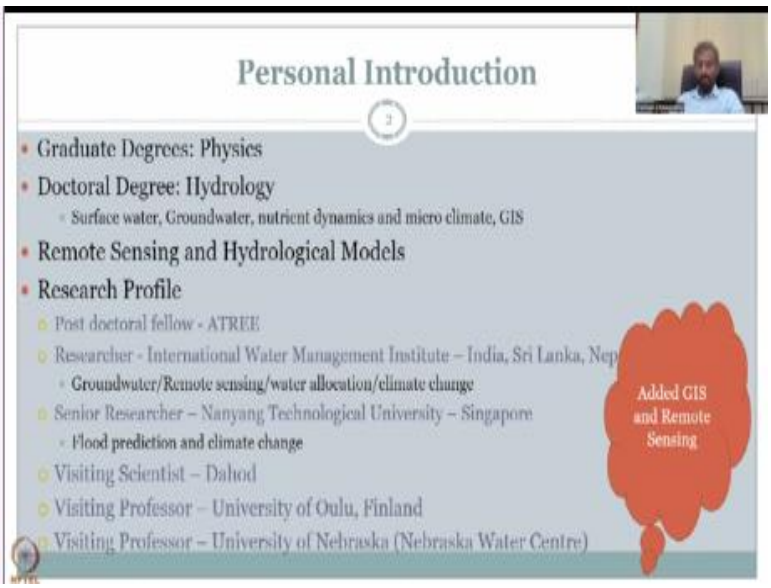
**Remote Sensing and GIS for Rural Development**
**Professor Pennan Chinnasamy**
**Centre for Technology Alternatives for Rural Areas (CTARA)**
**Indian Institute of Technology, Bombay**
**Week 01**
**Lecture 05**
**Rural Development**

(Refer Slide Time: 0:16)


Hello everyone. Welcome to NPTEL course on Remote Sensing and GIS for Rural Development. This is week 1, lecture 5. Through this lecture, we will be wrapping up the first week and part of the introduction to the course. I hope the introduction material was useful to also self-learn some of the rural issues and avenues for rural development.

(Refer Slide Time: 1:02)



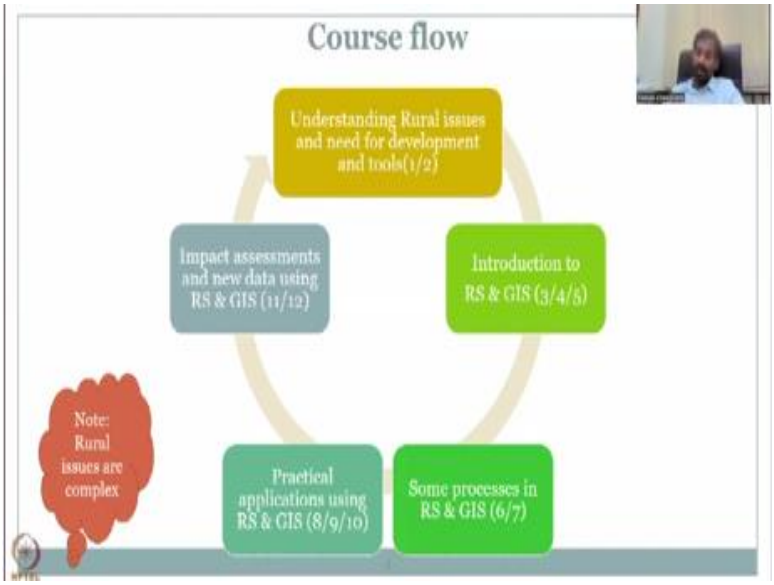
Today we will be looking at a quick personal introduction that I gave during the first lecture, and most importantly, the takeaway message is GIS and remote sensing were not part of my degree, as in I did not get a GIS or remote sensing degree, which is also there in in a lot of universities. More than that, this was added to my profile because for rural development. It was noted that there is more data needed and historic data, which you cannot go back and collect. So, remote sensing data was handy in addressing those issues.

(Refer Slide Time: 1:54)


Moving on, I also mentioned that students who were enrolled in this course should consult different reference materials and manuals. The links to these manuals and reports will be provided in my slides. Questions will be from my slides. However, to enhance your learning and interest in rural development, I strongly recommend going through these government reports.

Since this is an introduction course and an undergraduate level, only part of the need for rural development and how it can be achieved using remote sensing and GIS will be taught. The week by week schedule will be based on that course. Also, as I said, there will be many field notes and agency reports that will be used together in this course for you to understand and think on rule development initiatives.

(Refer Slide Time: 3:19)




Let us look at the course flow. So, in the first two weeks, we will be understanding rural issues and need for development and tools. We have already come to the end of week 1 where first we have defined what is rural development and why we need it. We also mentioned about what are the key areas where rural development is facing an impact, food, security, water security infrastructures, etcetera.

Again, these are the avenues that have been also identified by the government agencies and ministries. So, some of the material that I have used in the course is also linked to the ministries reports. So, this will come handy for people who are going to work further ministry agencies or rural development colleges and higher education programs focusing on rural development. Very similar to the course and the center that I am currently part of in IIT, Bombay.

In the week 2 also, we will continue some more aspects of rural development, why there is a need for rural development and the issues and concerns that are impacting rural development. Finally, we will lay the foundation stone for the tools that are needed for rural development. There are multiple tools to monitor and manage. However, this course will focus on remote sensing and GIS tools. So, we have set the context in week 1 and week 2.

Week 3, 4, 5 will be a very basic introduction to remote sensing and GIS. We have divided it into three course lectures. So, over these three course week lectures, 3, 4, and 5, you will be introduced to what is remote sensing, how is it different, where can you get remote sensing data, and what is the difference between open source proprietary data and data on demand. Open source is free and open to all to use, whereas proprietary data is you have to pay and

use. And data on demand is where you produce a request and data is taken for you and provided.

For example, after a flood, the government agencies do require higher resolution data. So, they ask a satellite agency to park the satellite and take your measures. So, after that, it has been processed in the GIS environment. So, for that, I will also give you an introduction to GIS, especially a GIS platform, which is open source QGIS. There are multiple NPTEL courses for a full understanding of remote sensing and GIS. I will be sharing the NPTEL lectures link, which you could use to get up to speed. Here we will not be explicitly using it for same issue that is mentioned in the courses, but here it will be useful Google development and understanding of global development.

Then in sixth and seventh week, we will be looking specifically on some remote sensing and GIS lectures, tutorials that will quickly allow you to assess the need for deeper analysis. Let us say identifying water bodies size, and diminishing or is it losing water quality, those kind of aspects. You could also measure the farm area from which you can assess water demand, supply demand, and also the transportation demand. So, these are the infrastructures I have already spoken about in week 1.

Then moving on to 8, 9, and 10, we will be looking at some practical applications in using remote sensing and GIS. Again, some hands-on tutorials will be taught guiding you how to download the data, where to download the data, how do you create an account for downloading the data, followed by processing the downloaded data in a GIS environment. It will be time consuming, sometimes some for some people to download the data depending on the internet speed. So, you can pause this video and then download it and then follow the steps.

Since transcripts and steps will also be given to you, you can also do it when you have stable internet. Part of the homeworks would be to assess some boundaries and areas using these remote sensing and GIS tools, which are open source. We will also be doing some lectures on a remote sensing platform where you can readily do the analysis on your internet for which you do not need a very high performing laptop. So, all the exercise will be done using a basic computer accessory laptop or a desktop.

And for those high end analysis, we will be using an online version of Google Earth Engine where you can give analysis request and it will be performed using a super computer remotely. So, you do not need to have an access, it is just your normal laptop, or a desktop

with good internet, and the data will be processed behind in an environment in Google, and then you will bring the data back to your system.

And then we will follow it up and close the lectures in 11 and twelfth week by impact assessments and new data using remote and GIS where we can look at some impact assessment studies from the government of India schemes, how you can do using remote sensing and GIS tools to assess the progress of a particular scheme. And also you can assess the important other indicators that are benefiting because of these schemes.

For example, as I said, if you rejuvenate water resources, then children can go to school. They do not have to spend hours waiting for water and or fetching water. I share examples from my own story. In villages, we used to go and fetch water long distances, and that did not change when I came to Chennai because even in Chennai when I was going to school, I remember waking up early, early morning and standing in a pipeline to get water. This is 3 o'clock, 4 o'clock in the night because that is when they will turn on the taps for public water distribution and the tap would be on the road corner. So, all people would have to go stand in line, fetch water for drinking and then bring it up.

This is tremendously impacting students because school going students, because they lose sleep and get tired and they are not active in class, it may be once a week or twice a week, but still, that whole day is gone. So, we will focus mostly on the rural environment, which is more and more, impacted compared to urban setting. So, you would think that the courses end in week 12, but I keep the cyclic loop as you can see, the arrow still valid. Why?

Because once you know the impact assessments, once you know more remote sensing and GIS tools, you can redo the loop by go and understand or probe for new rural development issues, new rural development concerns. I start with the basics, but with now all these tools and understanding, you can go back and then redo the analysis, redo some process, redo some practical applications.

The course will stop on week 12 for sure, but you can still continue the same process and the tools that you learn in this class to do more analysis. So, at the end of this course, I hope to give you a toolbox. I hope to equip and empower you with a toolbox and open source toolbox that you can carry and assess the impacts of rural development and or propose new areas for rural development.

(Refer Slide Time: 14:29)


Also, we said that rural development is a very complex issue because it is not just water. It is not just food. It is not just social. It is not just economic, but it is a cross-cutting theme where you have agriculture which is dependent on natural resources such as water, soil, nutrients, sunlight, but also dependent on ecosystem and livelihoods, domestic use and sanitation and climate change.

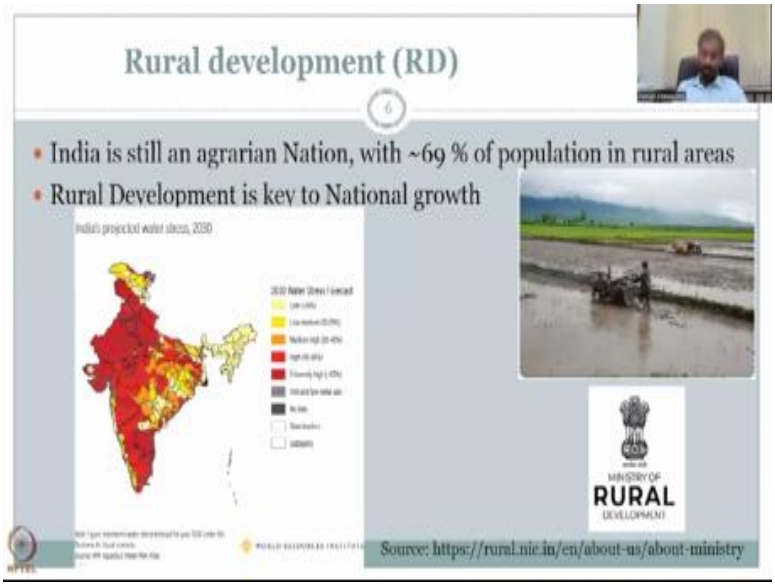
All these are themes by itself. So, agriculture is one theme. Ecosystem livelihood is one theme. Domestic, is one thing, and climate change is a separate theme. But for rural development, all have to come together. We call this a holistic approach or a cross-cutting theme approach where the theme has to cross-cut and then rural development occurs. For example, if you just focus on rural development using agriculture and you say that, oh, the productivity has increased, so maybe the social issues are gone, no, it will not leave.

Maybe the economic issues, I do not know. It will not be. As I clearly mentioned, through green revelation we have quadrupled, 4 times the wheat, 6 times the rice in some regions. But does that mean the farmer has become 6 times richer? No. So, there are issues and it needs have cross-cutting team approach. So, it is a very, very important subject to keep yourself grounded and work on it.

So, my aim through this course is to enlighten you on the aspects of global development so that you could look at different aspects in focused lens and then work more independently and focusly on these schemes. I have mentioned that since I am a hydrologist, I do put more emphasis on water, but water does cut across all these themes.

So, for example, as I said, water is needed for agriculture. Water is needed for ecosystem, which is plants, trees, biotic features even for soil formation, water is needed. Livelihoods such as aqua culture, mushroom cultivation and others. Domestic use for drinking and sanitation and climate change is mostly impacted by water. So, it is of utmost importance to consider water.

(Refer Slide Time: 17:26)




I have also mentioned that rural government is key in India for India's GDP growth because India is still an agrarian nation with approximately 69 percent of the population in rural areas, maybe 10 percent of them are very rich. You would have seen very rich farmers, but most of the others are not. In fact, a lot of farmers are still below the poverty line. So, this course when we speak about rural development, focuses on these population of farmers that are mostly below the poverty line and or just above the poverty line. And we would like to find avenues which can help them for rural development.

And most importantly, rural development is key to national growth, not just because of more population residing in the rural areas, but because this is the areas that produce food security for the remaining population, the remaining 31 population, 31 percent population in urban centers. However, as indicated, lot of people have identified that water stress is very, very high and the projections of water stress is very high for the next 10, 20 years.

So, this report by WRI clearly indicates that the water stress forecast is concerning for India. And more importantly, you see the red color, which is high or extremely high water stress is concentrated on the rural regions. The urban centers will always get water from rural. So, how do you understand this? Distil this into the rural areas and provide rural development.

So, these are the key factors that we will be addressing through this course. It is not only climate change is impacting the water security, but also the unsustainable water use patterns both in agriculture and urban is leading to high water stress.

(Refer Slide Time: 20:13)


Because of this, there is a very devoted, focused ministry working on rural development. So, this course is actually targeted towards understanding and focusing on the schemes that a ministry is being set up for the minister rural development. So, you will not see a ministry of civil engineering or a ministry of aerospace just for aerospace, engineering. They are important, but it comes under science or, or it comes under multiple ministries.

But this course as a rural development comes under a ministry. So, that is how important it is. And under the ministry there are multiple missions. Amrit Sarovar mission is one where it is looking at to rejuvenate the water bodies, map the water bodies, etcetera. And there are multiple schemes that I have explained in the week and missions that I have explained in this current week. Most important of them is your MGNREGA the guaranteed employment scheme.

In the MGNREGA, there are multiple sub schemes that are also looked upon like IWMP, which is Integrated Water Management Plan for rural development. So, it is not only to provide labour for rural enterprises, it is not only for providing guaranteed income for farmers, but also to use their labour time and efforts for rural development. Building roads, removing encroachments by trees and plants, removing them, eradicating weeds, invasive species, creating new water resource structures, all these come under this IWMP, which is

part of your schemes. So, not just wasting the labour time, but also keeping it more productive on rural development schemes. We will be addressing most of them in this course.

(Refer Slide Time: 23:01)


Not only that, this course can also be related to multiple ministries. Let us look at some of them which are very directly related to the Rural Development Ministry. However, it is itself by its own ministry. So, Minister of Rural Development is what the first key ministry that this course will focus on. How do you create remote sensing and GIS tools for rural development? But also we will be looking at ministry of Health and Welfare, Family Welfare, where we do have a vertical that we will be looking at. How do you map health infrastructures.

So that data, the remote sensing GIS data can be used by the Ministry of Health and Welfare, Family Welfare. In the Ministry of Housing and Urban Affairs. Yes, housing is also needed in rural entities. As I clearly mentioned in the previous slides, previous weeks. The housing is not up to mark in some villages and how do you improve that is through the risk ministries activities and what you learn in this course can be used for that.

Ministry of Women and Child Development is an integral part of Rural Development. This ministry does look across rural and urban spaces, and even rural spaces. But most of the need, the demand, high demand or vulnerable population is still in the urban areas because women are needing the support in rural regions more than urban centers, I would say. You do not see, girl children dedicated to go and fetch water in urban centers, but you do see some of them in focused villages where water resources are very limited.

Ministry of Home Affairs is also linked to Ministry of Rural Development, same as Ministry of Personal and Public Grievances, where social impact that we create in rural development schemes can help Ministry of Personal and Public Grievances. There is also Minister of Environment Forest and Climate Change, which again is very much related to Ministry of Rural Development.

You could see food security, the environment, the forest and climate change impacts being discussed in the Ministry of Environment and for forest and climate change. Those are the sub themes that come under rural development also. And last but not the least, the Ministry of Agriculture and Pharma Welfare is also part of rural development because agriculture by rural, it does happen in rural development scenarios.

You do see some agriculture happening in urban spaces, but that is not subsistence farming, which means it is not able to cater to all urban settings. You still need your vegetables, rice coming from rural entities, wheat. So, this ministry is also very much linked to rural development. What percentage, how they interact to each other is the ministry's mandate. But we will be focusing on the first ministry, rural development. But the tools you understand and develop skills on can be applied to all these ministries.

(Refer Slide Time: 26:35)


So, this course is also important for future financing. For example, I have told that there is a lot of funds kept for rural development. So, you as a person can create more understanding and potential using remote sensing GIS tools that can be helping the financing available for rural welfare and agriculture and mostly rural development.

So, yes, we will be catering to the Ministry of Agriculture and Pharma Welfare, but it does and is part of the rural development. More of these infrastructure financing schemes can be found from the National Agriculture Intra Financing Facility, which is part of the Department of Agriculture Farmers Welfare.

Through this course, there is also an increase potential to identify participation and improve the efficiency of schemes. So, some of the schemes are not done purely by the government. It also requires some participation from local partners and farmers. And this mapping exercise can become a tool to identify where such synergies can happen and public participation can be improved. So, for this, there is a need of better data and mapping, which remote sensing and GIS can help, and that is core on this course.

(Refer Slide Time: 28:19)


So, to conclude, rule development is important for India's growth, but there are issues and concerns that exist. To better understand data can help. These issues can be brought to limelight and debated in depth if there is better data. However, data concerns exist better special and temporal data as needed. We do not have such data. Not only here, most of the developing and even developed nation’s data is a key issue for which remote sensing and GIS can aid.

So, next week we will still continue with some introduction in material and remote sensing and GIS tools and how they have been used. You could see multiple bilateral agencies working on rural people's interest and rural development, and there has been a lot of books like this Mapping Rural Development, how to use GIS to monitor and evaluate projects. So, this is a key, key takeaway from this whole course, how you could contribute to India's

growth, how can you contribute to India's ministry schemes and also these kind of big projects that are occurring in India.

And do not, please do not forget that future financing also requires a good understanding of dual development issues for which remote sensing and GIS can be an integral part. For now, it has not been an integral part for preparing the schemes or through the scheme analysis or even monitoring an evaluation. We will discuss scenarios in this course and how to use remote sensing and GIS for rural development.

With this, I conclude today's lecture. I will see you in week 2 lectures. Thank you.