Water, Society and Sustainability
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Lecture – 09
Water Harvesting and Water Use Techniques in Ancient India – II

So, this is in continuation to the previous lecture on Water Harvesting and Water use Technologies in pre-colonial India or Ancient India. And so, in the previous we focused on east and north east and in this lecture I will be focusing on west, north and south.

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So, to begin with west and the famous state of a Rajasthan, the beautiful Jhalara system or the step well you know irrigation system that is still prevalent in Rajasthan today in Bikaner, Jodhpur, Jaisalmer. So, like Rajasthan it is an arid region west it is mostly arid and semi-arid. So, a nearless a near rainless dessert, but then we find that how different a crops including Jowar, Bajra and different other crops, where are cultivated in Rajasthan, through the maintenance of these old water harvesting mechanisms and techniques.

For example, this local dialect called Chahi. So, Chahi means a land irrigated by wells. Now, if we see the villages in Bikaner or Jodhpur for that matter we will find that every household had a well. So, many wells series of wells, network of wells, in Rajasthan mainly in the district of Jaisalmer, Jodhpur and Bikaner. So, there is a particular report and account by Brake and Brockman which was published in 1908 that that provides a

conference of coverage of well irrigation in different parts of Rajasthan. And, it also talks about the use of various you know water lifts or water lifting devices for lifting water from these wells.

And, as I talk about this Jhalaras or step wells. So, is a unique system which was developed in Rajasthan and it is rectangular structure with the so, many you know it is a tired structure. And, Jhalaras were main to collect you know (Refer Time: 02:36) seepage for the upstream reservoir. And, it ensured water supply for religious rights for royal ceremonies and for many other important functions public function as well. So, I mean Jodhpur for example, still it has 8 Jhalaras 8 big and extensive Jhalaras. And, one of the oldest Jhalara is known as the Mahamandir Jhalara in Jodhpur where you can still visit and take a look.

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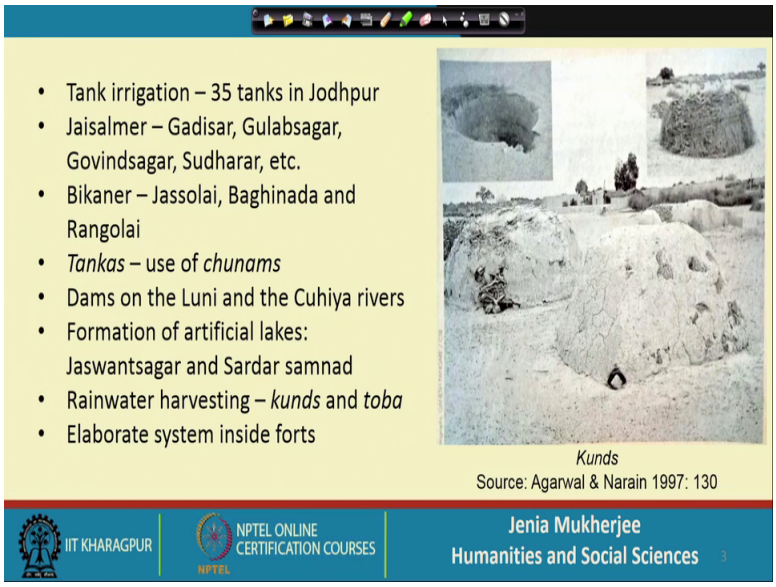

So, apart from wells or step wells we also have a tank irrigation in Rajasthan. And, the Rajasthan again is very much well networked by water reservoirs or tanks. So, for example, there are even now 35 tanks in Jodhpur and Jaisalmer is famous for Gadisar, Gulabsagar, Govindsagar, Sudharar Tanks, but unfortunately what is happening in Jaisalmer today is that for example, we do not have this Gadisar Tank functioning anymore. And, previously while Jaisalmer entire water supply used to depend on tank irrigation or tanks. Now, there has been a change from tanks to you groundwater.

So, now the entire area or entire Jaisalmer, it depends on groundwater supply for meeting the basic requirements including you know drinking water other amenities and also agriculture. So, there has been a change or there has been transformation from the use of a tank as the major or the pivotal water harvesting structure, to the you know increasing reliance and dependence on groundwater. Similarly, these famous tanks Jassolai, Baghinada and Rangoli so, they are no more there in Bikaner. So, they were wiped off from the map of Bikaner which is really an unfortunate story.

So, apart from tanks we have Tankas these are the small water harvesting structures, but mainly used for drinking water. And so, Chunams or Lime was used at I mean so, that you know the water did not get contaminated. So, that was the indigenous mechanism which was used for the maintenance and the storage of drinking water in the Tankas. And apart from that we also have small scale dams not large scale dams like the you know Farakka barrage or for that matter the Kosi Dam or the Hirakud Dam, but small dams you know that had a minimum interruption on the flow of the river. So, we are I mean the during the pre-colonial time ancient times they were dams on the Luni and the Cuhiya rivers.

And, we also have artificial lakes. So, two very important lakes called the Jaswant Sagar and the Sardar Samnad lake are still there, and Rajasthan also dependent on rainwater harvesting. So, again we have an extensive system of the kunds. So, the picture of there is a there are the pictures of kunds here so, kunds are a I mean kind of a excavation on the ground, which was also covered with a lead. So, that the stored water could be protected from contamination and we had another system called toba. So, toba again how water was stored in natural depression?

So, there was also the prevalence of elaborate systems inside forts. For example, if you just take the example of Chittor Fort. So, Chittor Fort itself I mean the inside of Chittor fort is consist of 84 water bodies and of which 22 are existing today currently.

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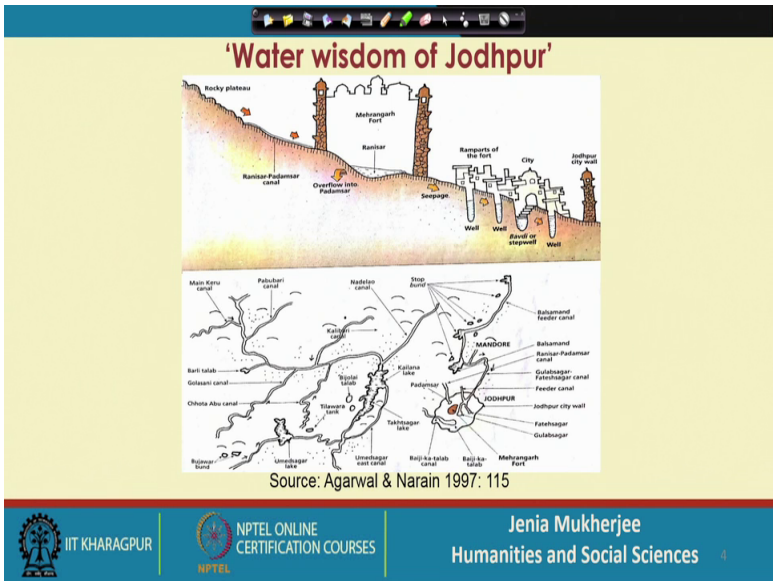

So, this is the snapshot of the 'Water wisdom of Jodhpur'. So, you can see and integrated you know an integrated water system. So, how you know the canals, the barns, the wells, and the tanks, they are all you know embedded and integrated as a single system for you know for irrigation purpose in Jodhpur and, also for other purposes including the supply of drinking water and all that.

So, you can find the name of these different canals and also the talabs some of which still exist. And so, this is known as the water wisdom of Jodhpur, because how they could they were not depending on a particular or a specific water structures? But, how they concentrated on integrating this different water structure? For a continuous supply of water for the purpose of both you know agriculture and drinking water.

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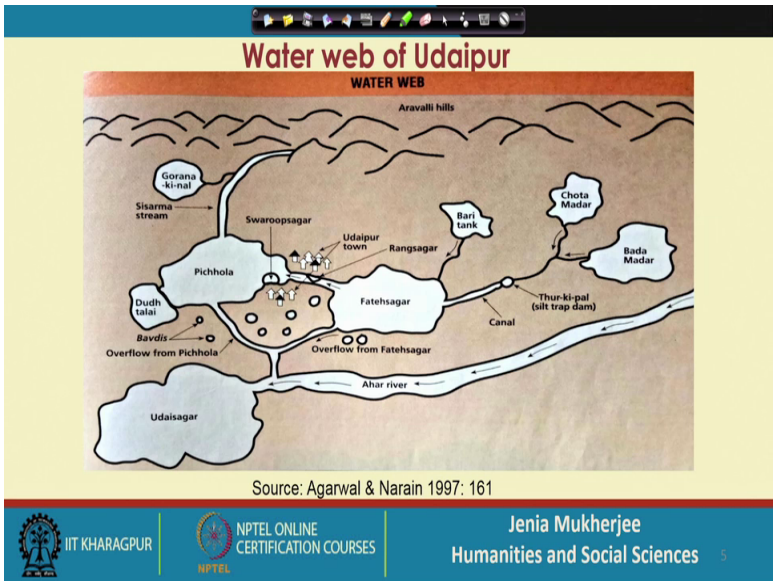

So, this is the another very interesting diagram on the water web of Udaipur, Udaipur is also a very famous site for I mean so, far as water bodies are concerned. So, it is a beautiful waterscape. And so, if you see that this is again a complex integrate web, where we find this that there are 3 major waterscapes: the Pichhola, Fatehsagar and Udaisagar. And, these 3 are again connected with each other right.

Because, the Sisarma stream it important water to Pichhola, and then the Bari tank the Chota Madar and the Bada Madar, it fade Fatehsagar and, then the Ahar River the major river in Udaipur. So, one of the major rivers in Udaipur called Ahar apart from Muharram. So, the Ahar River it fade Udaisagar, but then if you can see how the how these 3 waterscapes are connected to each other? So, this particular you know structure or the way it was designed, it was extremely vital for the lifeline of Udaipur, but unfortunately we do not have this system anymore.

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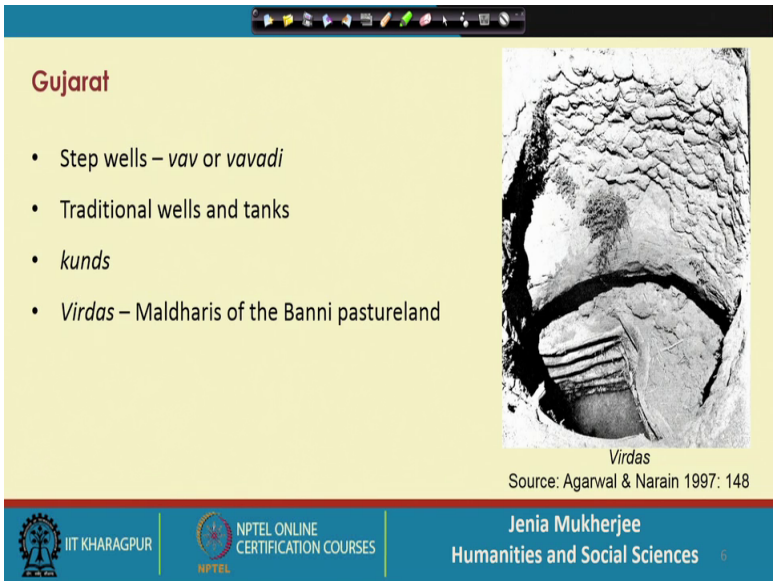

So, now coming to Gujarat like Rajasthan in Gujarat also we have this step wells, but they are not called Jhalaras, but in Gujarat the in local dialect this step wells are called vav or vavadi. So, again there is a history of the traditional wells and tanks in Gujarati. And, in the folk songs and the folk (Refer Time: 09:45) of Gujarat. We have the mention of these wells and the different functioning's of these wells, how it was very much connected to the social life and social fabric of the state of Gujarat.

So, apart from wells and tanks there was also the kunds, again that particular I know kind of an artificial excavation or a kind of a pond with a lead. And, along with kunds also in Gujarat there was the prevalence of virdas. So, virdas it is a it was a system developed by one of the tribal communities called the Maldharis who were mainly the inhabitants of the Banni pastureland. And, the virdas is also a very interesting system and when we will be discussing you know, we will be entering into the debate.

You know regarding whether, the pre-colonial system, the water harvesting systems were absolutely, environmentally benigned and socially, accommodative or not you know compared to the colonial hydraulic design and the management, then we will learn about virdas in greater detail. But, for now it is important for us to know that the we find numerous virdas even today. And, these Maldharis they are also not only involved in a excavation of virdas, but they are was involved in the repair and maintenance of virdas.

So, it is a system absolutely again owned and managed by the Maldharis of the Banni pastureland.

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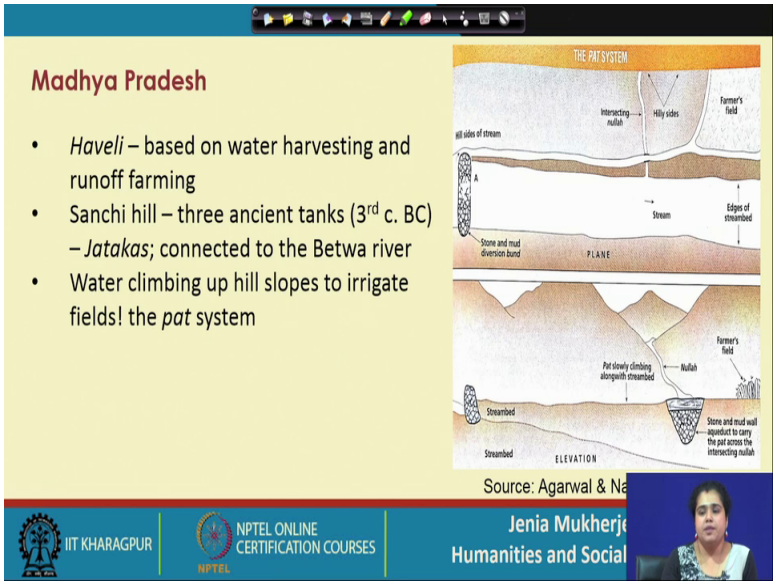

So, Madhya Pradesh, Madhya Pradesh is famous for the Haveli system. So, Haveli is a kind of an you know agricultural practice, it is totally based on water harvesting and runoff farming. So, a Haveli again fortunately still very much prevalent in the different villages of Madhya Pradesh and so if we again focus on the sanchi area the Sachi hill. So, there tanks are still there. So, and which were excavated much earlier, it gets back to the 3rd century BC. And, the mention of this tanks are there in the Jatakas. And these tanks were connected to the Betwa river. And, another interesting thing is the pat system, I do not know how to pronounce like pat or pat whatever, but the pat system maybe so, so, water climbing up hill slopes to irrigate fields.

So, this was a seaming defense of the law of gravity. Because, how could water you know climb up hill slopes to irrigate fields? So, the pat system, it was a system again you know a very interestingly developed by the (Refer Time: 13:31) the (Refer Time: 12:31) tribal's of a Madhya Pradesh. Through which you know they actually could make water climbed up to the hill slopes. And so, the pats we can again see the illustration here and you can this is the technically it is available, I mean the technically these are reflected in the illustration itself. So, where we find that how you know water from the from the from the stream flowing through the hills were diverted to the irrigation fields.

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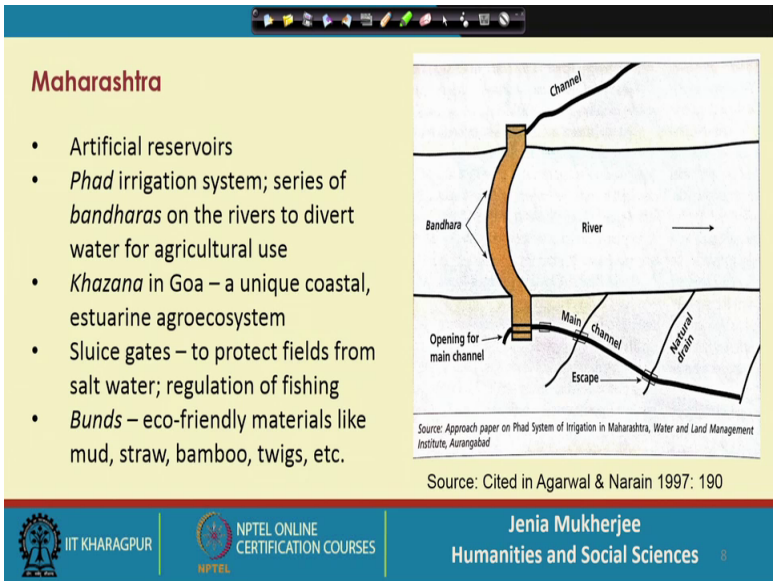

So, Maharashtra, Maharashtra also numerous artificial reservoirs and the very famous phad irrigation system; so, phad irrigation system it was also depend it was also dependent on dependent on the bandhara. So, the bandhara the these kind of a structure for water storage. So, and the so, the bandharas on the rivers used to divert water for agricultural use. So, you can see that the main channel or the main canal connected to the river. And, how it brought water to this bandharas? And then finally, how you know water was stored in this bandharas? And again how through the outlet channel water was diverted to the agrarian fields?

So, this was the famous pat system prevalent in Maharashtra. And, apart from that Goa is famous for it is Khazana system again a unique coastal, estuarine agroecosystem. Why it is called a an estuarine agroecosystem, because like several other water harvesting techniques, Khazana is also a system that you know integrates forestry, vegetation, Ecology River and all that together.

So, and also this is a very important you know. So, far as the specificities of the goan climate topography are concerned. So, in Goa in the Khazana system we also find the use of the sluice gates. And, these gates were very important the construction of the sluice gates were very important, because in order to protect the fields from saline water. Because, being situated on a coastal region it was important that you know saline water and freshwater did not get mixed or intermingled.

And the so, it also has a social history very interesting social history by which we see how this you know sluice gates, were operated to regulate fishing activities in this areas. And, the you know Goa is a bunds rather bunds are known as the greatest community asset for Goa. And, the this bunds were I mean constructed of eco-friendly materials like; mud, straw, bamboo, branches, twigs, and there were also mangroves on the bunds so, for better protection. So, again as I mentioned that that it is an it is a kind of an integrated you know agro ecosystem. Where, we find that all these very important elements of ecology were integrated together.

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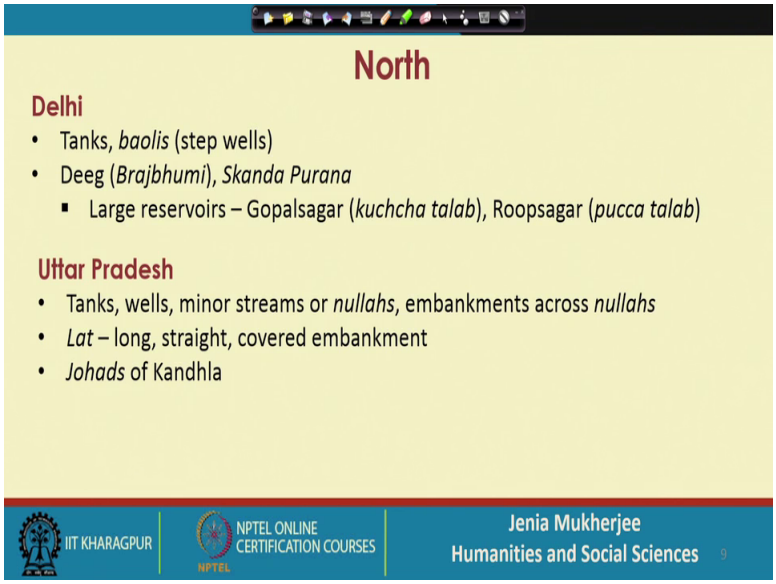

Yes. Now coming to North I will not very much focus or emphasize on north, while I will be talking about you know water harvesting techniques or mechanisms in ancient India. The reason being that Delhi or Uttar Pradesh or the entire North West frontier province, it is very important to focus on North West frontier province; so, far as medieval India was concerned. Because, like I mean all the very important water harvesting techniques came up during the sultanate and Mughal times.

So, for example, extensive systems like the sakai use of sakai (Refer Time: 16:38) (Refer Time: 16:38) and all that, these actually emerged during the rule of the medieval rulers or the medieval monarques under the sultanate and the mughal dynasty. So, I would be mainly focusing covering a lot on north and north east frontier province, while I will be

discussing medieval India. But so, far as you know ancient India is concerned of course, Delhi is also Delhi, Delhi had the Baolis or the step wells.

And there is an area called the Brajbhumi which is the you know kind of a sent (Refer Time: 17:11) north central part of Delhi. And, the mention of Brajbhumi is there in the Skanda Purana. And, we get to know that this particular area had a very big or large reservoirs both you know kuchcha talab and pucca talab. So, the famous reservoirs some of even exist today like the Gopalsagar and the Roopsagar.

So, yeah coming to Uttar Pradesh again tanks wells minor streams or nullahs, embankments across nullahs these are the some of the you know oldest water use techniques that are that were there in UP. And apart from that we have a unique indigenous specific up system which is known as the lat. So, lat means is this long straight covered embankment and then of course, the Johads of Kandhla.

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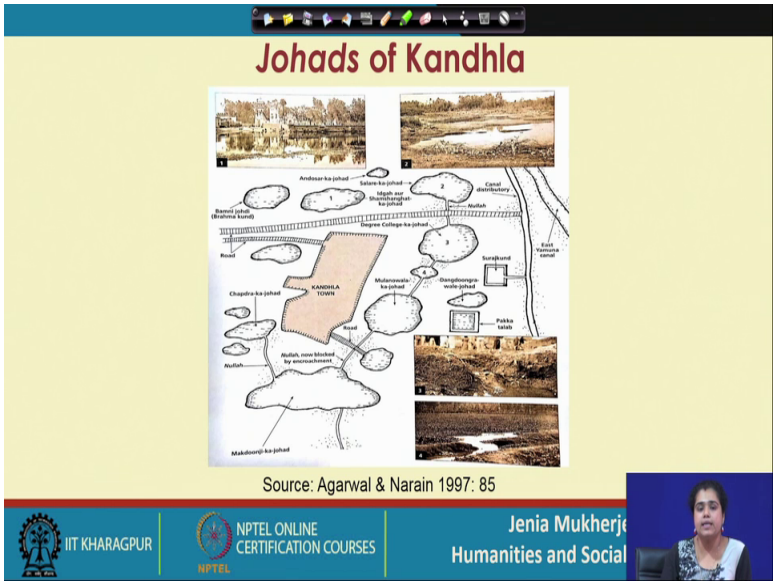

So, Johads were also used as fertilizer plans. So, that is why there are so, famous and this is an illustration again from the particular book called (Refer Time: 18:39) wisdom. So, you see again nullahs and the bunds and canals and they are distributed how it was in telling to the Yamuna river. And, the Yamuna canal system and, but unfortunately it is I mean it is still there, but it has decayed like anything.

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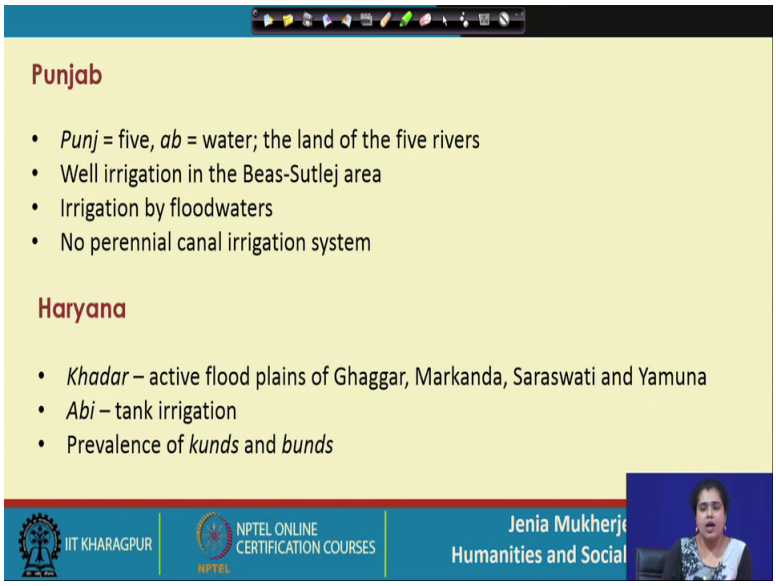

So, coming to Punjab, Punjab we all know that it is the land of the 5 rivers the Indus and it is 5 branches or channels and streams. So, well irrigation is was very much there in the Beas-Sutlej area and Punjab in Punjab also like Bengal and Orissa we find irrigation using flood waters. So, if not over flow irrigation, but at least floodwaters was used it was tapped. And so, the alluvium was retained and flood water are very much used to irrigate the paddy fields mainly.

And of course, there was no perennial canal irrigation system in Punjab. So, later when we will be focusing on colonial hydrology we will see, how the old you know well irrigation system, how it got replaced by the perennial canal irrigation system? And, what had been the if you know impact or implications of that on the ecology and society of Punjab.

. So, Haryana again there is a local dialect I mean local term called Khadar which means the active flood plains the Ghagger basin. So, Ghagger and also other rivers like the Markanda Saraswati and Yamuna. And, Haryana is also famous for it is Abi tank irrigation again an integrated system that integrates the tanks and wells and canal and finally, connected to the river. So, kunds and bunds exist in Haryana till today though the numbers have been decreased.

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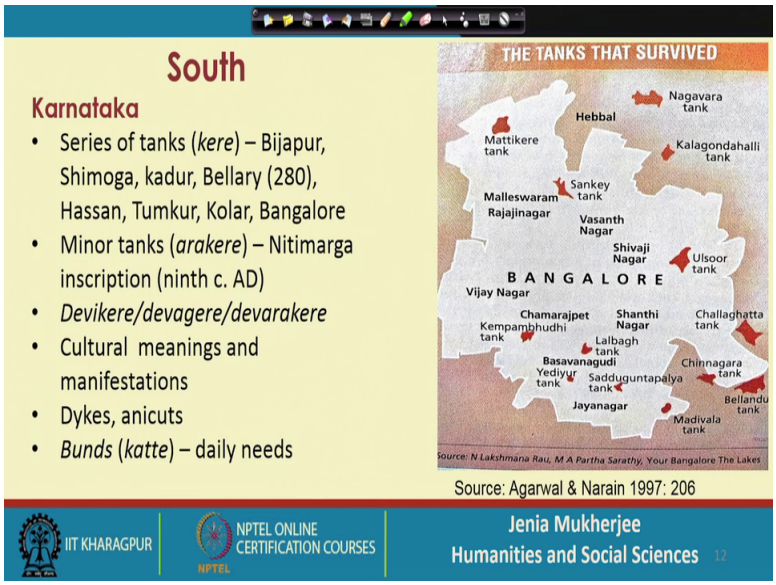

So, coming to south very important region and extremely famous for it is series of tanks. So, the extensive tank irrigation system and richly loaded with also cultural history, social and cultural history. Because, again when we will be moving on to the debate about you know ecologically malline verses ecologically benign, socially accommodative verses socially disruptive.

So, we will be talking about the tank irrigation system of south India. So, lots of interesting researches have been conducted on the tank irrigation system of south India. So, tanks they were known as [FL] in the local language and in Kannada I guess and so, we have the series of tanks in Bijapur, Shimoga, Kadur Bellary so, Bellary is like 280 tanks have been mapped and Hassan Tumkur Kolar Bangalore Bangalore is known as a city of tanks.

And apart from [FL] so, [FL] are the big tanks the large tanks. There are the minor tanks called the school ara [FL]. So, the nitimarga inscription of ninth century AD about this minor tanks or the arakere and, this there are other terminologies like Devikere or devagere or devarakere. So, that talks about the association between tanks and temples in south India. So, the tanks and the history of tanks and history of temples are very much interconnected. So, as far as south India is concerned so, we have these terminologies as well. And so, as I mentioned these tanks are richly loaded with cultural meanings cultural history and cultural manifestations. So, apart from tanks there were dykes and Anicuts

and bunds or katte which where water was stored for the daily needs washing, clothing, bathing and all that.

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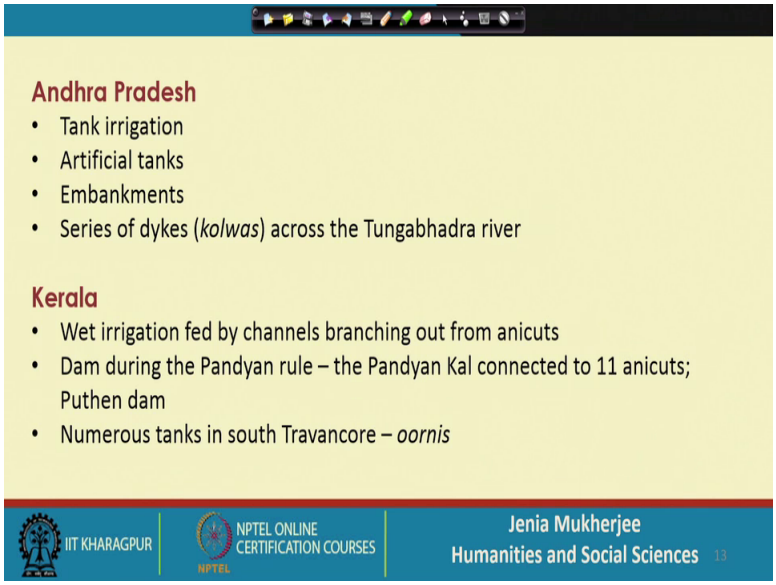

So, Andhra Pradesh also series of dykes called Kolwas across the Tungabhadra river basin and also series of tanks bunds or embankments artificial tanks and Kerala is famous for it is wet irrigation. So, wet irrigation fed by channels branching out from anicuts right. And, few dams even little large scale dams were built during the rule of the Pandyas. So, during pandyan rule we have this famous pandyan kal connected to 11 anicuts.

So, you can imagine how extensive the system was so, apart from the pandyan kal there is also the puthen dam. And of course, like Madhya Pradesh and Karnataka, Kerala also had numerous tanks and we I mean numerous tanks have been found out and identified and mapped in south Travancore. And, specifically in this region of south Travancore tanks are known as oornis.

So, oornis are these are not big tanks or large tanks, but they are small tanks. And so, like I mean the structure of tanks is quite different from the structure of tanks in Tamil Nadu or Karnataka. The reason being Kerala, it is I mean the topography is was quite what to say yes? So, the topography was quite undulated. And so, unlike Tamil Nadu, it did not have I mean large scale flat space. So, the size of the tanks are seemingly small compared to Tamil Nadu, Karnataka and Andhra Pradesh.

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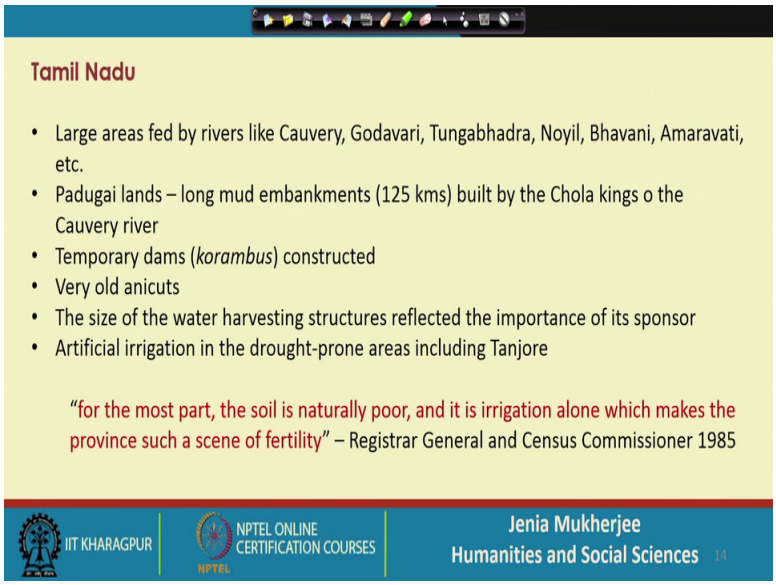

So, finally, coming to Tamil Nadu large areas were fed by rivers like Cauvery, Godavari, Tungabhadra, Noyil, Bhavani, Amaravati. So, many major rivers you know is crossing Tamil Nadu. So, again we have this padu Padugai lands. So, which of again were these structures long mud embankments were constructed very long. So, stretching at least 125 kilometers and these were built during the days of the Chola rule. So, built by the Chola kings on the Cauvery river and we also have the temporary dams. So, which were reconstructed annual. And so, these were called korambus and very old anicuts are there still existing in parts of Tamil Nadu.

And, again very interestingly like if we go through I mean some of the works by or researches by environmental historian or water historian and like David moss. We find that there is a relation between the size of water harvesting structure and the importance of a sponsor. So, he says that the size of water harvesting structures reflected the importance of it is sponsor. For example, the kings they actually sponsored this big anicuts. The local chives they sponsored tanks. And the private individual say actually sponsored well. So, by looking into the water harvesting structure, you can actually find out the pattern of sponsorship in there in different parts of Tamil Nadu.

So, we also have artificial irrigation in the drought prone areas including Tanjore. And so, from I mean the registrars general and census commissioner mentioned in 1985 that for the most part the soil is naturally poor. And it is irrigation alone, which makes the

province such as scene of fertility. So, we can understand the importance of irrigation. The divergent system of irrigation, again small scale cost effective eco-friendly irrigation mechanisms that ensured fertility of Tamil Nadu.

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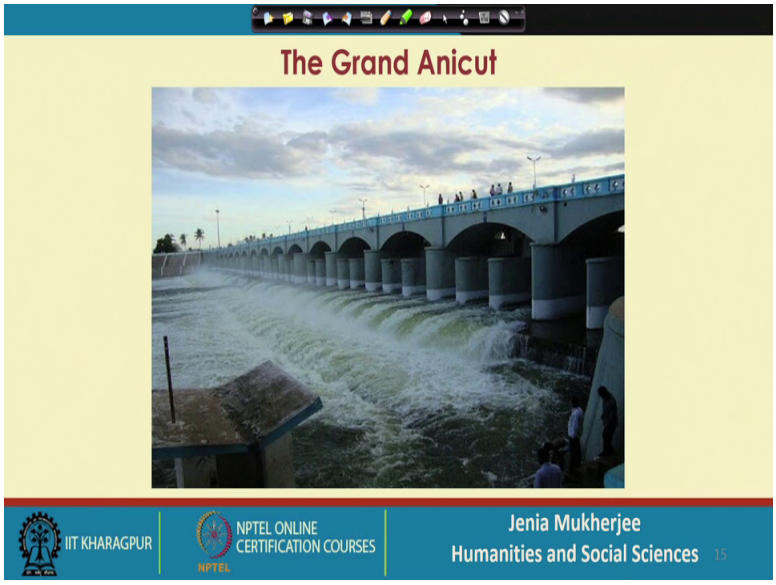

So, this is the Grand Anicut which was built by Karikala, second century AD this still there a very big structure.

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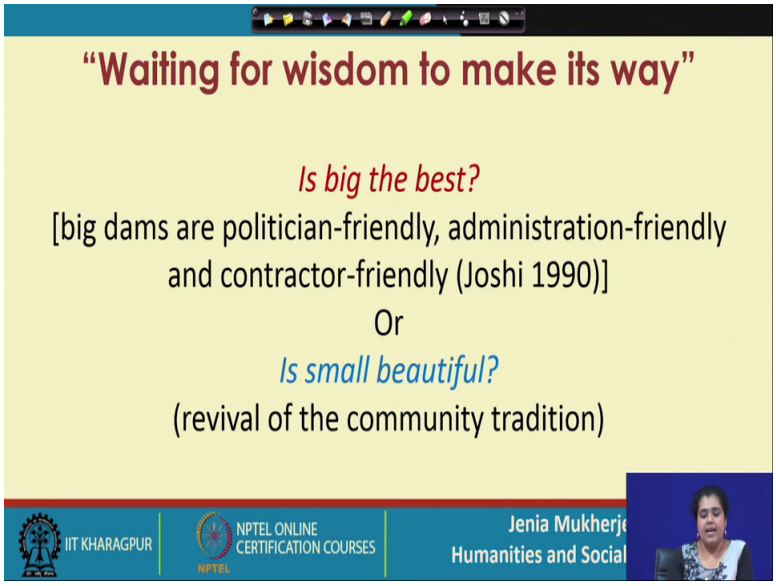

And so, finally, waiting for wisdom to make it is way ok. So, we can get engaged into a debate whether like is big the best or is small beautiful. So, I mean Joshi he mentioned in

1990, that a big dams were very important for independent India. Especially during the (Refer Time: 28:15) region, because they were politician friend they still are politician friendly, administration friendly, and contractor friendly this is very important

So, how it benefits the multiple stakeholders including the politicians and the contractors and administration? So, a very interestingly there is a kind of a promoter politician nexus in the construction of dams. So, we find that during immediate post independent period, how the different I mean how so, many large rivers were immediately damed. And, so, many dams constructed throughout the length and breadth of the country.

And, unfortunately the traditional harvesting systems to a great extent were replaced by large hydraulic structure. A thing that actually a phenomena that started since the colonial rule the colonial region, but fortunately you know again since the 1980s later part of the 1980s and 1990s many NGOs and many grassroots organizations and even the government I mean to a great extent mobilized.

So, many river experts or water experts they are also involved in the whole affair, where people and actually trying to think about the revival of the you know community tradition. So, in different parts of India also we find restoration of the different water harvesting techniques. And, to I mean mobilize this across scales. So, there are a few success stories which will definitely covered in this particular course on water society and sustainability. That help us critically interrogate, that big is not always beautiful. It is also important you know to believe in the (Refer Time: 30:04) or to believe in the wisdom that small is also beautiful sometimes.

Thank you.