Water, Society and Sustainability
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Lecture – 02
Beyond hydrology

So, this is the second lecture, entitled Beyond hydrology. So, in this particular lecture, I would be covering like why we need to go beyond hydrology today? To understand water research, to understand water science and to understand the relationship between water and society again, towards sustainable future which is the you know sole aim of this course.

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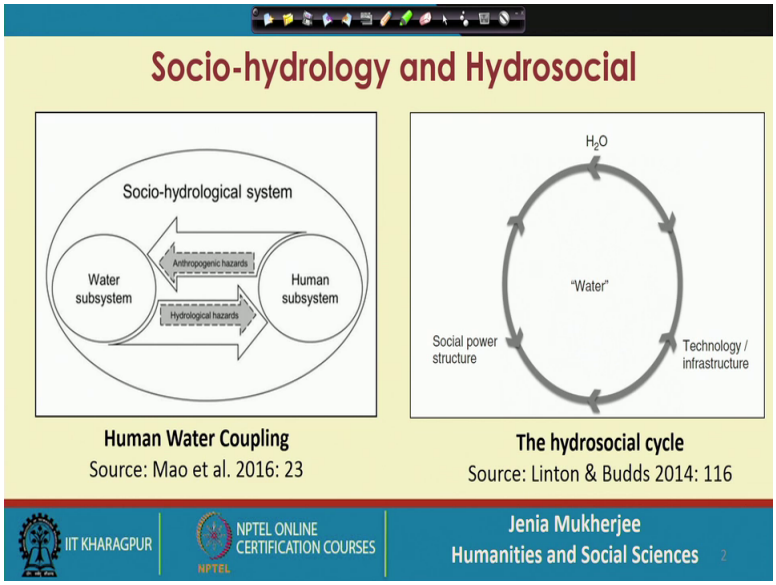

So, as I mentioned in my overview lecture, the previous lecture setting the context that very interesting emerging frameworks are coming up today in both natural sciences, physical sciences and also social sciences. So, you can see the first diagram which is called Human Water Coupling.

And here, it is all about the social hydrological system or the social hydrological research, where researches are actually or the natural scientist more specifically, they are incorporating society with in hydrological research. So, will discuss in detail about social hydrology in our next lecture; where, I will be introducing you with you know the cases,

the case studies, the case researches and also the you know the method, mythologies followed by hydro social hydrology today.

On the other hand, if you look into the second diagram it is all about The hydrosocial cycle. So, very interesting and strong development within a social science research; most specifically within the political ecology of water research in the contemporary times which actually talks about the I mean how water and society makes and remakes each other over space and time.

So, these are the very two interesting emerging frameworks that have come up in the contemporary times which help us and this is which help us go beyond or which enables us go beyond the hydrological framework within water science or water research.

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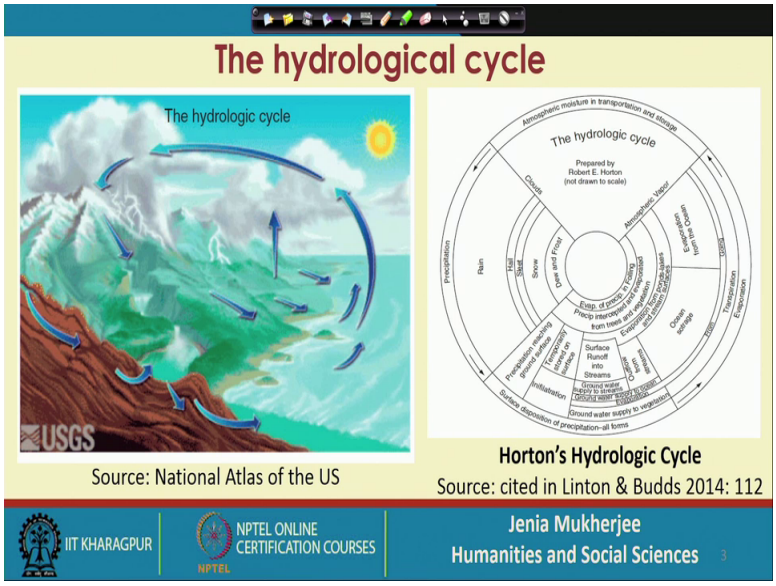

So, this is the famous hydrological cycle as all of us are aware of and this hydrological cycle was designed and conceptualized by Robert Horton, a very renowned hydrologist who is also known as Father of Modern Hydrology.

So, he came up with this diagram, with the cycle in the 1930's and. So, it explains the natural circulation of water in on an over the earth surface and what is most interesting and important in this drawing or in this diagram is that so it says that the water cycle or the water engine actually it function in its own way. So, it is fuel by solar energy and it is driven by gravity and it proceeds endlessly with or without human activities.

So, human activities could can be present or human activities can be absent; so, the absence or presences of human activities actually do not matter. So, what is more important are the technical components within the hydrological cycle. For example, you know transpiration, evaporation, precipitation and all these other physical components within the hydrological cycle.

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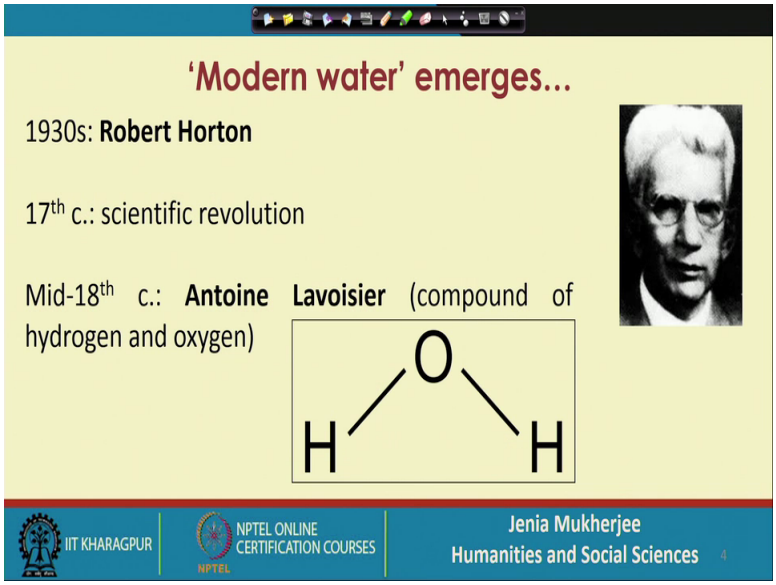

So, it does not take into account at all the human element or you know the social science component that is otherwise imprecated in the water cycle. So, again, a little bit on the hydrological cycle and more importantly how hydrological cycle had played a very important role in the emergence of what is known as Modern Water.

A very interesting paper has been published recently in 2010 by Jay Lenten and the tile of the paper is 'What is water? The history of modern abstraction'. And there Lenten says that you know hydrological cycle has given birth to modern water and these ideas has continued, has sustained for many decades at least till the 1980's.

So, what is this modern water is all about. So, modern water is the dominant and hegemonic way of knowing water and relating to water which reduces water you know to single substance and which render water as commensurable that is measurable. So, interesting enough this idea, it can be it actually takes back to the 17 century, the very important period in human history.

So, the era or the period of the scientific revolution because I mean in this particular period, it was decided and it was said it was actually announced that nothing will be considered scientific if it cannot be quantified or if it cannot be measured. So, nothing is scientific or nothing is knowable unless and until it is quantifiable; unless and until it is measured.

So, and this entire idea of you know measurement or this entire quantitative idea to a great extent you know laid to the laid to the what to say, laid to the separation of all other scientific activities beyond these era as so called quote unquote in exact or non exact sciences.

So, again if we consider mid 18 century; then, mid 18 century can be considered as one of the vital movements as one of the significant time period or a historical movement yeah so far as modern water is concerned because something interesting took place in the laboratory of Antoine Lavoisier.

Because Antoine Lavoisier is a person who for the first time reduce water into compounds of hydrogen and oxygen. So, these whole idea that water is nothing but H 2 O into a great exchange owes to Antoine Lavoisier and his experiment dated you know mid 18 century; so, implications and legacy.

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What had been the implication and legacy of the emergence of modern water which is again you know one of the outcome of the hydrological cycle. So, water had actually been reduced to a ‘ resource which can then be ‘ managed , controlled and hence quantified

So, Bakker, again a very renowned social scientist Karan Bakker, he led evaluation of particular term or terminology which is called the state hydraulic paradigm. So, Bakker says that modern water as it can be measurable, as it is measureable and as it can be quantified; so, now, what happened is that the supply or the development of water supply entirely went to the hand of hands of the state.

So, the state became responsible for supplying water to the people and so and the government agencies, they became deeply involved to you know engineer to control and to manage water resource with some tangible deliverable outcomes. So, these outcomes are the construction of massive infrastructure, big infrastructure, large infrastructures like for example, dams and also large infrastructure, large utility infrastructure like the piped drinking water. So, what are the major shortcomings in this?

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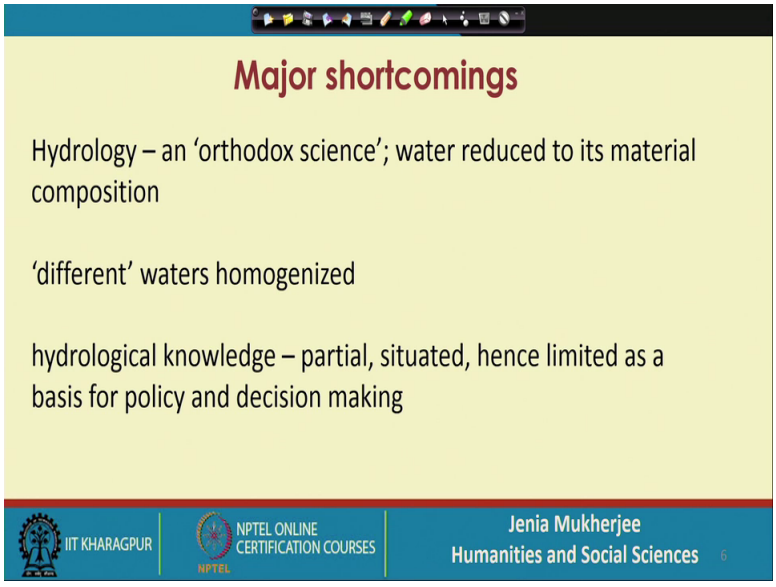

What are the problems relating to this kind of discourse, you know there as the discourse relating to modern water that is which is the outcome of hydrological cycle. The major shortcomings at this that water then and then had been reduced its material composition H 2 O.

So, to an extent it will not be an exaggeration to say that hydrology is actually a reduction science; it is an orthodox science and different waters where different waters have actually been homogenized. So, water has been abstracted; water has been different waters have been abstracted from the local context, from the social context, from the cultural context and also from the ecological context. I will explain this in next slide again.

So, again the major challenge or the major shortcomings of this discourse is that here hydrological knowledge seems to be partial incomplete it is situated and hence, these kind of a situated or partial or an incomplete you know discourse or knowledge had laid to severe implication so far as policy making or decision making has been concerned; because these had laid to lock sided water management schemes or initiatives leading to environmental disasters social disruptions and also political protest.

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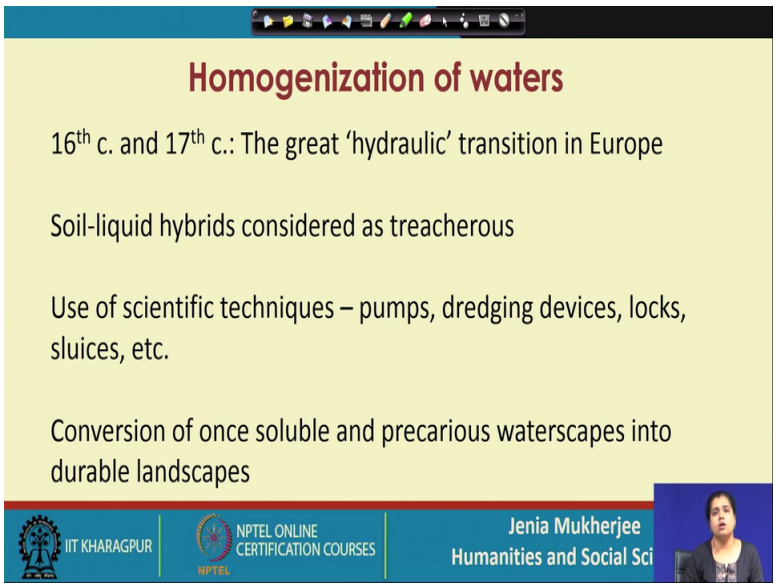

So, as I was mentioning about different waters and homogenization of different waters. So, the 16th - 17th century, this is also very important because you know if you look into what happened during this time period if we if we take little bit of history I mean across the centuries 16 - 17th century, then we find that this is the period when Europe was actually making a transition from the a medieval to the modern age and so there was change and there was a shift from the feudal mode of production to the capital this mode of production and this was also the era of scientific revolution, the era of you know

transport revolution ah, agricultural revolution, demography revolution, commercial revolution.

So, here I would like to highlight on you know 16 and 17 century as also the era of agricultural improvement. So, this is known as the great transition 'hydraulic' transition in Europe. The era of the great hydraulic transition, why? Because, for the first time land separation was affected between land and water. So, solid liquid hybrids, for example, marshes; for example, fin lands; for example, weight lands, these were all considered as treacherous.

So, what happened is that we find during this time that is 16 - 17 century numerous innumerable reclamation, drainage, sewerage and embankment schemes were initiated in for example, the is East Anglican Finlands or Italy or the coastal regions or the coastal deltas of the low countries like Netherlands and scientific techniques or hydraulics techniques and hydraulics equipments like pumps, dredging devices, locks, sluices were used to convert and transform ones soluble and precarious waterscapes into durable landscapes.

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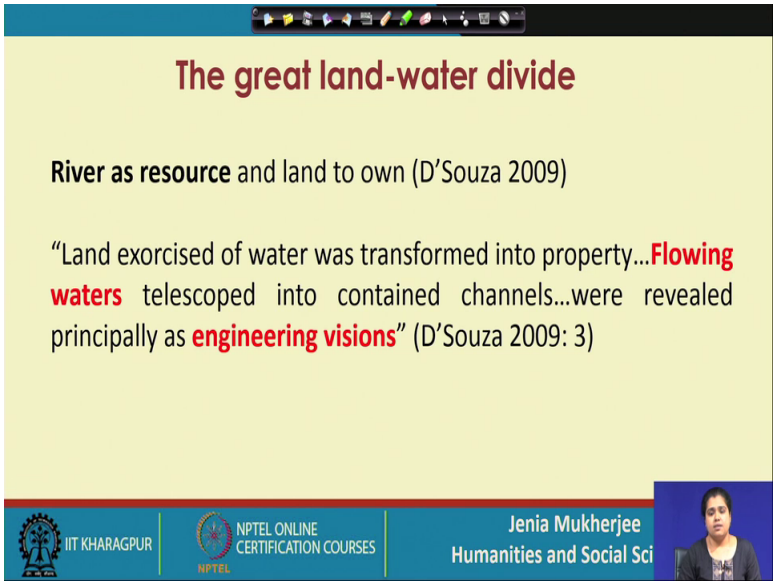

So, as I mentioned that a great separation was affected between land and water. Rohan D'Souza, he elaborates on this particular point when he focuses on what happened in Eastern India during the colonial times because he says that these hydraulic knowledge

was also it not only (Refer Time: 12:02) restricted within Europe, but it was also transplanted in the colonies including India.

So, he as written a paper called River as resource and land to own which was published in 2009 and then, he shows that how different experiments were carried on by the engineers, by the hydraulic engineers and very much propagated and very much very much you know the dictated by the state how the Mercies and Finland and the soil liquid hybrid spacious in Europe where converted into durable territories that is land from where revenues could be easily extracted by the state.

On the other hand, how water began to be treated as flows and increasingly sought in content channels. So, this was the rights land exorcised of water was transformed into property and flowing waters telescoped into contained channels were revealed principally as engineering visions.

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So, what was the outcome? The outcome is that, these regions or these areas like the wet lands or the marsh lands or you know the Finlands, the Bog lands if we use the Bengali delight or if we use the Indian delight like there are some areas called Chores which are mainly prevalent in lower courses of deltaic rivers. For example, we have chores or we were in Islands in Bengal, in west Bengal for that matter. So, all these areas these were ignored, you know to be having of any value.

So, these areas were regarded as structural; these areas where regarded of no significance to the state; because, they were not important to generate revenue. The state was only interested in agricultural land which could provide them lot of revenue through which they could earn profits; on the other hand, the state was also interested with rivers because rivers would enables the state to provide water utilities and river would also enable the state to generate hydro electricity and so on and so forth.

So, all these areas which were neither land nor water or which were partly land or partly water the complex realities in these so called land waterscape were absolutely ignored. So, beyond reductionism.

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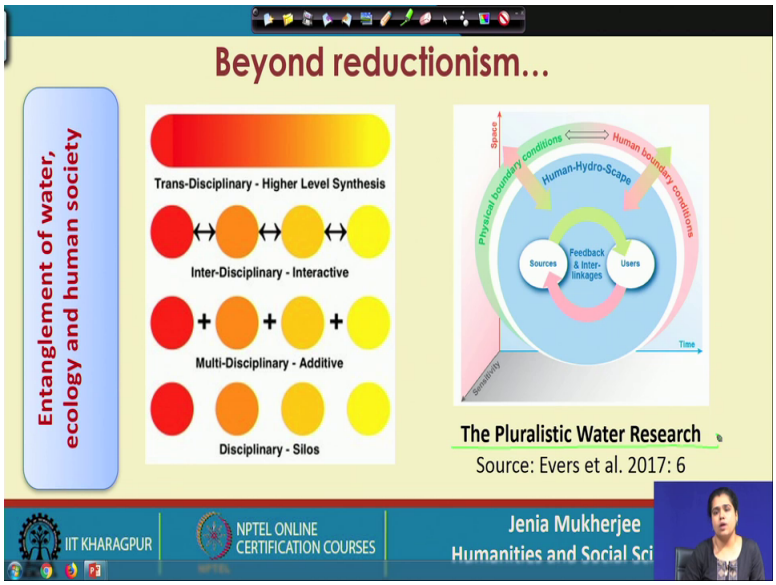

So, what I want to highlight or emphasis is that if we perceive water research or if we try to understand water by looking into only you know by basing on knowledge only hydrological research, then we would actually miss lot of complexities; we would actually miss lot of realities which are otherwise very much there within water or the complex water society, inter relation and water society embeddedness you know not only during contemporary times, but which had been there since times in memory.

So, modern water one of the fundamental differences between modern water and pre modern water is that while modern water, it has tried to you know make water undifferentiated that all waters are similar; all waters are the same H 2 O, nothing else.

On the other hand, if we really go back to history, if we look into pre modern water that is before the you know conceptualization of the hydrological cycle; then, will understand that for example, different tribal communities or different ethnic communities, they had understood water in very different ways.

So, there are very rich and interesting cultural context that had been added to water. For example, if we go through or if we take a look into some of the sources; sources that are represented in the form of cultural artefacts.

For example, you know pictures, a paintings in mud walls of the tribal houses or you know the different stories the folk tales, folk narratives or for example, the you know ink prints in the cloths etcetera. These artefacts the cultural artefacts a thickly loaded with different meanings of water.

So, while modern water looks into water as you know undifferentiated; pre modern water looks into water as differentiated; water different, waters having different meanings, having different cultural connotations, having different social realities. So, things are not reduced to quantities, but things definitely have their qualitative values and insides. So, this is what I want to highlight by saying you know by uttering this particular phrase that is beyond reductionism.

Because hydrology to a great extent it is really a reductionist prospective which you know only enables us to understand water in a very linear way; on the other hand, today if we really are able to come up with an integrated trans disciplinary prospective on water; then, we will be able to integrate and combine prospection and understandings relating to water from different fields of discipline. So, if you can see this or look into the picture.

So, this is disciplinary Silos. So, Silos means like these are all isolated; you see there are no connections among this. So, this is the disciplinary approach, where different disciplines they actually do not talk to each other. On the other hand, there is these multi disciplinary approach. So, multi disciplinary approach means here the scholars, they try to you know combine some of the ideas or knowledge system from different disciplines. So, one different ideas plus another disciplinary ideas or combination of several disciplinary ideas and knowledge system.

Then, there is this inter disciplinary framework which is actually interactive. It means that the different disciplines actually talk to each other; they talk to each other. They exchange their methods, mythology; they exchange their knowledge, their ideas all that. So, that is inter disciplinary idea or the inter disciplinary interactive framework. But our aim our target is Trans the Trans-Disciplinary integrated framework, what is that?

So, trans-disciplinary means how it is different from Inter-Disciplinary. It is actually different from inter-disciplinary in two ways. So, inter- disciplinary means for example, with in social sciences, there can be combination of approaches from history, anthropology and other social science discipline. Again, inter-disciplinary also means with in natural sciences, there can be combination or exchange of methods mythologies within for example, physics, chemistry and other natural science subjects.

But trans-disciplinary means that there would be combination and exchange and integration of different you know disciplinary frameworks from both natural sciences and social sciences and there would be a higher level of synthesis. So, you can see that all the disciplines here, the all the disciplines here they have become integrated, as a composite whole. So, they are not separate parts like this like for example, so in case of inter disciplinary interactive frameworks.

But they have become totally integrated and it was evolve as a composite framework. So, our target is actually to evolve a trans-disciplinary framework in river research a trans-disciplinary framework in water research. So, that we can understand or we can capture multiple aspects in the inter relationship between water and society which is the need of the our today.

So, this is another diagram the pluralistic water research which Evers et al. Evers and his colleagues came up with in again a very recent publication in 2017 and this is an example of trans-disciplinarity where you know Evers are try to combine all the knowledge system inherent in the different disciplines relating to water research and river research which he called Pluralistic. So, he could understand.

So, it combines the multi layered multi liner understanding and perception on water. So, it is not you know it is not informed by any singular discipline, but it is informed by plural disciplines across both natural and social sciences.

So, this is the target that how we can really you know evolve towards a pluralistic river research not you know by focusing on you know different disciplines or rather you know hydrology being single handed discipline or not even multi disciplines, but you know combination on integration of different discipline to a composite whole towards what is known as pluralistic water research.

So, these would be our agenda so that you know because previously, we are seen that hydrological cycle it has been used you know it has played the role or I mean it has been use us as epistemological tool to disentangle water from its ecological functions and to descendant in tangle water from society. So, our role would be to re entangle water with ecological and also a societal components.

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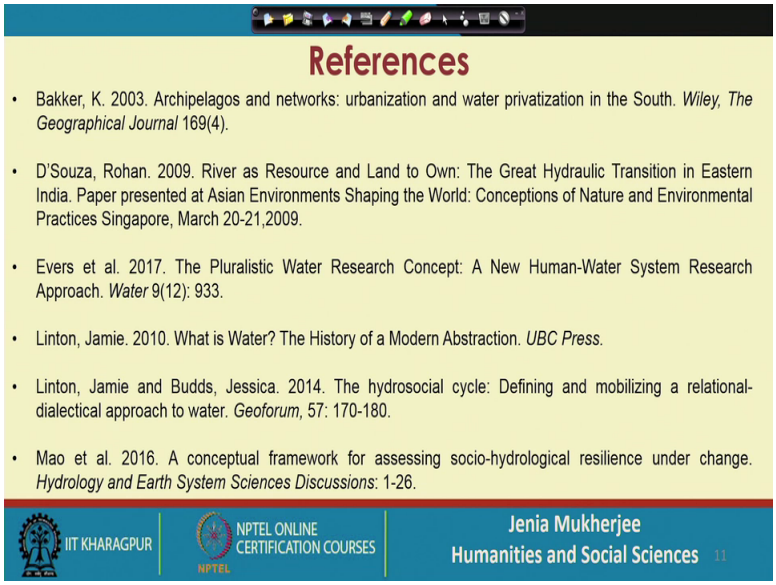

So, these are the some of the very important references for these particular topic and most important being the Devoxx by Jamie Linton and Jamie Linton Jessica Budds so in 2014 an entire issue came up on the hydrological a hydro social cycle.

So, which absolutely you know criticises the hydrological cycle and says that today within the era of anthropocene no more we should or no more you know anybody practising water research or anybody involved in a water research should be only informed by hydrological cycle. Because it is incomplete, it is partial and it is situated. So, there has been a shift. So, one needs to really take into consideration, this particular shift from hydrological to the hydro social cycle.

So, these are some of the references which we need to go through which would provide you clear idea that why today we really need to go beyond hydrological research in order to understand rivers, in order to understand water and in order to understand different waters across the different parts of the globe and also take into account not only the understanding and perceptions of scholars and experts, but also understanding and perception of local communities of you know local ethnicities, who also live close by the river system who also inhabit riparian environments.

Thank you.