the ecosystem. It is not just how the biological activities interact, which is the earthworm the water the trees, plants now, it also includes the abiotic which is the rock soil et cetera.

So, all this taken into one system is called ecosystem and it is adequate water available for both biotic and abiotic systems in the region and does it aid for sustaining nature. Because when you see nature, your rock also nature living thing is also nature. So, this is how the

ecosystem work derives from you cannot just say no, my nature is just a rabbit, the rabbit needs a bottle the rabbit needs a hole to go and sleep and have you know, food where the food they get all these things.

So, you cannot disconnect just the biological or living life form in a system and say that is the ecosystem it is a combination of all. So, that is, is there enough water available for all I will give you an example your water goes through the soil, if the soil is not getting enough water, it is very very dry like a clay soil at one point it will repel the water. So, you might have enough water but your soil is not taking the water.

And because of that your plants are not getting water and because of that you are birds, insects, worms, snakes, animals, plants, nothing is growing. So, that is where the ecosystem services come that is where the ecosystem plays a vital role. Is there enough water for sustaining ecosystems? The last one is resilience, which is very, very important in this era because of climate change.

So, climate change is happening and the extremes let us let me talk only about the extremes. The extremes means very high temperature and very dry weather, no rainfall or very high temperature and flood or it can be the very cold temperature and no rainfall or cold temperature and high rainfall in floods. So, if you just take the water aspect, it is either there is a big, big floods or big big drops is water enough during climate change, to adapt, or resilient means to manage during the crisis.

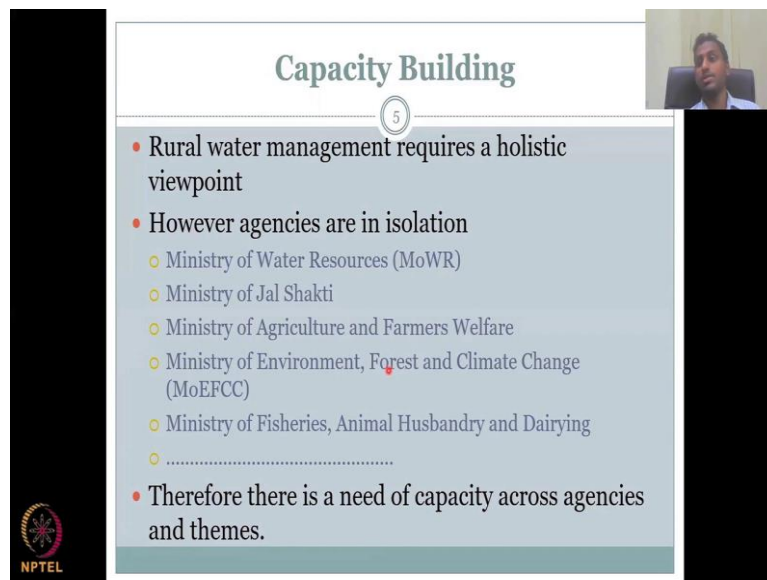
Let us think about the COVID situation also. So, there are a lot of people who got really affected by COVID they closed the shops, they could not ask sustain the livelihood, whereas others flourished. So, there is an imbalance. And that is not okay for the full security of this nation. So, in water also it is the same thing. During the drought, some people might have access to groundwater, and they will be happy they will take the water for agriculture use, whereas some farmers will not have water. Same thing on the opposite.

During the floods, some farmers are okay, they will not even farm the land. And they will say okay, next year, I will take the profit, but is that available luxury available for all the farmers because most of the farmers may not have that luxury. So, resilience is very, very important to climate change, how you combat it, how you are resilient to water related hazards. And pollution, pollution is also picking up during climate change is very important.

So, all this defines water security. In short, do you have enough drinking water for all? Do you have water to sustain economic activity, including agriculture industries, et cetera? Do you have water for the ecosystem services which is running water between your rocks, your groundwater, your base flow et cetera? And for the birds, animals et cetera? and is water enough for your resilience, resilience to climate change?

For example, dams stores lot of water groundwater stores a lot of water under the ground aquifers I am saying. So, the groundwater aquifers store a lot of water under the ground which can be used during both the floods and droughts. So, these are resilience to climate change, is there enough water in that is the question.

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Capacity Building

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- Rural water management requires a holistic viewpoint
- However agencies are in isolation
 - Ministry of Water Resources (MoWR)
 - Ministry of Jal Shakti
 - Ministry of Agriculture and Farmers Welfare
 - Ministry of Environment, Forest and Climate Change (MoEFCC)
 - Ministry of Fisheries, Animal Husbandry and Dairying
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- Therefore there is a need of capacity across agencies and themes.

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So, of this I also mentioned capacity building, capacity building is building out of people's skills that can address to a particular problem, I cannot have people alone without the skills and call it capacity. So, capacity means I should have enough number of people for a particular work. And those people should be trained in that particular work to help me out and that is capacity building.

So, rural water management requires a holistic point of view. Holistic means bringing all these 4-5 players which I discussed in the previous slide. It is not only for agriculture, not only for domestic, or not only for forest et cetera, it has to bring everything into the picture. And bringing everything means I need capacity in some regions by for example, forest, water requirement, agriculture, what requirement economy water requirement, all this has to be titled in.

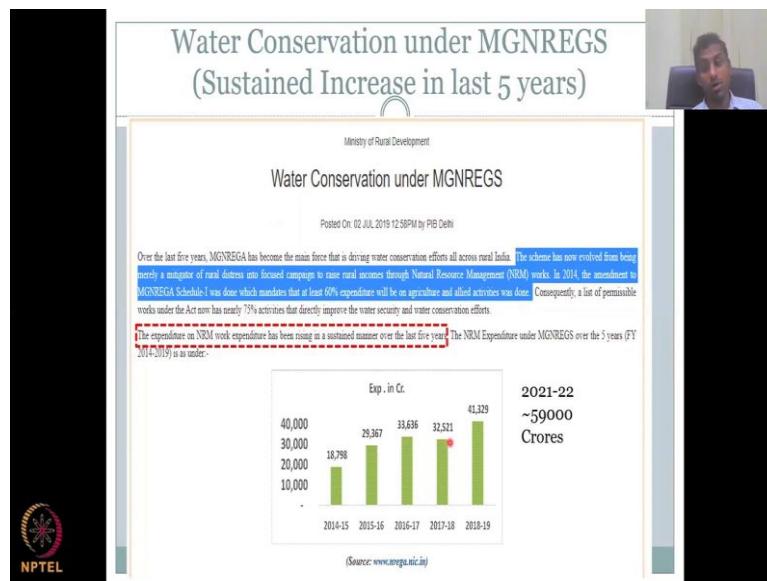
However, our agencies are in isolation and this is not only in India, I am just giving an example here. But if you look at around the globe, for some reason, water is being divided into sub agencies. And those agencies do not talk to each other. They do not manage it together. They manage it differently. This way, we will manage it differently. And at the end, the public are the ones which are getting affected.

For example, let us say the Ministry of Water Resources there, there is a ministry of JAL Shakti, only looking at drinking water supply pipe water supply. And then there is the Ministry of Agriculture and farmers welfare, which looks at only agriculture water, and then forests and climate change which looks at the ecosystem of water and then there is water for fishers, animal husbandry and dairy.

So, you see that how one water which comes from the dissertation is being divided into sections and for example, administer the Agriculture says no, I want to put large large check dams, large irrigation dams to store the water, then there will be not enough water for climate change and Environment and Forest because below the dam, all the forests are going to use water and also about the dam because the water gets inundated.

So, all these agencies have to talk together. And that requires also capacity. Therefore, there is a need to build capacity across agencies not only within agencies. So, that is also good and is needed, I need a lot of people to work on pipe water supply for Jal shakti but they should also know what is groundwater they should also know what is the water related to agriculture and farmers so, that they manage it properly. So, just given one source might deplete another major, major source for another ministry, and that should not happen. So, all this can be taken care of if the water balance approach is used initially in the study, and all of them actually look at this image, single holistic picture.

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And that is what the government is doing now at least in the MNREGA. So, the MGNREGS which is also known well known for the 100 days scheme for farmers so, the minimum wage is given to farmers for 100 days so, that they do not leave the farmers land or they do not migrate.

So, it is just initially started with migrations, how do you stop migration, just pay them 100 days, labor in the village and they will stay for the whole year. But slowly, the money is now be also in so, when the weather there for 100 years 100 days, they can also be used to work on water conservation projects. And that is where natural resource management NRM works have started. And that takes a big chunk, big chunk out of the MGNREGS is budget.

So, every year the government gives a budget for MGNREGS. The names differences it says NGNREGA MGNREGA MGNREGS all these are Mahatma Gandhi the same name would come for in different sources, for example, NREGA is there MGNREGA MGNREGS so, it is all the same. So, for just now we will say that it is the scheme that the government has started for keeping people in the villages, preventing them from migrating and for that 100 days, labor cost is given. Every year it increases.

So, if you look at the budget that they give, every year it increases and almost 60 to 75 percent of that budget is now allocated for people to work on water conservation, or natural resource management. And after natural resource management what was very, very key, for example, they will say, I am giving you this money, please work on desilting a tank making the month stronger for percolation ponds or recharge pits.

And if you look at the budget, it is in 2014-15 it was 18,000 crores which is around 60 to 75 percent of the MGNREGA budget and it has been raising very, very steadily and in the recent data it is around 59,000 crores per year and that is spread across India. So, if in those days when the scheme was announced, they would just take the money and then say the village but not much work was done because at that time there is no work like the agriculture activity is not there. But now, the government has realized that you can use it for natural resource management. And they put a lot of money for creating these water structures for the village.

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Mission Water Conservation under Natural Resource Management Component of MGNREGA

Important Protocols to Refer from the document:
2.2, 6, 7

No-I-11011/07/2016-RE-1 (31427)
Government of India
Ministry of Rural Development
Department of Rural Development

Krishi Bhawan, New Delhi-110114
Dated 14th October, 2016

To
The Additional Chief Secretary/Principal Secretary/Secretary
(In-Charge of MGNREGA)
Rural Development Department
All States/UTs

Subject: Regarding Mission Water Conservation Natural Resource Management Framework under the MGNREGS within the overall framework of PMKSY.

Source: www.nrega.in

The mission water conservation under the NRM component of MGNREGA has also been promoted so, that they work more on water conservation works under the NRM. As I said, natural resource management can also include your forests, your deepening of rivers, streams, et cetera. But most importantly, now they are looking at full water conservation works groundwater surface water.

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The image displays two presentation slides. Slide 8, titled "Need for cross cutting theme capacities", features a central box labeled "Rural Water Management" surrounded by four quadrants: "Agriculture", "Ecosystem and Livelihoods", "Domestic use and Sanitation", and "Climate Change". Slide 9, titled "Sustainable Development Goals", shows the 17 SDG icons on the left and a group of people holding signs for various goals on the right. Both slides include an NPTEL logo in the bottom left corner and a small video inset of a speaker in the top right corner.

So, that there is a need for cross cutting team capacities, it is not just water, it is water agriculture it is also rural water for ecosystem and livelihoods, domestic use and sanitation, sanitation is a very important part for water management. Because there is one scheme where there is building toilets for rural villages, but if there is no water in the toilet, how will they use it if there is no connection of pipe supply.

So, that is how you should build water across the teams. Very directly saying that water is very key for livelihoods, your food and also clear say clean, sanitation et cetera. So, it is very important to have all these sub sectors understood and capacity built for. For example, if I say I am going to do rural water management, and I only care about agriculture, I do not care about climate change, then what happens?

When a big drought happens your agriculture fades. Same thing your if I do not care about your ecosystem, forest everything I just take all the forest off and convert it to agriculture water, then what happens when there is a landslide all the land is gone on the soil is gone. So, all these different capacities have to be acknowledged first and there is a cross cutting of themes. It is not only agriculture, it should be agriculture and climate change. How do you have crops that are resilient to climate change?

Which means for example, I have a rice variety which can grow in floods are a rice variety which requires 30 percent less water so, that will be helpful during a drought. So, this is how you merge different sectors agriculture and climate change across water and this cross cutting is very necessary for moving on with rural water resource management not only for rural water resource management but also to attain the sustainable development goals.

A nation is called developed okay if they attain all these goals and most importantly they have to attain it in a very sustainable fashion and the sustainability is defined with these ascending goals. So, number one is no poverty it is not like your GDP is high but still people are begging on the streets is that considered sustainable development? No, it is a section of the society which is developed the other section is not.

So, how do you define sustainable development is no poverty should exist let us take a village and half the village is very rich have the village is poor does not make even though the average salary is high it is skew. Statistically it is skewed because part of the society is having 5 times the income. So, that does not equate to a sustainable development that is what this goal says zero hunger no hunger no one should die of hunger no one should have no food during any part of the three times meal.

And then your health your gender equity, clean water sanitation, all these other ascending goals goes, what do you find clearly is water is tied across all these sustainable goals one way or the other. For example, if a farmer does not get water, they end up in poverty. So, water is very important for a farmer. So, gender equity, but very directly it is related to number 6 clean water and sanitation and then life of aquatic water, life under the water, and then your life and land and water, all these things.

So, to attain all this, it is very important to have a collaborative cross cutting capacity to understand how much water is needed for agriculture, how much water is needed for economic activity, sanitation, and then build a system for everything. Let us take a tank for example for rural water management. If I build a tank, and I say that the tank only supplies

water for agriculture, then what happens to the daily water in there is no water how will they survive, if there is no water for sanitation, how are they going to be clean?

So, every single part should be acknowledged. And if it cannot be done, for example, I can only have water agriculture field not for chicken farm, then some kind of alternative should be suggested for that. Like no chicken farms, but you can do this kind of farming. So, some promotion some subsidies may be given to take the water out. Same thing with dams in a dam you are stopping the water and then storing the water for hydropower for example but you are stopping the water from going down which people and animals and birds might need it.

So, there should be some balance saying that okay, even though I store the water, I am going to release some water there. What I am going to build a smaller tank there for you to have water during the non-monsoon season. So, those kind of things should be well thought of and acknowledged when you make these sustainable development plans. More importantly, the agency should talk together because water is a cross cutting team and all should work together for rural water resource management with this concludes today's lecture. I will see you in the next lecture. Thank you.