Conservation Geography
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Module - 12
Special topics in Geography and conservation
Lecture – 36
Valuation of natural resources

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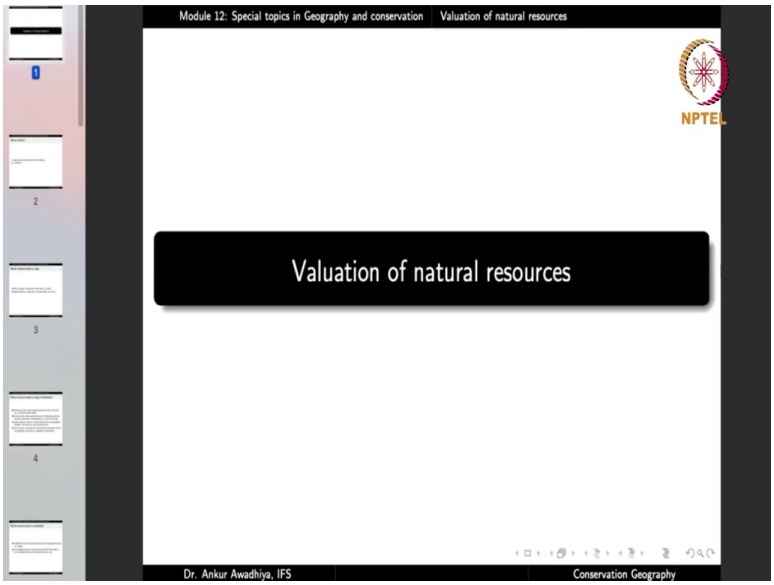

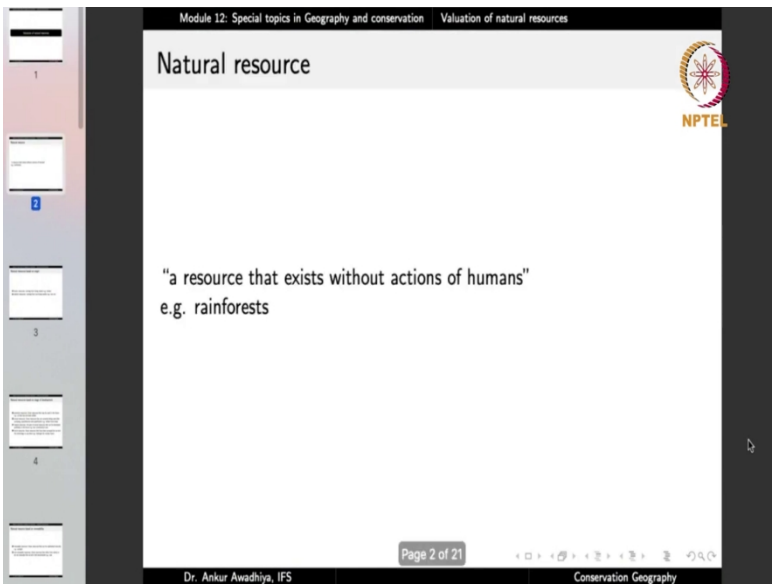

Namaste! We carry forward our discussion on special topics in geography and conservation. And in this lecture, we shall have a look at valuation of natural resources. Now, we have observed before, that natural resource is a resource that exists without the actions of humans. And a good example is forest or rainforest or wildlife. Now, the forests are going to exist whether we do something for their benefit or not. The humans only have the power to exploit

a natural resource, to completely finish it off; but humans are not required for the continuation of a natural resource. If humans are required for the continuation of a resource, we will not call it a natural resource.

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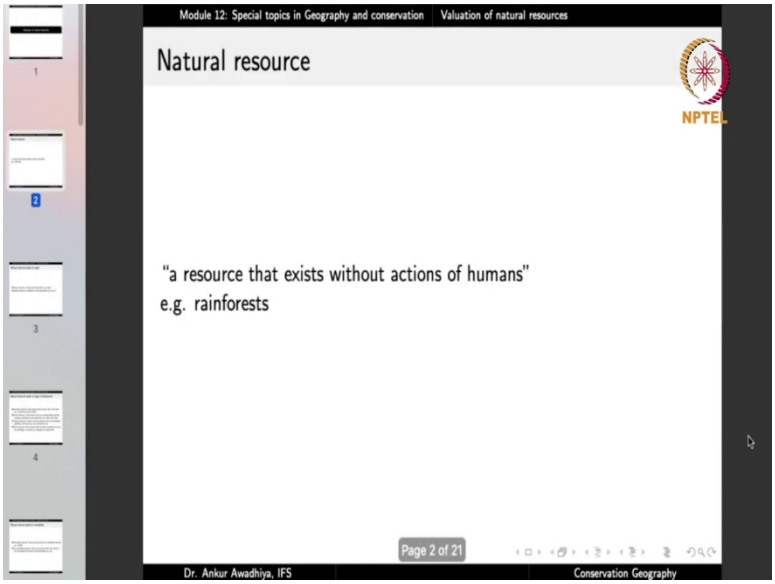

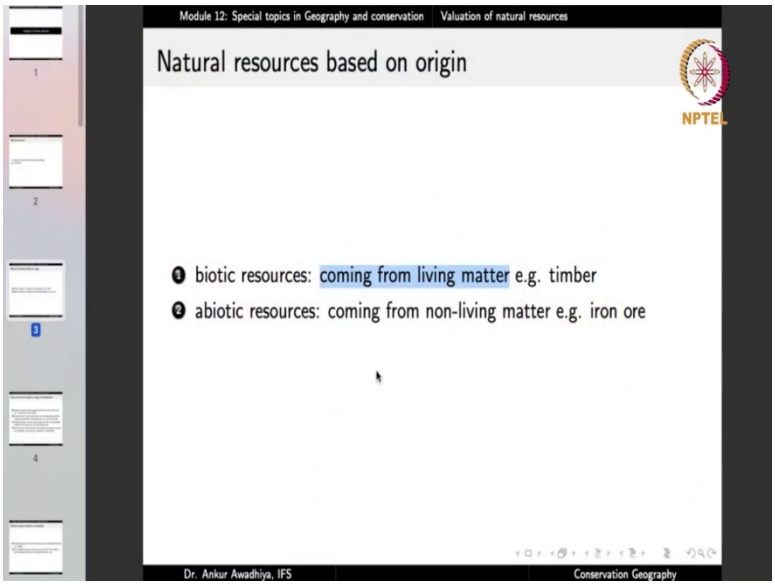

So, natural resource is a resource that exists without the actions of humans and we have observed before that, natural resources are of several kinds. Based on origin we can have biotic or abiotic resources. Biotic resources are those that come from living matter such as timber or products from wildlife or things like honey or non-timber forest produce, medicinal plants. So, these are all biotic resources because they are coming from living matter. On the other hand, we also have abiotic resources which come from non-living matter, such as iron

ore. Now, ores such as iron ore or say copper sulphate are of a non-biotic origin. They are not coming from living matter and so we call them as abiotic resources.

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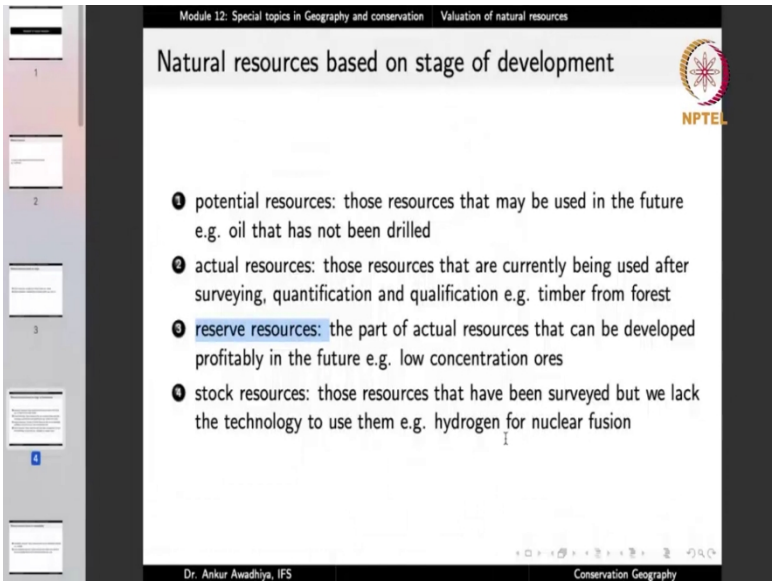

Another classification is the classification based on the stage of development. So, in this context we saw that we have potential resources, that is those resources that may be used in the future. So, we are currently not using them, those resources; but they can be used in the future, such as oil that has not been drilled. On the other hand, we have actual resources which are those resources that are currently being used after surveying, quantification and qualification. such as timber from a forest. Or in this context we can also talk about things like wildlife or non-timber forest produce like honey.

Now, in these contexts these resources are actually being used in the present day. In most cases we have already surveyed the whole area to quantify, how much of timber is there in the forest, what is the quality of that timber. And once we know these values then we can decide on whether we want to harvest them at one go or we want to go for a sustainable harvest. And in these cases, the harvest will mostly depend on the kinds of income that is, it is going to provide.

So, for example if you have an area where you have say, teak plants, teak trees and the area has a very good furniture industry, so in that case the exploitation of this resource will depend on the kind of wood that is required for the furniture industry. So, we will basically go for very large size trees, so they will be preferentially harvested from the forest.

On the other hand, if you have an area where there is a huge requirement of say railway sleepers. Now, in that case you do not require huge size trees, you require those trees that are of a medium girth and so those will be preferred. On the other hand, if you do not have any such requirements and the primary consumption of timber is as fuel wood. So, in that case you will observe that even very small plants will be taken away, they will be harvested and they will be put to use. So, the survey quantification and qualification are done but then the final usage of the resource depends on the prevailing market conditions and the prevailing economic conditions.

So, these are actual resources, the resources that we are actually using today. But some part of the actual resources may be reserve resources. The part of actual resources that can be developed profitably in the future such as low concentration ores. So, in this case the resource is a part of the actual resource, but we are currently not using them because they are not very profitable.

For example, in our forest you can be having certain species of trees that do not have a very good market value today but say later on because of certain technological improvements or because the preferential trees have already been harvested, there may be a stage where we will have a market for those trees. And so, these resources they are a part of the actual resources. They are a part of the forest from which we are already taking out timber.

But then we will call them as reserve resources because they are not that profitable today. Maybe sometime in the future they will become more profitable and then we will start to exploit those resources. Similarly in the case of low concentration ores. In the case of low concentration ores, the concentration is so less that extraction of the material of interest or the metal of interest is prohibitively expensive. It just does not make economic sense to extract the metal from low concentration ores.

So, they are not profitable, but probably later on with advancements in technologies, we will come to a stage, where it becomes profitable to extract these metals from the low concentration ores So, in this case these are known as reserve resources, because these low concentration ores they are also a part of the ore seam and they are, they are currently being removed and not being used but maybe sometime in future we will start to exploit them. Another category is stock resources which is those resources that have been surveyed but we lack the technology to use them such as hydrogen for nuclear fusion.

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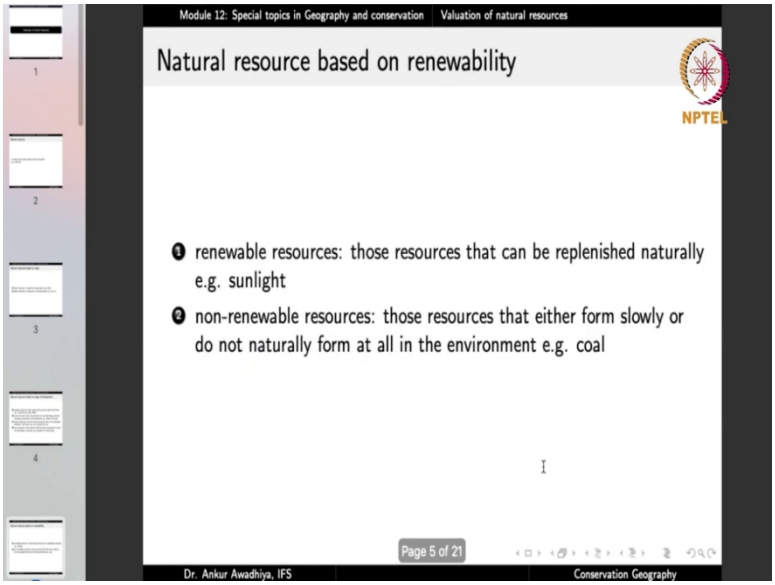

Then we have also observed that on the basis of renewability we can have renewable or replenishable resources and non-renewable or non-replenishable resources. And in most of these cases we have to make a choice between whether we are going to exploit these resources or not and if yes to what extent.

Now, this has become more and more important because we now have a large population and this population needs certain resources. We also have an advancement of technology. We also have an expansion of aspirations of people. So, today most of us want to have sufficient food, water, clothing houses, but we also need things like electricity or internet or computers or telephones and so on.

Now, these wants were not existing before. So, if you consider your ancestors, say 200 years back; there was no computer. There was no electricity, there was no mobile communication and so we did not have these wants. But now with the advancement of technology, with the advancement of aspirations, we everybody wants to have these resources and we could have provided these resources to everybody but then our population has also grown over time. So, now you have more mouths to feed. You have more people to provide electricity with, more people to provide telephone communication with and so on.

Now, if you want to provide all of these wants where are we going to get the resources from? If you want to provide people with, say computers, so to make the computer you require certain amount of metals, so those metals will have to be extracted. You will want to have certain amount of plastics to make the body of the computer that will have to be extracted say from petroleum. You will require certain pieces of glass and to manufacture the computer

you will require a lot many machines. Now, those machines will again require lots of metals. To run those machines, you will require lots of energy, lots of electricity. To get that electricity you will have to perform mining, say for coal or for natural gas or you will have to stop rivers and make dams.

So, to make just one thing, just a computer you require a huge amount of natural resource. Now, just think about what all things do we need, what all things do we want and to make each and every one of them, we are requiring a huge amount of resource, lots of natural resources. You talk about things like clothes, so to make cotton you will require a farmland, so that farmland requires a land and that land will have to be taken away from some other use. In most cases we are using the forest, so the forests are clear-cut to make way for agriculture.

Now, not only do you need land you will also require water. So, you need to have a means to stop the rivers to divert their flows to bring water to your farmlands. You will require things like fertilizers or pesticides that again would require lots and lots of resources. To run your tractors, first of all you will need a tractor which again requires lots of metals, lots of rubber.

And you to run that tractor you require lots of fuel, the that again is petroleum. Now, once you have the cotton, that cotton will have to be processed again that will require machines, that will require electricity. That cotton will have to be transported that cotton will be converted into yarn and that yarn will be woven into cloth. Then that cloth will be dyed and then that cloth will be again transported to some other location.

So, just to make a simple thing such as cloth available to people you require huge amounts of resources. Now, some of these resources are renewable, some of these resources are non-renewable; but the point is with an increase in our population size and with the increase in aspirations and technology, we now have more resources to be provided to lots of people. And when you want to provide these resources, when you want to provide these consumable and non-consumable goods; the question is, are you going to divert the forest or not.

And if yes to what extent because we have also observed, say in the case of the Aral Sea that when the water was diverted for agricultural uses that led to an ecological catastrophe in the area. The rivers dried up; the Aral Sea dried up. The concentration of pesticides heavy metals in the area went up, the cases of cancer and other diseases went up. People lost their employment. People lost the fishing industry. People lost the tourism industry.

So, if we make any such decision, if you make any such intervention to exploit the natural resources, they will have certain consequences. But then we cannot say that no we are not going to touch any forest, because if you do not do that where will you get the metals and the coal from? So, in this case we need to make a choice, we need to make a cost benefit analysis and to do that cost benefit analysis you need an economic evaluation of the resources that you have.

Now, why? Because suppose there is a proposal that, okay we are going to convert, say 1000 hectares of forest into say a farmland. And this farmland is going to provide people with employment, it is going to provide people with money and suppose people are going to get a sum of money, let us say that they are going to earn 10 crores rupees every year. And the person who comes up with the policy might say that okay this forest is of no use and if you convert this forest into an agricultural land, we will be able to provide people with 10 crore worth of money and employment. And everybody would say that, okay why not?

But then if you actually did the valuation of the forest and if it so turns out that the forests were able to provide people with an amount of resource that is say equivalent to 15 crores of rupees every year. So, in that case would you want to let go of 15 crores of rupees every year to get 10 crores? Well, the answer is no, because why would you want to put your society into a situation of a loss. But if the forests were providing say resources worth 5 crores and by converting them into the agricultural fields, you were able to extract or you were able to provide people with 10 crores; then everybody would say that ok let us convert this forest into a farmland.

Now, when you make these decisions it is essential to know how much amount of resource or how much amount of money is the forest able to provide every year, because if we did not know that there is a huge chance that we will be pennywise and pound foolish because we will be gaining certain amount of employment. We will be gaining certain amount of GDP increase but with the loss of a much greater amount of money.

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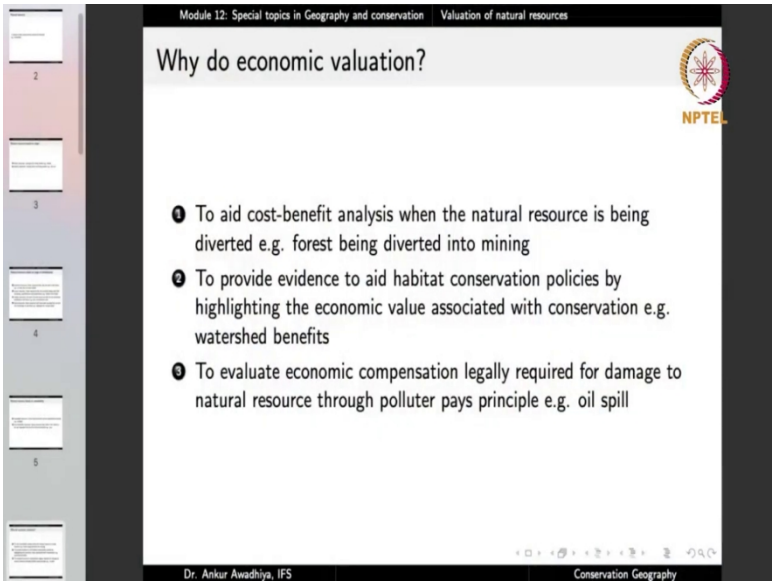

So, for these reasons we need to do an economic valuation. So, economic valuation is needed to aid cost benefit analysis when the natural resources being diverted. Example, when forests are being diverted into mining because there have been instances where forests were diverted into mining and say over the life of the mine say over 50 years this mine provided people with ores that were worth say 500 crores.

But then after this mining was done when people looked at the area, they found that okay the people who are living in the vicinity they have a very huge amount of disease burden, disease load, why because when these mines were extracting out the ores. They were also polluting the water bodies. They were also polluting the ground water. And so now all the water bodies and the groundwater in the vicinity they are all full of heavy metals and because of that people are getting toxins because the heavy metals are toxic elements. And so, to clean up the area, to clean up the water bodies, to clean up the ground water; we now need to process this water.

And when the cost of processing was figured out it turned out that, we are going to need 600 crores to do this processing. So, in this case, what is happening is that we got 500 crores because of mining, but the amount of toxicity that it led to was worth a loss of 600 crores. And at the same time, we also lost the benefits from the ecosystem that was there when the mine had not started because before mining the area was all full of forests.

So, there was a benefit of water purification, there was a benefit of air purification, there was a benefit of conservation of soil, preservation of biodiversity; huge lots of benefits. They were all lost because we wanted to have 500 crores but afterwards when we did the calculation it turned out that, we were at a loss of much greater values. And so, it would have been much better, if we had actually done the economic valuation before setting up the mine. So, by looking at these examples now the norm is that before we divert anything, we do a cost benefit analysis. What is the benefit that this mine is going to provide to people and at what cost?

And so, for that we need to do an economic valuation. We also require economic evaluation to provide evidence to aid habitat conservation policies by highlighting the economic value associated with conservation such as watershed benefits. That is when you tell people that okay, we have a wildlife reserve in this area and we should continue this area as a wildlife reserve. So, people will always come up with certain statements that okay this area is not giving us that much of benefit, let us convert this area into an industry.

Now, to counter these statements or to counter these sorts of ideas you need to come up with an analysis of the kinds of benefits that your wildlife reserve is providing to the people. In a large number of cases because we do not have an idea of the kinds of benefits, that these areas are providing; we make bad decisions.

And it is only once that we have completely obliterated the well-functioning ecosystem that we realize that okay we did something that was very wrong and we should not have done this. Now, to avoid such situations you need evaluation of the kinds of benefits that your natural resources are providing to people. Now, in this case you require them to be able to say forcefully that this area needs to be preserved or conserved as a wildlife reserve.

And we also require economic valuation to evaluate economic compensations legally required for damage to natural resource through polluter peace principle, such as oil spills. Now, it turns out that most of the industries will try to cut costs to boost their profits. Now, in certain situations, the cutting of cost happens in such ways that the company forgoes the installation of a pollution controlling device or the company does not install safety mechanisms because of which accidents become more probable. In certain cases, the accidents such as the oil spills can affect large areas, large ecosystems.

So, if there is an oil spill, the oil is going to float for a very long distance and any organism that comes into contact with the oil will get smothered with the oil. In the case of many aquatic mammals like dolphins once they come into contact with the oil, the oil covers their

bodies and then their ability to control their temperatures is lost and they die out of hypothermia.

In certain other cases when the animals come to the surface to breathe the animals such as turtles can have oil entering into their lungs and in those cases the animals are going to die because they are now no longer able to breathe. So, there is a huge loss to the ecosystems. The oil spill if it reaches into the beaches, it will cover the sand and so it will destroy the habitat of all those species that are living in that sand. And also, all those species that use that sand for say laying of their eggs.

If this oil spill reaches into a mangrove forest and it enters into the pneumatophores you will have a situation where the trees die off, with the death of these trees there will be a loss of a large number of other organisms that are dependent on these trees. And to make companies responsible for any such accidents or any such lapses legally we have made provisions that if somebody makes a damage to the ecosystem, they will have to pay to overcome that damage.

That is, we will have a situation where we take money from these people who are polluting the environment and that money will be used to compensate for the loss of the ecosystem. So, basically, that money will be used to say clean up the beaches or that many will be used to take away the oil from these areas or that many will be used for replantation of these areas and so on.

Now, the question is, what is the amount of money that you should take from these people because legally we have a provision that the polluter will have to pay. The question is how much will the polluter have to pay. To know that we need to do an economic valuation of the national resource because only when we know the value of the natural resource, will we be able to say this is the amount of natural resource that was destroyed because of your oil spill, because you did not take precautions and for taking that money you need to do valuation of the natural resources. And so, the economic valuation of natural resources has become a very important topic these days.

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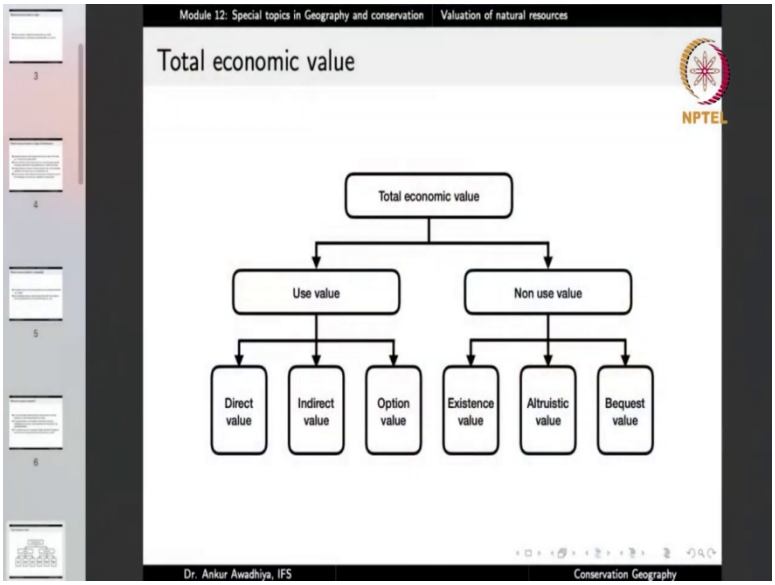

Now, in this context the question is what is the total economic value of a natural resource. If we have say, a forest is the value of forest equal to the value of the timber that you will sell in the market. Is that the value of the forest? Or does it also involve certain other values. So, in this context we talk about the total economic value of a natural resource. Now, total economic value of a natural resource is the sum of the Use value and the Non-use value.

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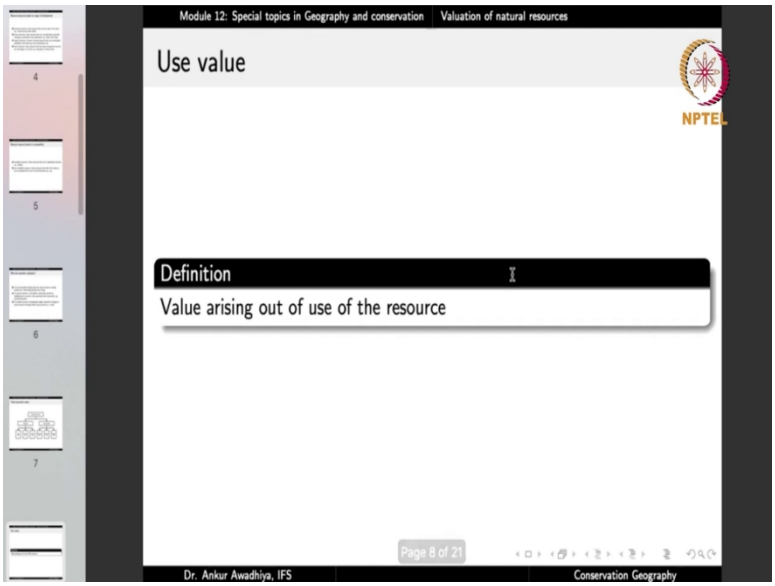

Where use value is the value that arises out of the use of the resource. So, in certain cases you are using the forest for something and the kinds of economic benefits that you get because you are using the forest, will be called the Use value of the forest. At the same time, we also have the Non-use value that is the value arising even though the resource is not being used.

So, even if you have a forest and you are not using that forest then to it provides you with certain benefits, certain values and that value is known as the Non-use value of the forest.

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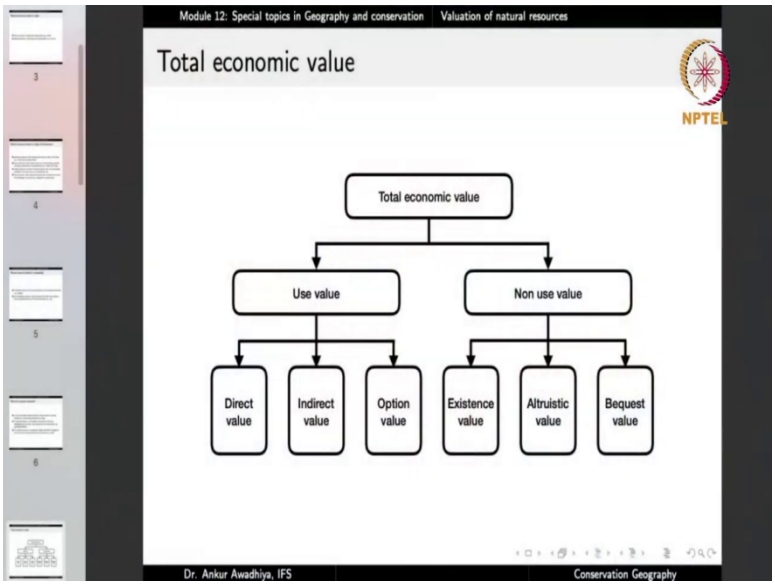

We will look at Use and Non-use values in a short while. So, Use values comprise direct values, indirect values and option values. And Non-use values comprise existence value, altruistic value and bequest value. So, these are the different categories of or different sub components of the Use and the Non-use values. So, let us now look at all of these.

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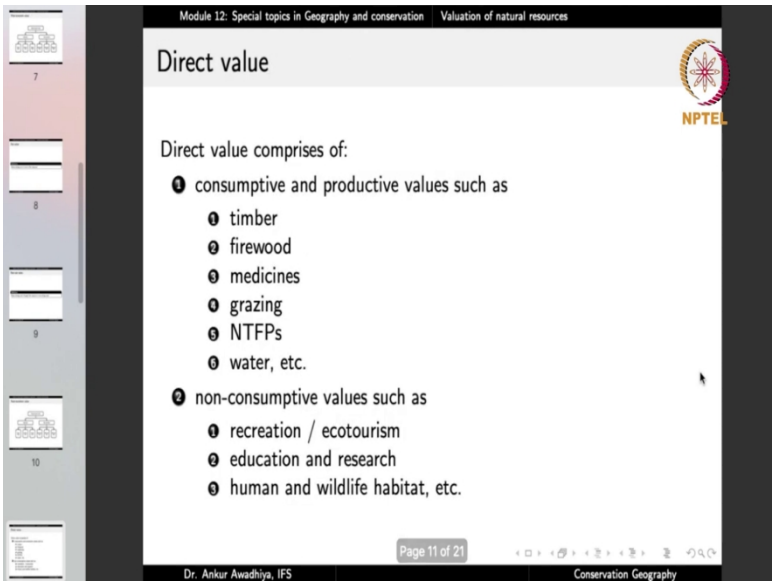

The direct value comprises of all the consumptive and productive values such as timber, firewood, medicines, grazing, NTFPs, water etc. And the non-consumptive values such as

recreation, eco-tourism, education, research, human and wildlife habitat etc. Now, what do we mean by the consumptive and the non-consumptive values.

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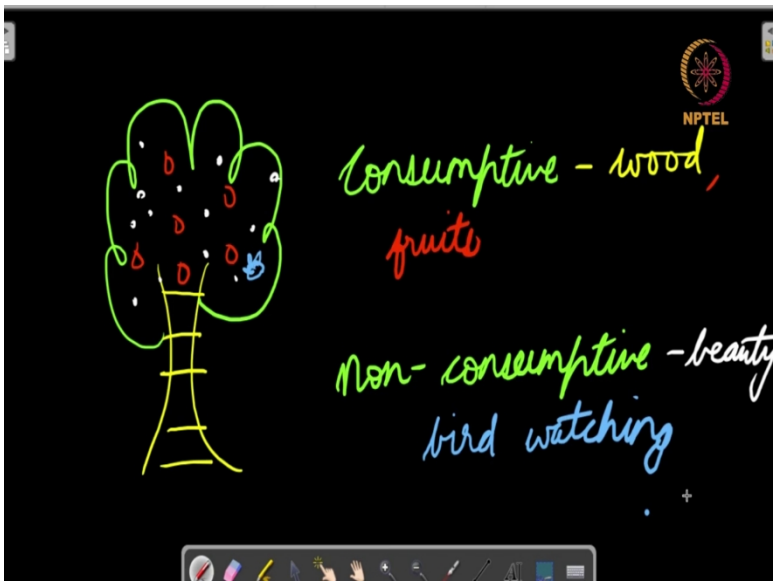

Suppose we consider a tree. So, in the forest you have this tree. Now, you can use this tree in a consumptive manner or a non-consumptive manner. Suppose you decided to chop this tree. Cut it into wood and use that wood that would be a consumptive use. Or suppose there are fruits on this tree and you wanted to pluck all of these fruits and use them, that again would be a consumptive use.

Why, because you are consuming certain resources. If you are using the wood of the tree, then no more wood is available in the tree for the use of others. That is either you can use the wood or I can use the wood. If you use more of the wood, there is less available for me or for others. Similarly, if you take all the fruits that will less and less fruits are available for me and others. So, these are consumptive usage. In the case of a consumptive usage, if one person uses the resource then less resources available for use by others.

So, that is consumptive use. Whereas we can also use the tree in a non- consumptive manner. How, suppose this tree has beautiful flowers and we decide that we are not going to pluck these flowers but we are just going to see the beauty of these flowers. So, for example this is a tree that is right next to a highway and when this tree blooms, we just observe this tree and we are happy by seeing the beauty of the tree. That would be a non-consumptive usage, because if you are seeing a beautiful tree that does not reduce its value for me or for others.

Similarly, if there is say the nest of a bird on this tree and this nest is having the young ones and the mother bird is bringing food and feeding to the young ones. Now, in this case, we can decide that we will leave this tree as such. We are not going to disturb the birds, but we are going to use this tree for bird viewing or bird watching. In this case again we are using this tree in a non-consumptive manner because if you watch a bird on a tree, then it does not reduce the value of the tree for others for doing the bird watching activity. So, this is a non-consumptive utilization.

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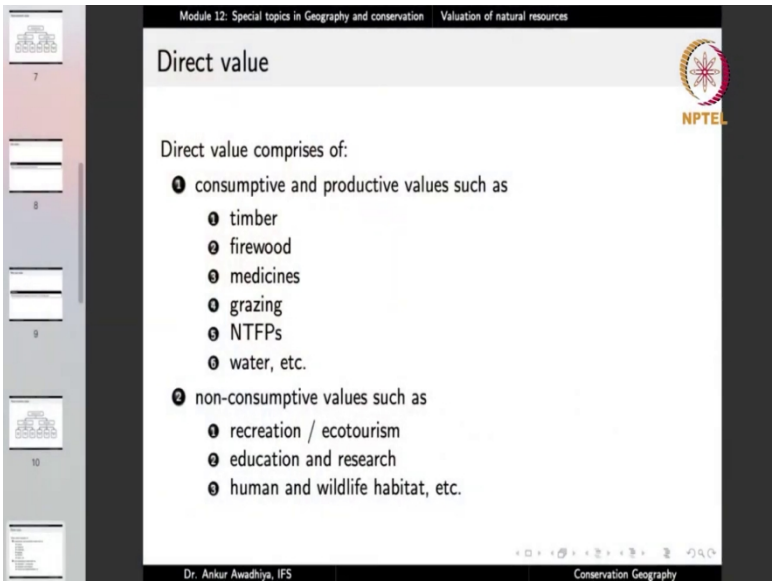

Now, direct value comprises of all different consumptive values and all the non-consumptive values, that is we include things which are being used in a consumptive fashion, that is if one person uses it, there is less available for others such as timber, firewood, medicines, grazing, NTFPs, water and so on and the non-consumptive values in which things are being used in a non-consumptive manner, that is if one person uses it does not reduce the value for others such as recreation or eco-tourism.

Now, here we are seeing eco-tourism. We are not seeing tourism because the difference is that ecotourism is environmentally sensitive tourism. It is environmentally responsible tourism, that is if you are going to visit a place you do not over utilize the resources there. You do not dump that area with trash you maintain that area in the most natural way. So, you do not take anything other than photographs. You do not leave anything other than your footprints.

In the case of ecotourism, we do not take away resources from the area. We do not pluck flowers, we do not eat away the trees, we do not hunt animals and we do not leave anything other than our footprints. We do not leave trash. We do not leave plastic bottles. We do not create filth in the area, so that is ecotourism. Now, if we are doing ecotourism, it does not reduce the value of the tourism area for the next person. So, this is a non-consumptive utilization of the area.

So, recreation or ecotourism, education and research; you can use a forest for education and research activities. For example, we may need to teach people about the different kinds of adaptations that organisms have and there's no place better than a forest to learn these things or if there is a botanist and wants to know about the different kinds of leaves that are there or if there is a taxonomist who wants to understand why different trees were named in different ways.

What are the significant characteristics of different trees or if there is an ecologist who wants to understand what is the manner in which the populations of various predator and precious species are regulated. Now, all of these things comprise education and research values. Now, if one ecologist goes into a forest and watches animals, notes down the number of animals that are there and various predator species and various prey species and deduces a kind of relationship that is going on between different species; that does not reduce the value of the forest for the next ecologist or for the taxonomist. So, in this case again we are talking about the utilization of a forest in a non-consumptive manner. If one person uses it, it does not reduce the value that is available for the next person.

Similarly, they use as human and wildlife habitats. When people and animals live in the forest without consuming a lot of the resources. Now, suppose there is a group that has gone for ecotourism. It pitches up tents in a designated area and suppose just 4 or 5 people have gone into the forest. Now, these four and five people, if they are careful. They will not be over exploiting the resources.

They will not be making things dirty. They will not be splitting trash in the area and in that case the value of the forest will remain the same for say the next ecotourism party, who will probably pitch up the tents at the same location. Similarly, if the forests are being used as wildlife habitats and we are gaining values from different kinds of wildlife, say through tourism. So, in that case again we are not consuming the forest by its use as a habitat. So,

these are the non-consumptive uses of the forest and the direct value of a resource comprises of all the consumptive and productive values plus all the non-consumptive values.

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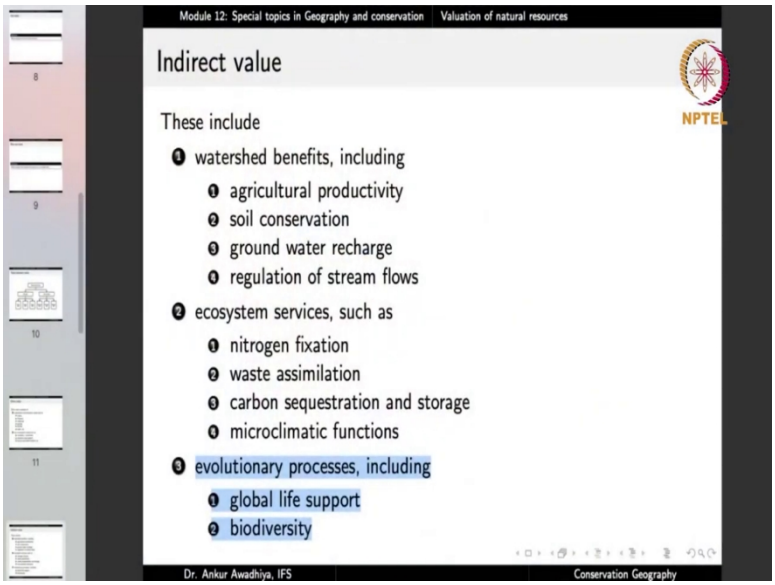

Then the use value also comprises the indirect values, in which case we are using the forest or the natural resource in an indirect fashion. These include things like watershed benefits, ecosystem services and evolutionary processes. Now, we use the forest or we gain certain benefits because we are using the forest in an indirect fashion.

Now, we are using the forest because we are gaining certain resources out of the forest but we are not taking these resources directly but in an indirect fashion. Such as the watershed benefits including agricultural productivity or soil conservation or groundwater recharge or regulation of stream flows.

Similarly, ecosystem services such as nitrogen fixation, waste assimilation, carbon sequestration and storage, microclimatic functions. Similarly, if you look at evolutionary processes including global life support and biodiversity then forests support various life forms. Forests support various forms of biodiversity. When that happens, the ecological processes are more and more stabilized. So, this is again a utility of the forest, but this is an indirect utility. This is a by-product of the forest being there. So, these are the indirect values.

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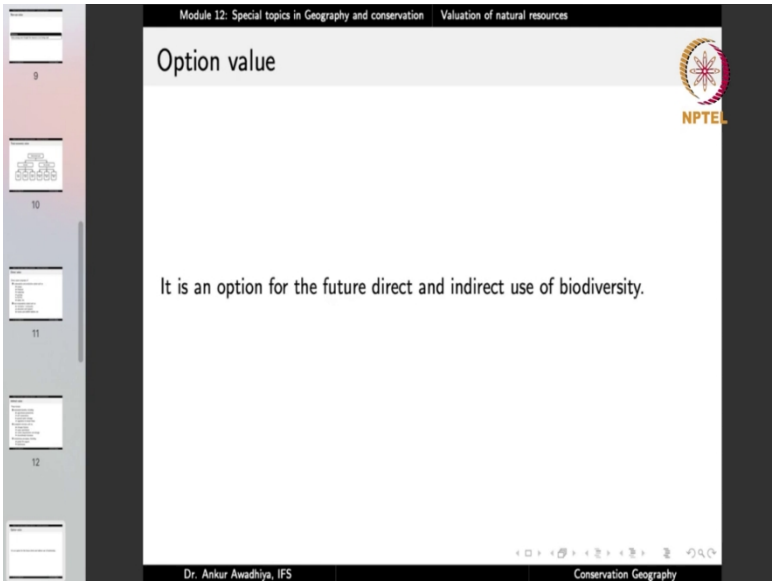

And the third is the option value. An option for the future direct and indirect use of biodiversity.

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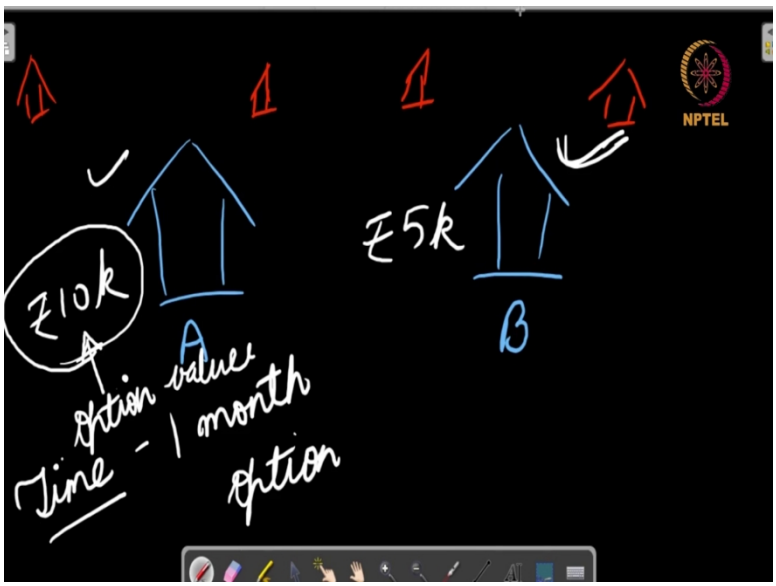

Now, what does that mean. Suppose you are in the market looking for a house and there are two houses that you are preferring. Let us say house A and house B. In the market you also have several other houses, but you do not like those houses, but you have decided, that okay I am going to buy house A or house B. But it is just that you have not fully decided whether you should go for house A or whether you should go for house B.

So, probably you will need some more time. Suppose you will require one month to decide whether you should go for house A or house B. Now, in this one month, it is possible that

both the houses may be sold in the market. You have the money with you and you could have purchased either house. You are not going to purchase two houses but you can purchase either house, but you are still undecided which house to buy and it will take you one month to decide or say 15 or 20 days. But you have this hunch that because the property is booming in the area and there are so many people who want to buy houses, then if you decided on buying house A and in this month the house A was already sold.

Then you will not be able to get the house of your own liking. Or suppose you decided that you will you want to go for house B, but in the one month that it takes you to decide the house B is sold. So, you want to create a situation or you want to maintain an option on both these houses. Now, if you go to the owners, you go to the owner of house A and you tell this person that okay please do not sell this house for one more month, because I am deciding whether I should buy this house or not and it will take me one month.

What will the owner of house A tell you? The owner would say or the seller would say that okay that is fine but I am here to sell this house. So, if you do not take a decision now and if somebody else comes, I am going to sell this house. Then you can negotiate with this seller or the owner. You will say that okay, let us do one thing; I will give you 10,000 rupees. You keep these 10,000 rupees and these 10,000 rupees is for you to give me this option for one month, that is; if in this period of one month I decide that I am not going to purchase your house, I am compensating you by these 10,000 rupees.

And if in this one-month I decide that I am going to purchase your house then nothing like it. So, you are giving this person 10,000 rupees to have the option on this house and similarly you will give say 5000 rupees to person B to create an option on house B. So, in this case you are giving this person rupees 10,000 and you are giving this person rupees 5,000. Now, suppose at the end of your month, you decided that you will buy house B. In that case these 10,000 rupees that you gave to the owner of house A, that becomes an investment; that you did not use.

But this investment was necessary or it provided you with certain values by letting you a period of one month to decide between both of these houses. So, these 10,000 rupees that you gave to this person is an option value or the price for the option value of having this option to buy this house say after a period of one month.

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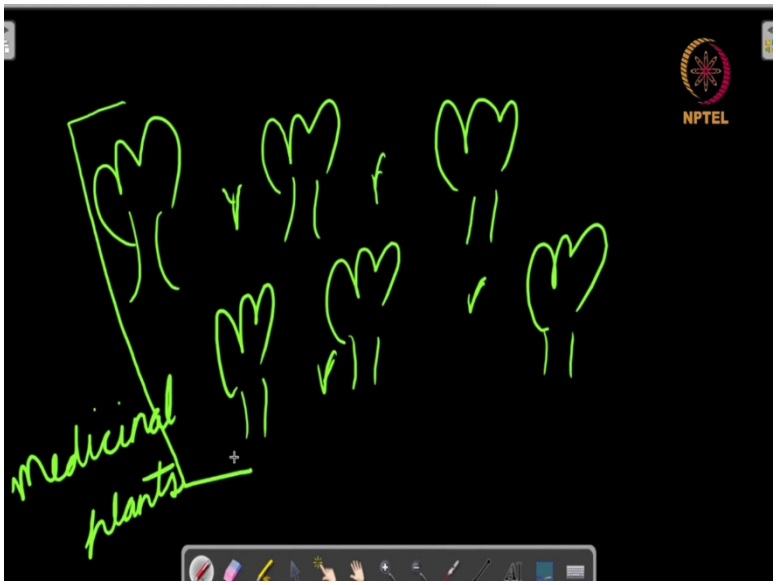

Now, similarly if you consider a forest. Then you have two options one is that you use up all the resources that are there in this forest. You cut up all the trees, sell them off and earn money. The second thing is that you let this forest remain as such and probably say after 20 years, there is a disease that crops up and the medicine to counter that disease may come from say a plant that is currently growing in this forest.

So, if you want to have access to these medicinal plants after 20 years you will have to maintain this forest as such for the next 20 years. Now, this maintenance would require you to forgo the use of the resources today and to conserve or to devote resources for the conservation of this forest for the next 20 years. So, you are actually investing money to keep this forest as such to have an option to take those medicinal plants after a period of 20 years. So, the forest just by being in the place is giving you this option. So, this kind of a value where you keep an option of using the forest or the natural resource at a later date is the option value of that resource.

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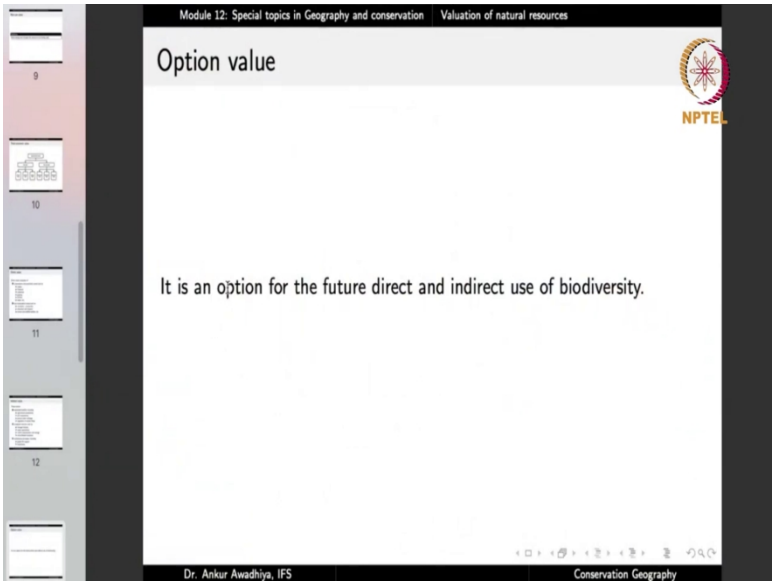

So, option value is an option for the future direct and indirect use of biodiversity or of the natural resource.

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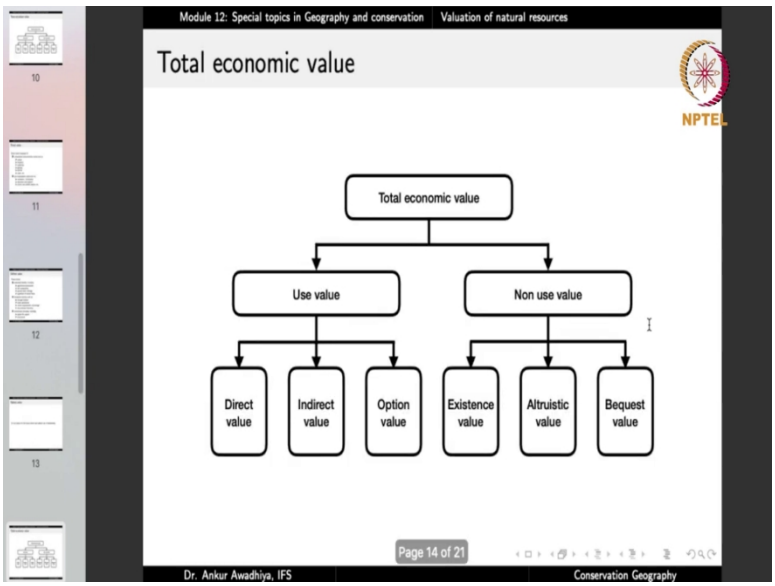

So, when we talk about the use values, we can use the natural resource either directly or indirectly or we can keep an option on the future use of the resource. So, these are the various use values of your resource. When we talk about non-use values, we are talking about those values that we gain without using the forest or the natural resource. And here we have existence value, altruistic value and request value.

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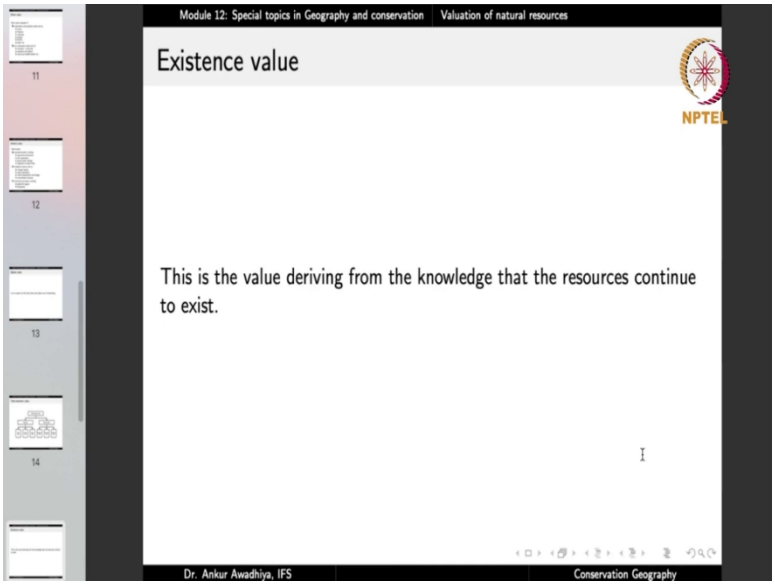

So, what are those? Existence value is the value deriving from the knowledge, that the resources continue to exist. Now, what does that mean. Today we know that we have polar bears in the polar areas. Now, a person who is living in India will probably never go to watch these polar bears. But suppose one day you get this news, that all the polar bears have been decimated all the polar bears have been killed.

Now, in this case will you feel happy that all the polar bears are killed or will you feel sad. Now, most of us will feel very sad, that there is this beautiful species that has become extinct and if we know that the polar bears are existing even though we will never go and see them directly. But just the knowledge that we have polar bears somewhere.

This knowledge gives you a certain bit of joy, a certain bit of value. And this joy or this value that comes because your resources continue to exist is known as the existence value. Similarly, when we know that, we have kangaroos in Australia or when we know that we have giraffes in Africa. It is possible that we will never see a giraffe directly. We are never going to use a giraffe directly. But just knowing that we have so much amount of biodiversity on this planet this makes us feel good. And that value that is being provided by the knowledge that the resources continue to exist. Now, this value is not being had through the use of the resource. This is a non-use value and this is the existence value.

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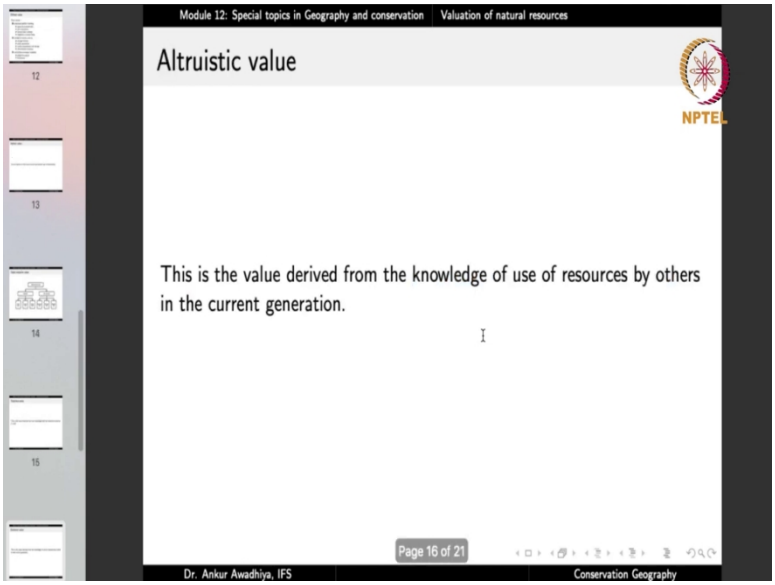

Altruistic value is the value derived from the knowledge of use of resources by others in the current generation. So, we are not using the resource but other people are using this resource in our current generation and the value that we get because of that, is the altruistic value. Now, in the case of altruistic value we can have things like say you have rhinoceros in Kaziranga national park and suppose you are living in Tamil Nadu. Now, you are not using the rhinoceros. The rhinoceros is not providing you any money because of tourism but people in your own country or people in your own planet are getting certain values because rhinoceros continue to exist in Kaziranga national park.

Now, this kind of a benefit or this kind of a feeling of joy that you have that okay I am not using this resource but there are some of my brothers and sisters who are using this resource who are gaining some value out of this resource. Now, this value that you have is known as an altruistic value. Altruism is the opposite of being selfish.

So, you are not thinking in a selfish manner that okay all the resources should be available for my use but you are thinking that these resources are available for use by someone else in the current generation. You are not talking about your children or your grandchildren. You're talking about people in your own generation, but somebody else is using the resource and this kind of a value is known as an altruistic value. The value derived from the knowledge of use of resources by others in the current generation.

And if we leave the use and non-use values for our offspring or future generations then we say that this kind of a value is a Bequest value. Bequest value means what are we leaving for our future generations. Now, if you have a forest and you are able to conserve the forest you

are able to conserve the biodiversity and you leave that biodiversity for your future generations. That is, you feel good that okay I worked for the conservation of tigers and I ensured that my children and my grandchildren will also be able to see the tigers. Now, in this case you are not seeing the tigers but you are leaving the tigers as a bequest for your future generations. And this kind of a value of a natural resource that derives by leaving these resources for our offspring or future generations is known as the Bequest value.

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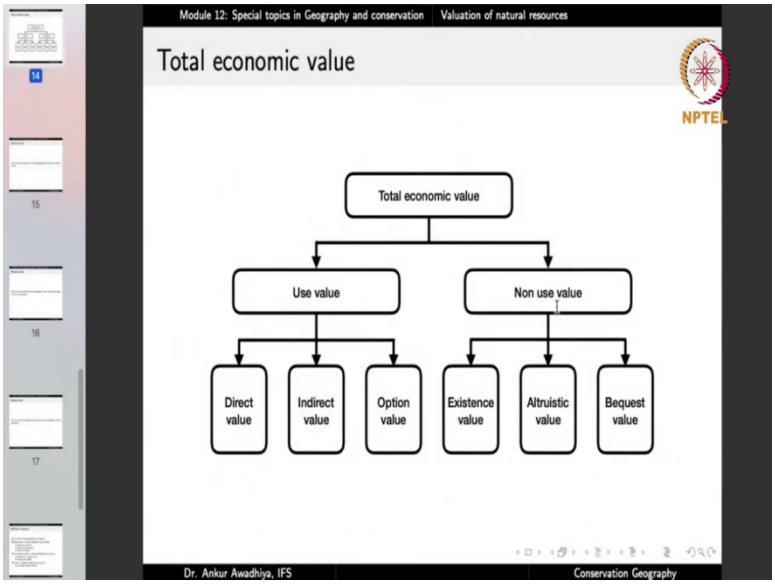

And so, if you talk about the various non-use values, we have the existence value, the altruistic value and the bequest value. So, if you combine all of these three you get the total non-use value. If you combine all of these three you get the use value. You combine both of these and you get the total economic value.

So, basically when we started to say that the value of a forest is not the same as the value of the trees or the value of the timber that you can derive from the forest. This is what we meant, that the forest provides us with several different values. A large number of indirect values, a large number of non-use values, a great amount of option value and if we only count the amount of timber in the forest, we will be subsidizing our forest. We will be putting a dollar value or a rupee value that is much lesser than the actual value of the forest. So, this is something that we have to be very careful about. Now, once we know these different values the next question is how do we put the rupee value or the dollar value to it.

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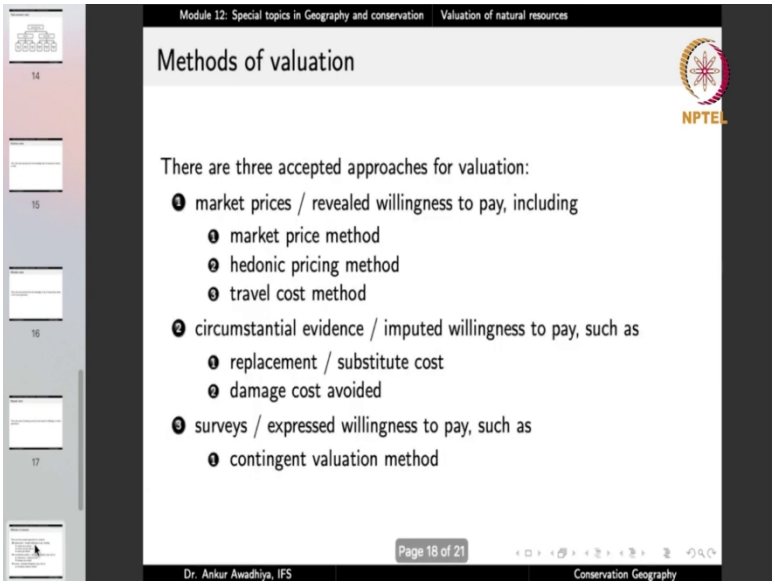

And in this context, we come to the methods of valuation of a natural resource. Now, because there are different kinds of values that the natural resource is giving us, we cannot have just a single way of evaluating the natural resource. So, we use things like market prices or the revealed willingness to pay methods such as the market price method.

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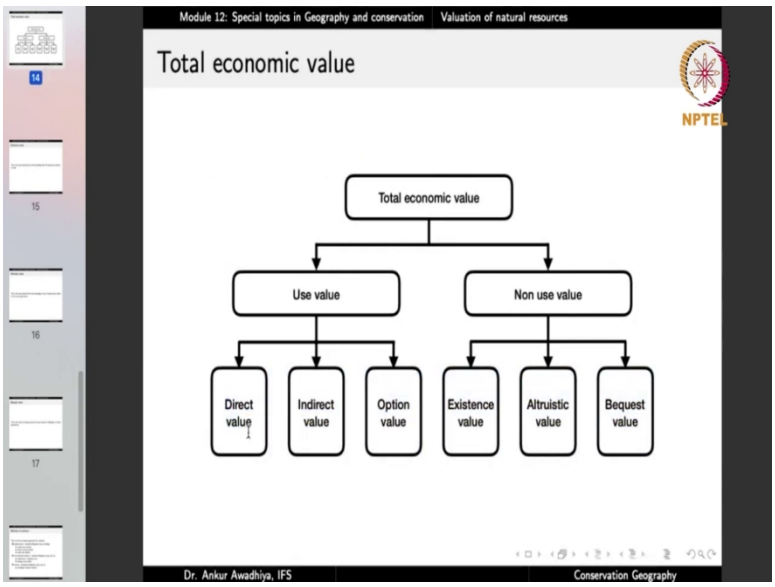

Now, in this case, we normally use it for those things that are being sold in the market. Things like the direct value. So, if you have a forest and the forest is providing you with timber and this timber is being sold in the market you can ask the question what is the value of that timber that this forest is providing to us every year. So, this is a market price method for anything that is sold in the market you can compute the cost or the price of that portion of

the resource that is being sold in the market and that is one portion of the value of your natural resource.

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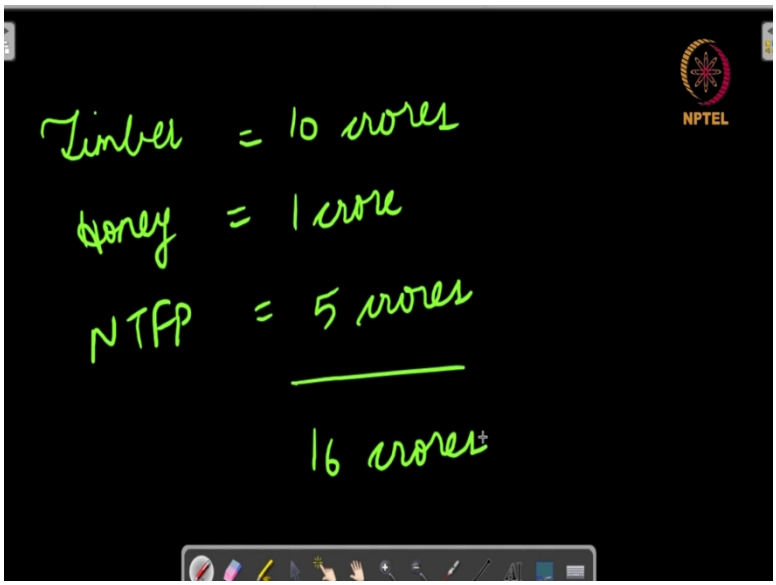

So, if your forest provides you with say timber which is worth 10 crores of rupees. It is providing you with honey, which is say 1 crore of rupees. If your forest is providing you with NTFP products such as the medicinal plants or say things like mahua, which is say worth 5 crores of rupees, then the value of your forest should be at least 10 plus 1 plus 5 is 16 crores of rupees.

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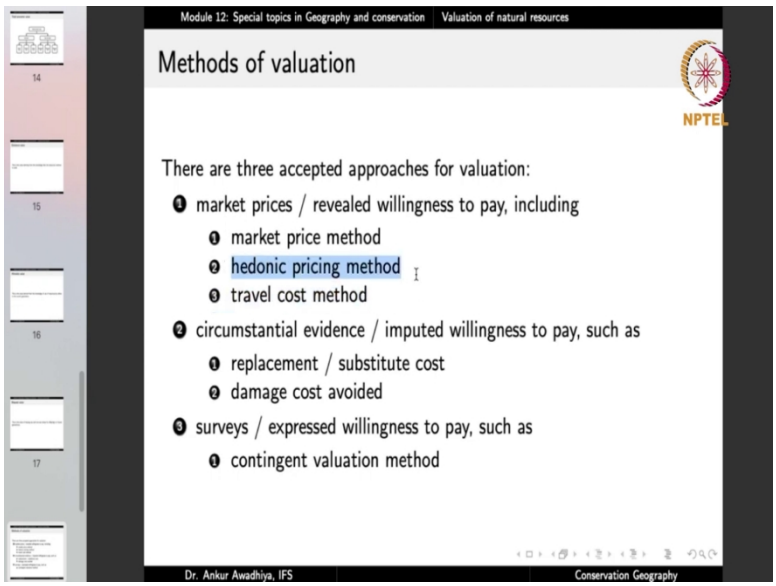

And this is the value that you are figuring out using the market price method. Similarly, we have the hedonic pricing method. Hedonism is a philosophy which asks people to maximize their pleasures and minimize the pain.

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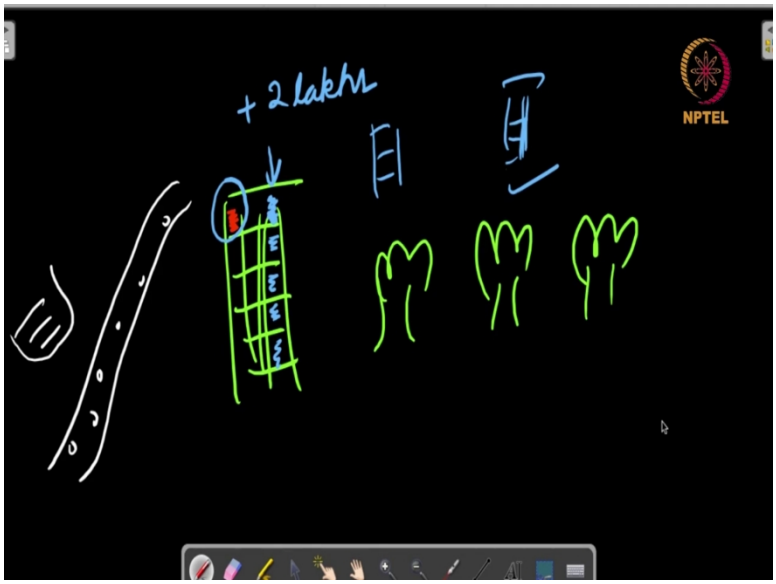

Now, in this case suppose you are living in a high-rise building and on one side of the building you have a forest and on the other side you have a road, where you have lots of vehicles that are plying and probably you also have a dump yard in this location, say a landfill. Now, if you take up a flat here then every morning you will wake up to the site of a dump yard and you will wake up to the honking of the vehicles on this road.

Whereas if you take up a flat here, every morning you will wake up to see the greenery in the forest and probably you will wake up to the sound of the birds. Now, which of these will you prefer? Now, it turns out that people prefer to have a house that is sea facing or garden facing or forest facing or mountain facing and this preference is also reflected in the price of the various houses.

So, basically, you will find that this house will have a cost of say 2 lakhs extra as compared to this house and this amount of 2 lakhs is coming because of a value that is being provided by this forest. Now, if you add up the value of all of these different houses and all the houses in the nearby towers then that is also a value that your forest is providing to you.

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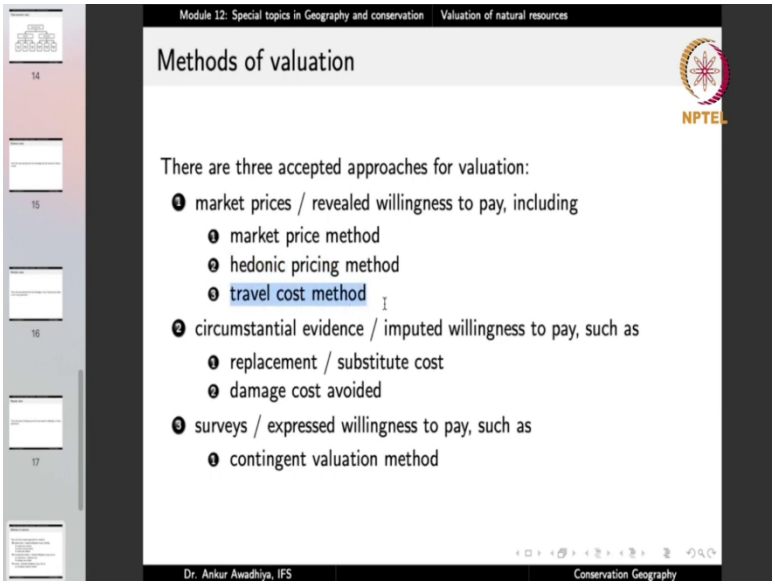

Similarly, we can ask the question that if people are coming into our forest to see tigers what is the amount that they are spending on their travel cost, because to see a tiger to come to a tiger reserve people have to spend money on transportation. People have to take up lodging in the area. People have to spend money for entry fees, for hiring a gypsy, for hiring a driver, for hiring a guide.

And if the value that the people are getting out of seeing the tiger was less than amount, so the value of the non-consumptive use of the forest, the non-consumptive use of the forest can also be had by looking at the amount of money that people are actually spending to come to the forest, to witness the tigers, to take the joy of seeing the tiger.

So, that is another way of doing a valuation of the forest. So, these are the market prices methods or the revealed willingness to pay, because people have already shown their willingness to pay through these interactions that are happening in the market, through interactions that are happening in the real estate market or through the pricing that people are spending in coming to see the tiger. So, these are the market prices methods, but we can also look at circumstantial evidence or imputed willingness to pay, which is an inferred willingness to pay such as replacement or substitute cost.

Now, in this case you ask the question that okay the forest is providing you with certain benefits, say for water purification. Now, if you did not have this forest you would have to spend money to purify the water, say by setting up a water purification plant. What would be the cost of setting up that plant, what would be the cost of running and maintaining that plant.

Now, if you have the forest, you do not have to set up that water treatment plant. So, the value that the forest is providing to you can be inferred from the value of setting up and running a water treatment plant or the value of setting up or the cost of setting up a sewage treatment plant or the cost of setting up say a tsunami barrier or a sea storm barrier because mangrove forests provide us with these values.

Or we can infer it from the damage cost that is avoided. So, suppose you did not have the forest and you did not set up your water treatment plant. In that case what would be the damage to the society? Say in terms of more amount of mortality more amount of morbidity or loss of work days. If you compute those values, they are also a value that the forest or the well-functioning ecosystem is providing to us.

So, methods such as these are known as circumstantial evidences or imputed which means inferred willingness to pay, because we are not actually setting up the water treatment plant in this case or we are not actually removing the forest and seeing what is the amount of damage. We are just inferring it from the available information.

So, that is another way of valuation. Yet another way of valuation is through means of service or expressed willingness to pay such as contingent valuation way. In this case you set up a survey and you ask people a hypothetical question, that the government is cutting down a forest to gain revenue and to stop the government from cutting down the forest, let us all contribute certain money in the form of an extra taxation.

What is the amount of money that you are willing to pay? Now, if a person thinks that the value of a forest to him is say 100 rupees, the person would say that okay I will be ready to pay anything that is less than or equal to 100 rupees but not one rupee more than that and if you do such kind of a survey with a large number of people you can get an idea about the value that they see for these forests and in this case, we are looking at the cultural values. We are looking at the beauty values of the forest as well. So, we have different modes of valuation and we can use one or more of these methods of valuation to put a dollar or a rupee value to our forest.

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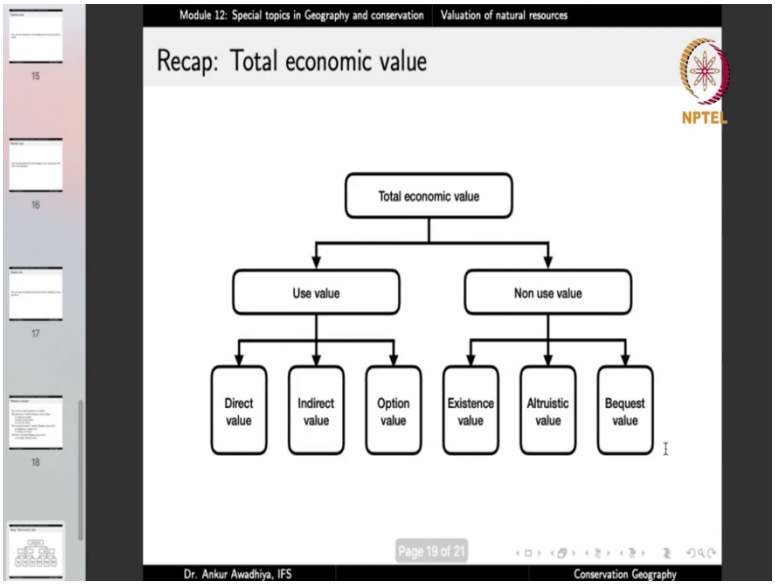

So, to sum up the economic value of a natural resource is given by the sum of use and non-use values and the use value is the sum of direct, indirect and option value and the non-use value is the sum of existence, altruistic and bequest value.

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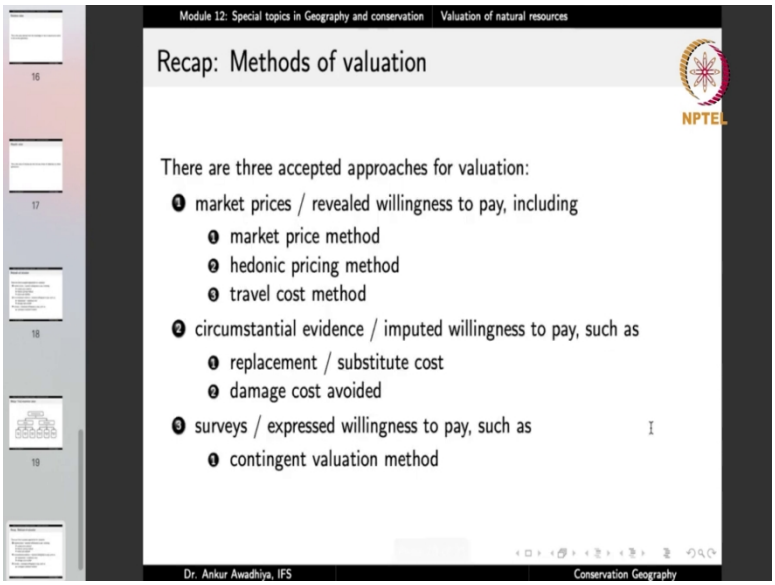

And to put a dollar value or a rupee value to the natural resource, we have several accepted approaches for valuation and one or more of these methods may be applicable for any particular case. So, that is all for today. Thank you for your attention. Jai Hind!