- Forests and Their Management
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Module - 01
Introduction
Lecture - 03
Value of Forest

[FL] In today's lecture, we will have a look at the Value of Forests. Now, like everything forests - have a price and forests have a value. Now, price is something that we pay to get something. So, for instance, if you want to purchase this pen, you will have to pay something. So, that is the price. Now, similarly if you want to set up a forest, then you will have to designate certain land that you will not be using for other purposes. So, for instance, you will not be using that piece of land to make a mall or to make residential apartments. So, that is the price that you are paying.

At the same time, if you are converting a land into a forest, then you might have to dig the pits, you might have to do certain amounts of soil amelioration, take seeds; plant those seeds - maybe in a nursery you make seedlings; then, you plant those seedlings, then you tend for those plants, you ensured that there is no grazing that is happening in this area. So, there are also some cost that are recurrent cost.

So, for instance, you will have to do a protection of this area. Every year you will have to go to the forest and see that there, that the fuel load has not developed to such an extent that there is a good chance of having a fire. You will have to deploy people to take care of the city source. You will have to have forest guards that are patrolling this area to ensure that people are not going inside for an illicit filling.

You will have to have community mobilization programs in which you spend money to convince the community people that these forests are important for them, and so, they should not be cutting these forests. You might go for a joint forest management in which you do something for the community so that the community in turn does something for the forest.

So, there are several recurring and non-recurring costs. But then, why are we putting or why are we spending so much amount? why are we going for such huge expenditures to

maintain a forest? This is because forest will provide in turn some value to us. So, we all know that forests are useful, forests are valuable, because they provide timber, because they provide non-timber forest produce, because they help regulate climate change, they are doing carbon sequestration, they are helping in groundwater recharge. And at times, if you maintain a forest for say its wildlife purposes, then you will also have money that is flowing in from tourism.

But then, how do we put a value to the forest? how do we put a rupee or a dollar amount so that we are able to make a judgment about, if I am putting say 100 rupees into the protection of this forest, what is the amount that I am getting back. How do you make such computations? - is what we are going to learn in this lecture.

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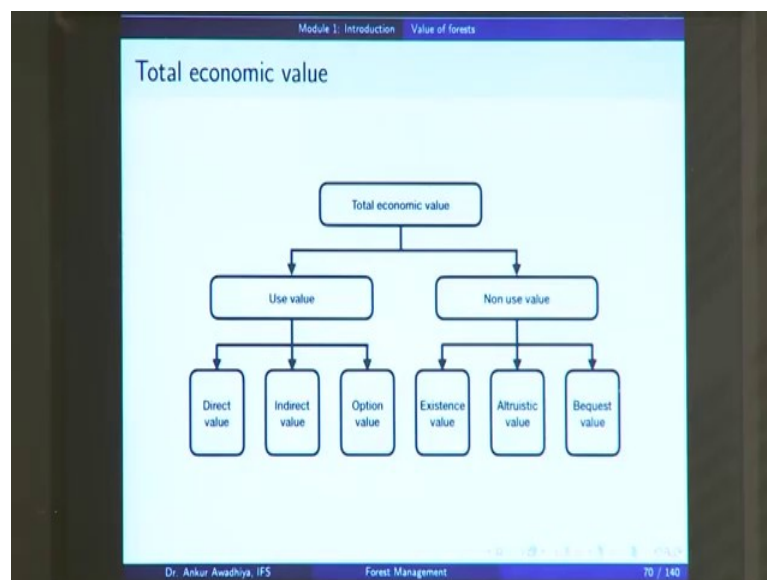
So, we begin with the TOTAL ECONOMIC VALUE. Now, total economic value of a forest or a natural resource or anything, for that matter, is a sum of two things. It is a sum of the "use value" and the "non use value." Now, what is the USE VALUE?

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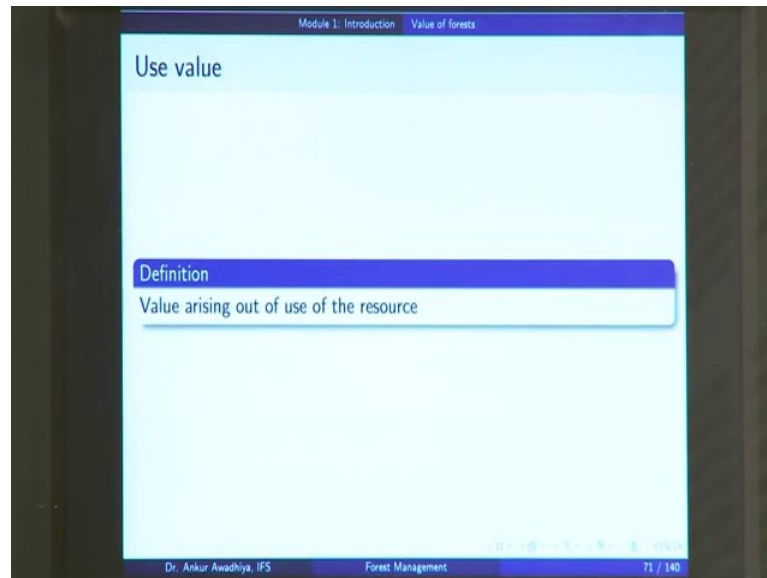
A use value is something a value that is arising out of the use of a resource. So, you are using a forest, for say, getting timber out of it, and because you are getting this timber by using this forest, the value that you derive from this timber is a use value.

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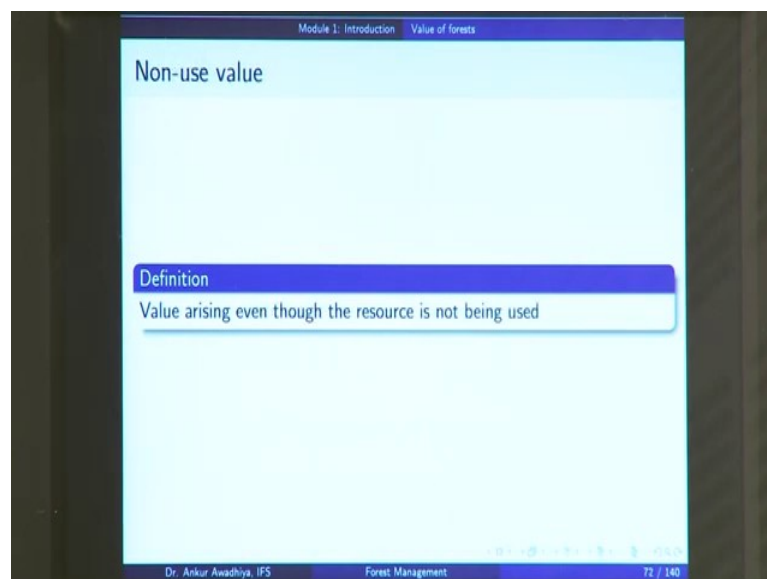
On the other hand, we also have things like NON USE VALUE. So, non use value is a value that is arising even though the resources not being used. So, for instance, you have a patch of forest; you are protecting it, you are maintaining it, you are tending to it and you are tending it for say your children or your grandchildren.

Because you want to say that ok, I will keep this area as a forest so that my children will be able to use it, so that my children are able to get enough amount of water, because of the groundwater recharge that this forest is doing. So, I am not deriving a value out of it by using it, but I am deriving a value because I am happy that 'yes, this forest is there for my children and for my grandchildren.' So, that is a non use value.

The value that is derived or a value that is arising even though the resources not being used, not being used by you, probably it is being used by somebody else, but you are still deriving a value out of it, even though you are not using this resource. So, the total economic value is a sum of the USE VALUE and the NON USE VALUE. Now, the use value has in turn got three parts - you may use it directly, you may use it indirectly or you may use it by having an option on the resource. Now, we will have a look at all three of these now. So, what is a direct value?

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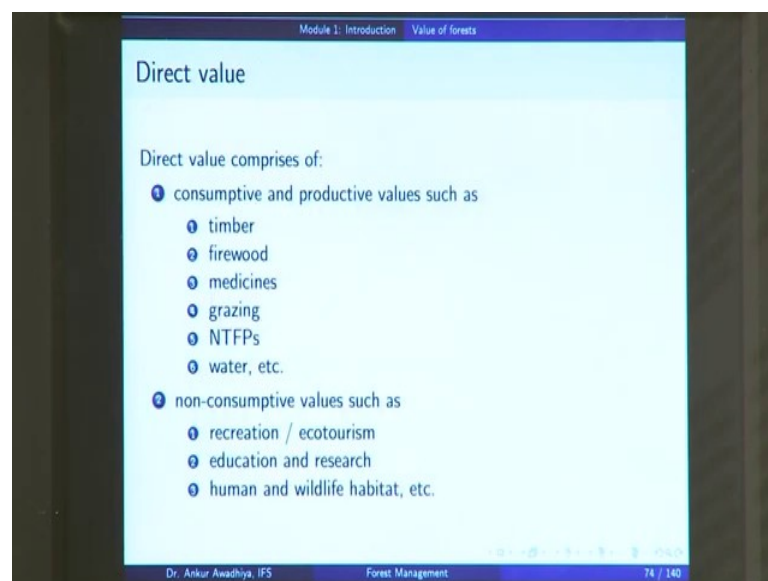
Now, a direct value is something in which you are using the forest directly, and this is comprised of two things. This is comprised of the 'consumptive utilization' and the 'non-consumptive' values. So, the consumptive direct values or the productive values comprise of things that you are consuming. Now, what is the difference between consumption and a non-consumption direct value? So, let us suppose that we have a tree that is there in a forest, and if I use this tree to get timber out of it. So, I go into the forest,

I cut this tree and I extract timber out of this tree. Now, suppose after a day you go there and you also want to extract timber out of it.

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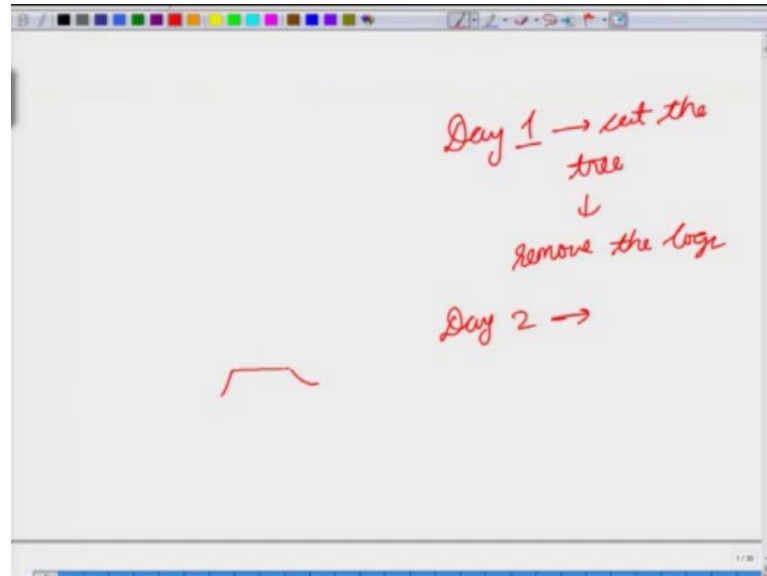
So, what we are saying here is that there is a tree that is standing, and on Day 1, I go and cut the tree, and then, I remove the logs. So that now, we just have this stump that is remaining in place of the tree and the tree is now gone. Now, on Day 2, you go into this spot, and you also want to have this timber out of this tree. But now, there is no more timber left because I have consumed all the timber. So, a consumptive utilization of a resource reduces its value for some other person. So, if I am deriving value, you will not be able to derive the value out of it.

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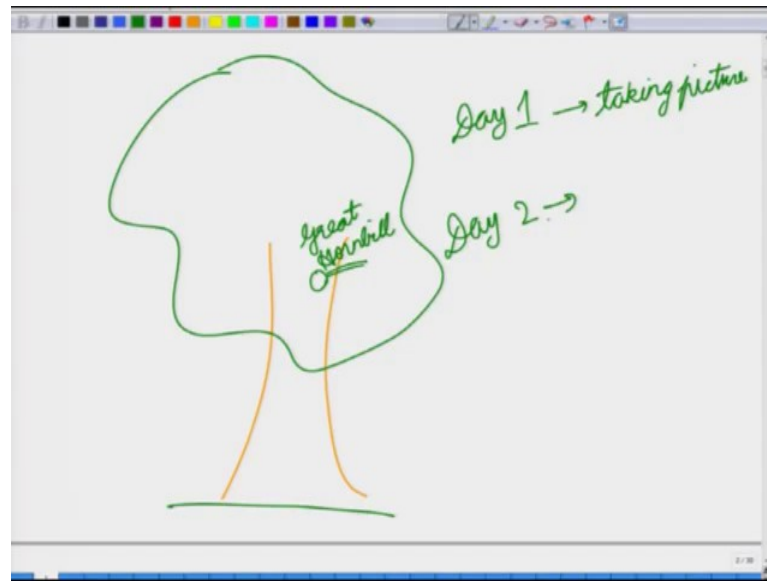
But let us say that we are using this tree directly, but in a non-consumptive fashion. How can we do that? So, there is this tree that is standing on this ground, and probably there is on the trunk, you have a certain species of birds, say, let us say there that of the Great Hornbill lives on this tree, and I am a fan of the Great Hornbill.

So, I go to this place and I spot this site, I take my camera and I take a picture, and I get a very beautiful picture of the Hornbill. So, what I am doing here is that on Day 1, I am going and taking a picture of the Hornbill, probably that in a pose where it is feeding its children. So, it is feeding the young ones the next generation. So, I go there and I take this picture and now, I have a picture that is that probably I can say sell on the market for say 200 rupees. So, I am getting a value by going to this place and taking a picture.

Now, after I am gone, on next day, on Day 2, you go to the site and you also want to take a picture of this Hornbill.

Now, will you be able to take the picture? The answer is yes, because the Hornbill is still there. So, I am deriving value through this tree, through this Hornbill, but I am not consuming it. So, when I am using this resource, I am using it in such a manner that the value has not gone down. You are also able to go and have the same amount of value. Probably, you also take a picture and you can also sell it for 200 rupees.

So, in this case, we will say that you are using this forest in a non-consumptive fashion. So, what are the different consumptive and non-consumptive uses. Consumptive or productive uses timber. I am taking timber out of a forest. So, the amount of timber now is less. So, you do not have sufficient amount of timber that is left or the same amount of number that is left. If I take away all the timber, you do not have any timber in the forest.

Similarly, with firewood. So, I go to the forest I collect all the firewood that is of label and so, now, you do not have any option to carry the firewood, because I am using it in such a way that the total value that is left for you has gone down. Medicines- so, there are a number of medicinal plants in the forest. If I extract those medicinal plants, then lesser amount remains for you.

So, for instance, there is an amla tree, and there are 100 kgs of amla that are on that tree. I go there and I collect the 100 kgs. So, no more medicinal plant, no one medicinal amla is left on the tree for you how to use. Similarly, grazing so, there is a forest.

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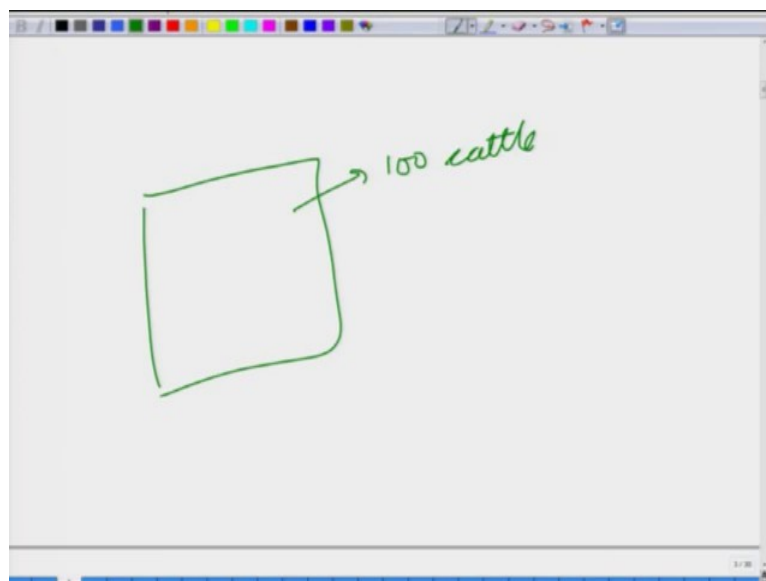
And, this forest is say, able to support 100 cattle. Now, I take my 100 cattle into this forest. I let them graze in this forest, and so, now, no more grass is remaining there. The next day you go and you do not have any grasses for your cattle. So, this is a consumptive utilization. The total amount or the total value that is remaining is going down.

Other NTFPs - so, things like fruits, things like flowers, or things like fodder, things like fuel, things like fodder - all of these are consumptive utilization of forest when you are extracting those. Water - so, there is pond in the in the forest. I go there I extract the water; water out of it. So, less amount of water remains for your use. So, all of these are consumptive values.

Then, we also have a number of non-consumptive values, such as recreation or ecotourism. I go into the forest, I see a tiger, I derive a value, I derive happiness out of saying this tiger. Then, afterwards you go, you see the same tiger, you also derive probably the same amount of happiness. So, the value of the tiger is not going down, because I am seeing the tiger, but then I could also use the same tiger in a consumptive fashion.

So, probably I go to the forest, I shoot this tiger, and I take the carcass of this tiger to my home and I put it in my home. So, now if you go to the forest, you are not seeing the tiger. So, the resource is the same, but then the utilization that you do of this resource could be a consumptive utilization or a non-consumptive utilization.

Now, another non-consumptive utilization is 'education and research'. So, probably I am a student of biology, I am a student of say taxonomy, or systematics, or ecology, and I go to a forest, and I learn about a number of things. So, I go to the forest and I learned - what is a tree? what is a herb? what is a shrub? what is a vine? I go to the forest, and I look at different species, and I derive, say a method of identifying these species. So, for instance, I go then and I learned that the leaves of amla tree are very different from the leaves of mango tree.

So, I am gaining knowledge out of the forest. I am going into the forest, and I am looking at tigers that are hunting, and I learn about the behaviors of tigers. I learn about how a tiger is able to hide itself in the grasses; what, how it is able to use stealth for its predation? what all species does it eat in the forest?

So, I am learning all of these. But then, afterwards if you go into the forest, will you not be able to learn these things? With the tiger still there, at all it is still has a number of prey animals, the trees are still standing there, the amla trees looks the same whether I have seen it or not, the mango tree looks the same whether I have seen it or not!

So, in this case, I am using the forest for education, for research purposes, but the value of the forest is not going down. So, this is another non-consumptive utilization of forest, or you can use it as human and wildlife habitat. So, when you are using a forest in a way that we are not decreasing its value, now again, if you are using it as a habitat, you may keep the value as constant or you may even decrease the value. Probably, you use your forest to create a wildlife habitat for say, deers.

Now, these deers are now moving through the forest. They are eating up all the regeneration. You do not have any predator to take to keep them in control. So, even though you are using the forest in a wildlife habitat, but if you are not using it, if you are not managing it properly, then, probably, in place of becoming a non-consumptive utilization, you can turn into a consumptive utilization. Because after a while, there will be no more young crops that are remaining in the forest.

So, the forest is the same, but we have the option of using it with in a consumptive manner or in a non-consumptive manner, and both of these together come under the direct use of a forest.
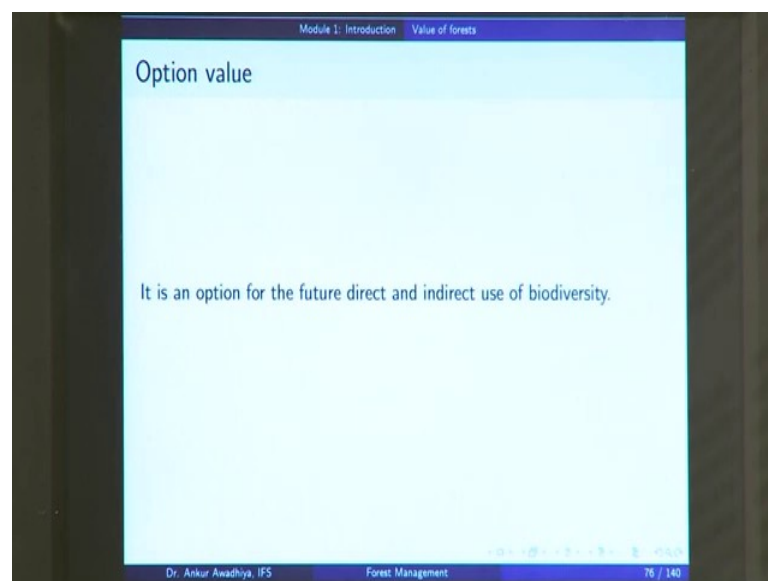
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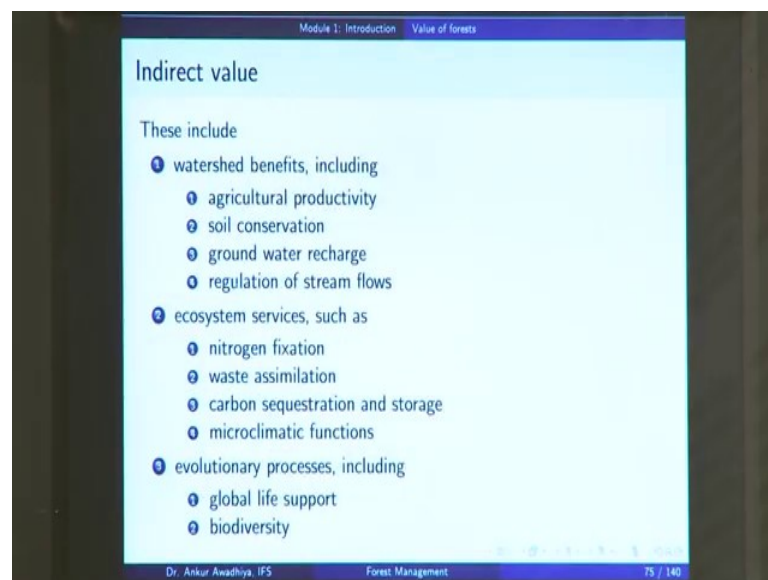
Next, we have the indirect values. Now, these are the values that we are deriving not through a direct use of the forest, but indirectly. So, for example, we are deriving watershed benefits - such as agricultural productivity. So, if you have a forest and it is helping in groundwater recharge. It is helping in slowing down the flow of water. It is

helping in, put in, keeping the soil erosion in check, and because of all of these you have dams that are working for a very long period of time, because there is no siltation that is happening. And because of all of these, you are able to get water, with all around the year and the agricultural productivity of the region is increasing.

Now, this is a value that you are deriving out of a forest, but not directly. So, you are not taking anything that is directly from the forest, but you are using the role of the forest in maintenance of the watershed to gain value out of it. So, a wat, so, the watershed benefits such as agricultural productivity, soil conservation, groundwater recharge, regulation of stream flows all of these are indirect values that you are deriving from the forest.

Similarly, the values of ecosystem services - for example, nitrogen fixation, assimilation of waste, or carbon sequestration and its storage, the microclimatic functions - all of these are also indirect values that you derive out of the forest. Similarly, you can have evolutionary processes such as global life support and biodiversity. So, the forest is supporting biodiversity, the forest is supporting life all over the earth, and this is a value that we are deriving out of the forest. But this is not a value that we are deriving directly from the forest; we are having certain indirect benefits. So, these are all indirect values that you derive from the forest.

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Next, you have the Option value. Now, what is an option value?
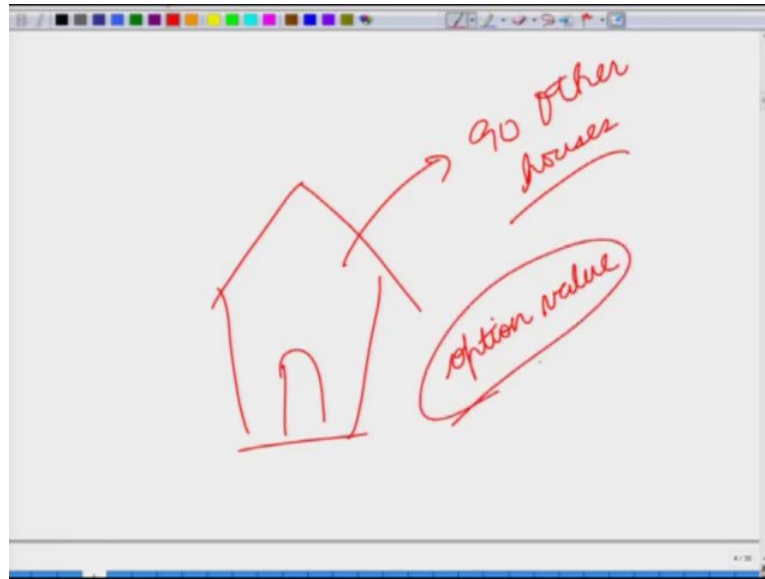
Suppose you have a building; suppose you have this house. You are thinking of buying this house, but you are not sure whether you should buy it today or whether you should search the market even further. So, probably you have looked at, say 10 houses in a market of say 100 houses. This is 1 house that you have shortlisted, but you want to have this option that it should be available in the market for say the next 2 months, and in these 2 months, you will compare this house with the 90 other houses that are still left in the market.

So, probably, this is a good enough house, and if you get something that is better than this, then you will take the better house, or else you will go with the house. So, you have made up your mind, but it is not completely made up, you still want to retain an option. So, you go to the builder and you say ok, I want to have this house for the next 2 months, available for me.

So, the builder will say that is fine, but in the next 2 months, if I remove it from the market, then probably I am losing some customer. Because you have not made up your mind, probably somebody else comes, who has made up his or her mind, and he or she pays me and you are asking me not to sell this house to that person. So, won't I suffer a loss because of that?

So, in this case you get into a negotiation and you say ok, this house is worth say 50 lakhs of rupees, but if you do not sell it in the next 2 months, I will give you 20000

rupees. So, I am giving you 20000 rupees, you will tell the builder so that you just keep this house in the market, you do not sell it to anybody else, and you let me have this option of 2 months, in which I am able to take this decision. Now, this sort, so, you are paying something because you are deriving the value out of this payment and this value is the option value.

So, option value is a value which is an option for the future direct and indirect use of forest or its biodiversity or anything else. Now, in the case of a forest, you have this option that you have a number of plants that are growing in this forest, probably you have a lot of timber in a forest, you also have a huge amount of non-timber forest produce. But you do not want to use all of them today.

So, you want to just keep them, because probably in the next 50 or 60 years, there is a new disease that erupts. So, there is a new epidemic and you want to search for medicines that will enable you to solve the set of this epidemic. But if you clear up all of your forests today, if you do not have any plants left, then where will you do the search.

So, you want to keep these forests, not because you want to use them today, but because you want to maintain this option that even after 50 or 60 years, you should be having some forest left with biodiversity so that you can use it in a time in future. Now, that sort of a value is known as an option value. So, it is an option for the future direct and indirect use of the biodiversity and that is there in the forest. So, what we said so far is that the total economic value is the sum of use and non use value.

Use value is something that you are deriving out of using this resource. Non use value is something that you are deriving without using this resource and use value is direct value that you derive directly; indirect value that you derive indirectly, and the option value for a future use or non use, or direct or indirect use of the resource. Now, if you look at the non use value, you have Existence value, Altruistic value and Bequest value. So, what are these?
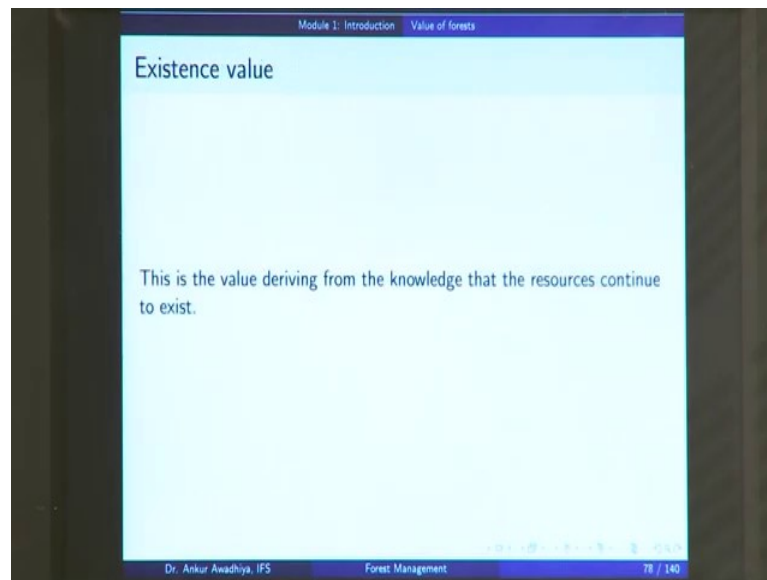
Existing existence value is the value deriving from the knowledge that the resources continue to exist. So, for example, recently, we had large scale forest fires in Brazil and in Australia, and we saw that a number of species or a number of animals died in large numbers. So, for instance, the Koala population, it is said that it has reduced by one-third. Now, when you get such a news that the koala population or the kangaroo population has gone down, the animals have died, you do know you do not feel good, you feel bad.

Because earlier you are having the satisfaction that "yes, there are kangaroos, there are koala bears," and there could be an option of going and seeing them. But even if you do not go there, you still are happy that just by knowing that "yeah, you have kangaroos "there or it is possible that you never go to an arctic region to see the polar bears, but still you are happy because there are polar bears on this planet. You feel happy, because they exist; even though you are not going them, you are not using them for tourism, you are not using them for say their meat or for their for the fats in the body or for their fur.

You are not using them for anything, but still you are feeling good that 'yes, we still have polar bears on the planet.' Now, that sort of value that you are deriving just because something is existing, is known as the existence value. This is the value deriving from the knowledge that the resources continue to exist. So, this is a non use value, you are not using this resource, but you are just feeling happy that yes you have these species.

You have the rainforest; you have the polar icecaps. So, you feel happy about those. Now, this is also a value that we derived from a forest. You are happy because you are having gharials (crocodile) in this country.

So, you know that the population of the gharials is going down like anything, but still there are people who want these gharials to exist in this country, and so, this is a value that they did they are deriving out of just the existence of these gharials. So, this is an existence value.

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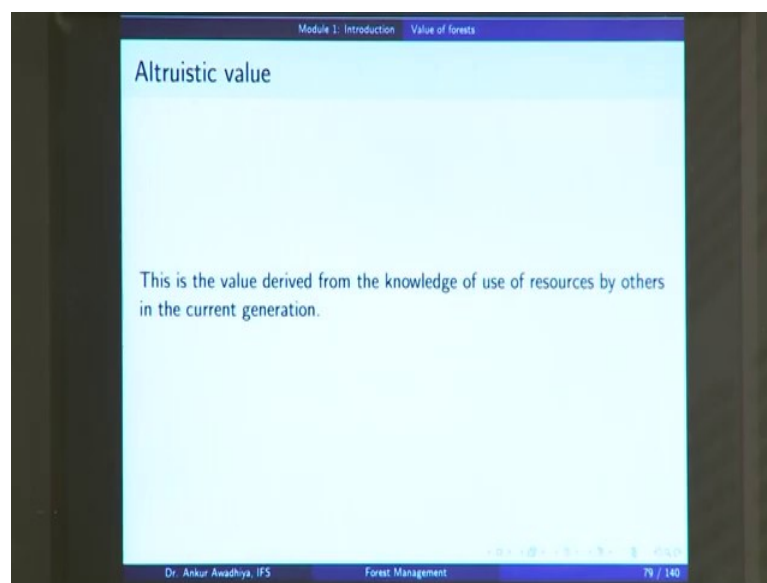
Next, we have the altruistic value. It is the value derived from the knowledge of the use of resources by others in the current generation. So, you are happy that there are some of your fellow human beings who are using this resource, and because, they are deriving a value out of it. So, you also derive the value out of it. So, this is an altruistic value.

So, for instance, I might say that there are tigers in the Sundarbans, and people in West Bengal are using those tigers, for say tourism purposes. So, they are deriving a value out of the tiger since Sundarbans, I am not deriving a value. So, when I am feeling happy because my fellow citizens are able to use a resource, the kind of benefit that I am deriving is an altruistic value.

So, this is; so, I am not thinking in a selfish manner. I am thinking in an altruistic manner that even though I am not using this resource, you are using this resource. So, at least

somebody is deriving some benefit. They are also my fellow citizens; they are also people in the same field, on the same planet. So, I am happy. So, this is the altruistic value that we derive.

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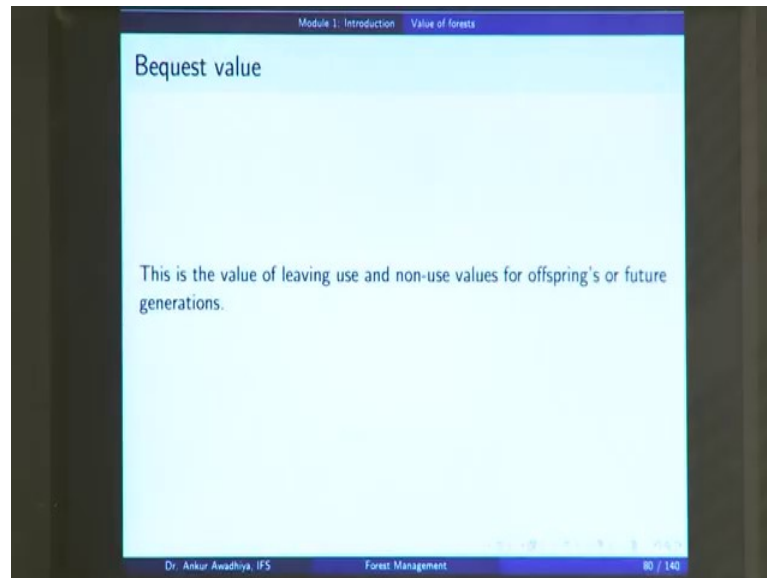
And, third one is a Bequest value. The bequest value is the value of leave of leaving use and non used values for the offspring of other future generations. Now, in the case of a bequest value, what I am saying, is that I am not going to derive this value, nor as anybody in my generation going to derive this value; but our children or our grandchildren will be able to derive value out of these resources. So, we are leaving these resources for the next generation, and this kind of value that we derive out of leaving these resources, so that they can be used by the future generations, is known as the bequest value.

So, for instance, you will have observed that parents leave quite a lot of property for their children and for their grandchildren. Now, why are they leaving this property? They are not using that property. So, if you have say, 10 lakh rupees in a bank account, you can use it yourself, but then, you leave it for your children, why do you do that? Because you want your children to be able to use that resource, so that they are not feeling scarcity and the same thing also arises in the case of natural resources such as forests.

So, we do not want that our children or grandchildren live in on a planet that is all full of pollution, they live in a planet in which there is a dearth of groundwater, they live in a in

a planet in which they are unable to see tigers and derive value out of it, they live in a on a planet in which they are unable to get enough amount of non-timber forest produce. So, you do not want your children and grandchildren to live on a planet that is devoid of resources. So, you conserve your resources, you forego the benefits that you could have derived today so that your children and grandchildren are able to get the benefits.

Now, when I am doing this, I am feeling happy that I am doing it for my children and my for my grandchildren, and the value that I am deriving out of it is known as the bequest value. It is the value of leaving the use and non use values for offspring's or the future generations. So, these are the different values that we derive out of the forest. But this is the theoretical construct. Now, how do we actually measure these values?

So, it is good to say that yeah, the forest is providing groundwater recharge, but then ground water recharge of what value? Is it worth 1000 rupees? is it worth 10000 rupees? is it worth the crore of rupees? how do you do that?

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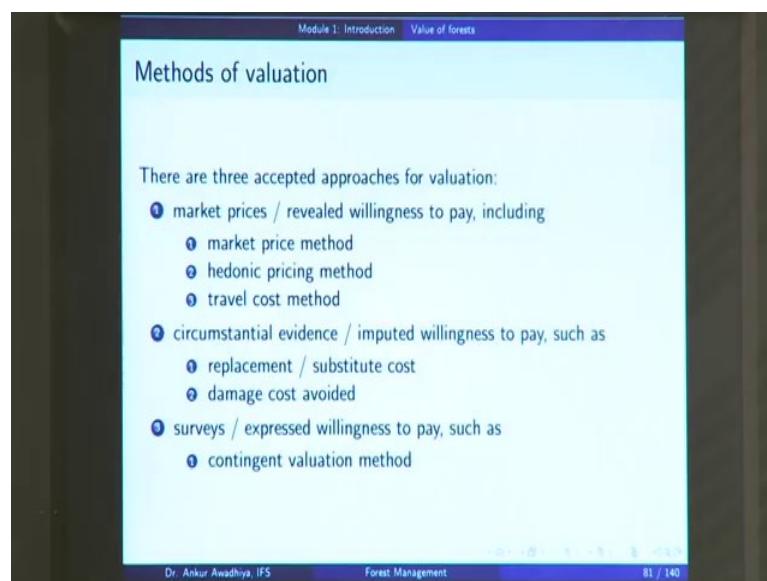
So, next we have a look at the methods of valuation, and there are three accepted approaches for the valuation of these natural resources. So, the first accepted approach is the market prices or the revealed willingness to pay. So, in the case of certain resources, especially the ones that you are using directly, you can just go to the market and ask what is the price at which these resources are being sold.

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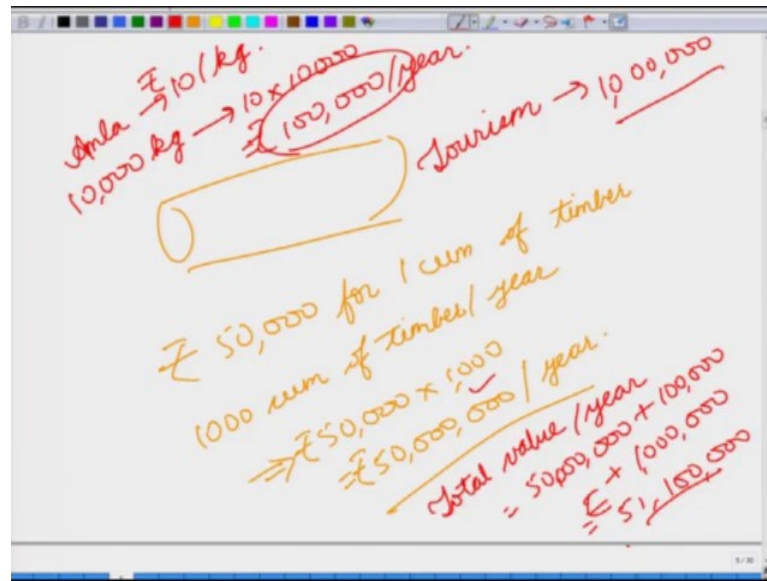
So, if there is a person who is or if there are people who are paying, say 50,000 rupees for 1 cubic meter of timber, and in your forest every year, you are deriving say 1000 cubic meter of timber every year. So, in this case the market value method would say that every year, you are deriving a value of 50,000 into 1000 rupees or 50 million rupees worth of timber every year. So, now, in this case what the market value method is saying is that the value of your forest is at least 50 million rupees a year, if you only consider timber.

But then, suppose your forest is also providing some other values, suppose you are collecting amla out of this forest, and 1 kg of amla is selling for 10 rupees per kg, and you are getting say 10,000 kgs of amla from this forest every year. So, in this case the value that you are deriving out of the amla is 10 into 10,000 is 100 thousand. So, you are getting a value of 100 thousand rupees per year because of amla.

Now similarly, probably, you are getting some tourism values out of it. Probably, your tourist operators or the people who are living in the in the local community, they are able to earn 10 lakhs of rupees every year. So, the tourism benefits to the local community are 10 lakhs or one million rupees. So, if you have these different things that are being sold on the market, you compute the total value of each and every of these items and then you add them together.

So, the total value that you are deriving from this forest every year is 50 million from here, plus 100 thousand from here, plus 1 million from here, which is 51 million 100 thousand rupees. So, this is a value that you are deriving every year from the from the forest by looking at those things that are being sold on the market. So, this is the market value method or the market price method.

So, in this case you are finding out the price at which each good is being sold that is being derived from your forest, you multiply the market price with the total amount of goods that you are deriving say every year from this market, you add all of these together, and that gives you an idea of the total value that you are deriving from this forest by selling the products. So, that is a value that you can assign to the forest.

So, that if now somebody comes and says that we want to cut this forest. So, you have say, a builder who comes and says ok, we want to cut this forest and we are going to pay you say 20 million rupees for this forest. So, in that case you will say my dear, you are going to pay me 20 million rupees, but every year I am getting a value of 51 million. So, I am not a fool to make such an agreement. You should at least give me an offer that pays me 51 million every year to be able to compensate for this forest.

So, this is the utility of doing these market computations, or our utility of finding out the value of the forest, because now you can use these values to make decisions. Now, another way in which we make use of these market prices method is the hedonic pricing method. Now, hedonism means 'feeling happy'. So, what is the hedonic pricing method? Let us consider that you have two localities.
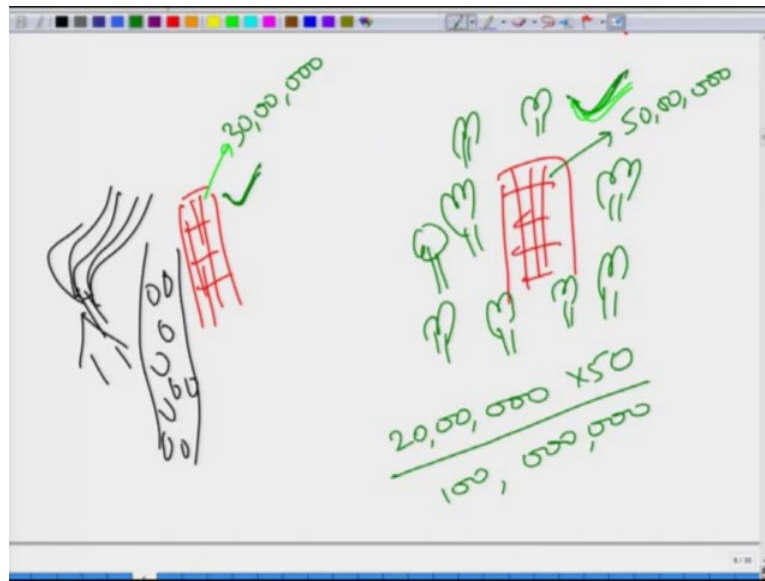
And in the first locality, you have this building, and in the second locality also you have a very similar building. Now, in the first locality, it is right next to an industry that is giving out huge amounts of smoke plus there is also a road in nearby, and you are having a number of vehicles on this road that all day long they are doing a lot of honking pem-pem pom-pom, and also giving out a huge amount of smoke and dust, whereas in the other situation, this building is surrounded by these forests.

Now, which of these would say demand a greater amount of value in the market. So, if both of these buildings are situated nearly the same distance from the city centre or from the industrial centers, then you will say that I am going to go with the second building because at least this gives me a peace of mind. It is a-non polluted area; it is not an area that is having a huge amount of noise, or a huge amount of dust or smoke.

So, now the hedonic pricing method would try to figure out how much is the benefit that I am deriving out of this forest, by saying that suppose one flat in this building is selling for 30 lakh rupees. But a very similar flat in this place is selling for 50 lakh rupees. So, there is a difference or a value of 20 lakh rupees that is derived by these residents because they are living next to the forest because of which they were ready to shell out 20 lakh rupees more.

For a very similar flat in a very similar location, so it has the same distance from the industrial centre or from their workplace, but they are ready to pay 20 lakh rupees more,

just because they have a surrounding that is serene, that is unpolluted. And let us say that this tower is having 50 flats. So, the total value or the total amount of benefits that people are deriving out of this happiness out of this hedonism is 20 lakh rupees per flat into 50 flats, so which comes to be 100 million. So, the people in this locality in the second flat are deriving a value of 100 million rupees that is greater than the value that is derived by people in the first flat.

And, you are getting an idea of this benefit that they are deriving by looking at the market prices of both the flats. So, this is the hedonic pricing method. It is a method that is using the market prices or the revealed willingness to pay to figure out what is the amount of benefit or happiness that people are deriving out of your resource, such as a forest. Now, the third value or the third method of valuation is the TRAVEL COST METHOD. Now, what is the travel cost method? You have a piece of forest.

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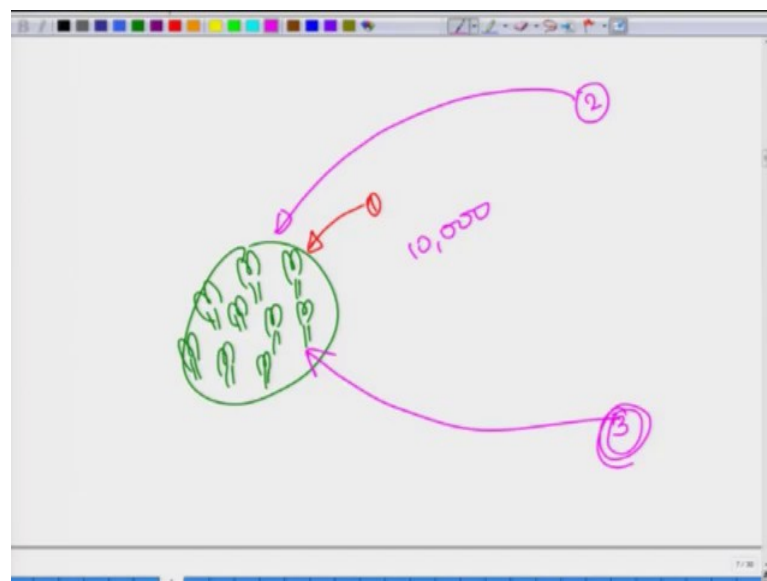
And say this forest is let us say this is the Kanha Tiger Reserve. Now, the, in the Kanha tiger reserve, you have tigers and people are coming from different places to see this tiger. Now, Kanha tiger reserve is there in Madhya Pradesh. So, we have people from nearby area. So, you have a person from Balaghat or a person from Mandla who is going and who is going to Kanha tiger reserve, to see a tiger. So, you have say, 1 person who is going from Balaghat to this area.

Now, this person is spending some amount to go and see the tiger there. So, probably this person takes a car, and this person goes to Kanha, and he is spending more amount as compared to what he would have spent at his home; he is spending more amount on his fooding, he is spending amount to pay for an entry ticket, he is spending amount to take a gypsy, he is paying the guides, and for one round, he is spending say 5000 rupees, and he is deriving a value out of seeing this tiger. So, suppose this tiger was only worth 1000 rupees for this person, would he spend 5000 rupees to see this tiger?

How do you take a simple example? Suppose, I think that this pen is will give me a value of say 20 rupees. So, if you want to sell it, sell it to me for 50 rupees. will I buy it? The answer is no, but if you sell this pen to me for 10 rupees, and I am going to derive a value of 20 rupees out of it, I will very easily by this pen. Now, in the case of the travel cost method what we are saying, is that the person is deriving a value out of seeing this tiger that is at least 5000 rupees, because of which he is spending 5000 rupees to go and see this tiger.

But then, this person is not alone. So, you have another person who is say coming from Delhi, and then, probably, there is a third person who is coming from New York. Now, this person has not only spent money on a cab, he has also spent money, in say the flight tickets, he has also booked an accommodation, he is spending money on fooding and lodging, he is spending money to get inside the area, he is spending money for the guides, he is spending money to get a passport, he is spending money to take a visa. So, he is spending a much greater amount of money to come to Kanha and see the tiger.

Now, the travel cost method would ask the question what is the total amount of money that all these people are spending to see the tiger? Now, in this case probably this person, the person 3 who was coming from New York, he did not come to India just to see a tiger, probably he also wanted to see the Taj Mahal. So, in this case you will divide the total amount of money that he has spent into the amount that he is spending to see a tiger and into the money that he is spending to see the Taj Mahal, and you will only take that portion that he is spending for seeing a tiger.

And now, what you are doing is that you have see, 10,000 people who are coming into this area and each of this person is spending a different amount. Somebody is say, spending 5000 rupees, somebody is spending 50,000 rupees, somebody is spending 5

lakhs of rupees; but everybody is spending something to come to this area. So, you compute how much each person is spending, you add them together, and you get the travel cost method.

So, each person is spending some amount to travel, to come to this area, and this is the value, this is the this is the bottom most value that these people are deriving out of your forest. So, this is the travel cost method. So, these are three common methods in the market prices or the revealed willingness to pay. So, this is a revealed willingness to pay, because people have already or people are paying for it. So, if you look at the market price, this is something that people are already paying for the use of your resource.

But then, you also have the second method which is the circumstantial evidence or the imputed willingness to pay. Now, what is the imputed willingness to pay? If you go to Agra, you will find that the sewage that is coming from the city, goes through an area that is known as Kakrita.

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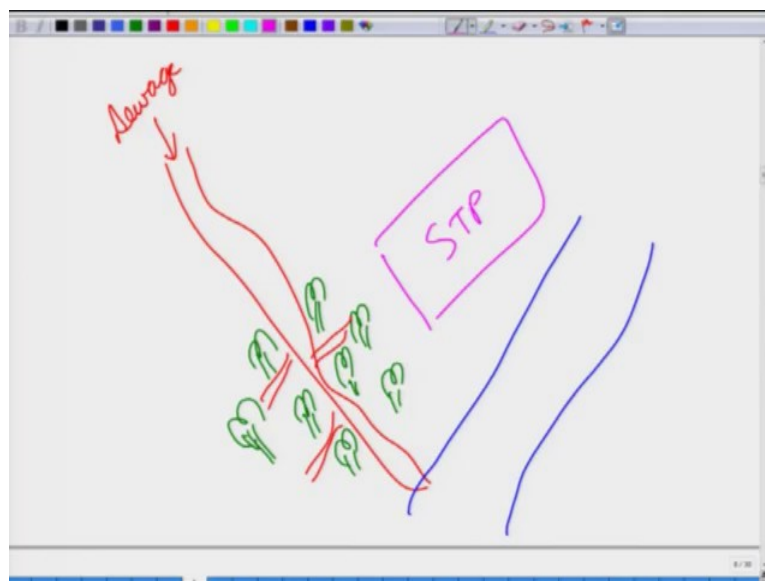
Now, in Kakraita, this sewage flows through an area where you have a good forest and now what these forests are doing, is you also have some channels that are bringing water to these areas. So, this is all the sewage that is coming from the city, and this sewage is now moving through the forest and what these forests are doing is that they are concentrating this water because they are they are taking up this water, they are they are

releasing some amount of water through transpiration. At the same time, they are also bioremediating on the waste.

So, what is happening here is that the toxic residues that were coming in the sewage water that have been taken up by the trees, and through the metabolic processes, of few of those toxic elements are getting rid of, and for some other toxic elements; they are getting accumulated in the bodies of these plants. Now, what was happening earlier was that this sewage was directly getting into the rivers, and was polluting the rivers. Now, you have set up this, you have set up a forest in this area, and this forest is now doing the sewage treatment for you.

Now, suppose you did not have this forest, and suppose in place of this forest, you wanted to set up a sewage treatment plant here, an STP in this area. So, what is the amount that you would have to spend to establish this STP and to run this STP, is the amount that you are saving just by having a forest in this area.

So, here what we are saying is that there will be some replacement or some substitute for the services that are being provided by your forest, and what is the cost of that replacement? what is the cost of that substitute? Now that is the value that your forest is directly providing to you. And another example is the Catskill Mountains that are providing water to the New York City.

Now, in the case of New York, the water is coming from this watershed, and you have a forest in this watershed which is ensuring that the water is coming in an unpolluted form. Suppose, you remove those forests, you convert it into agricultural fields and people start using fertilizers, pesticides in those areas, and then, all those residues of the fertilizers and pesticides will reach into your water bodies. Now, to make that water portable for the people of New York, you will have to set up water treatment plants. So, what is the cost of setting up those water treatment plants; is the cost or is the value that is being provided by your forests.
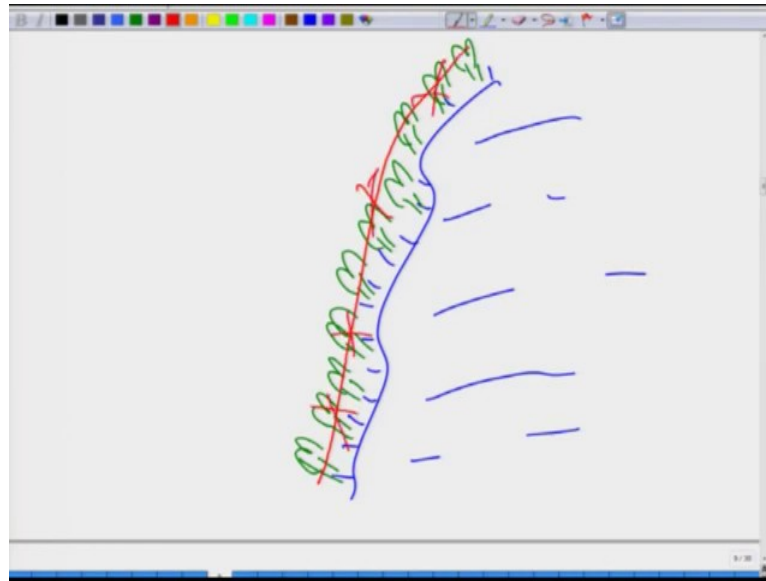
Or for instance, you have an area that is next to a sea coast, and probably, you wanted to build us a wall, to prevent or to mitigate the impacts of a tsunami. So, you want to build a protective barrier, and in place of building this wall through concrete cement, what you are doing is that you are just, so you are not building up this wall, but you are just planting trees here. So, you are generating a forest in this region for its protective benefit.

So, if you want to figure out the value of this forest, you should look at what will be the cost of its replacement. So, in place of the forest, if you were to build a protective wall how much would money would you pay for it, and that is the money that you are saving just by using these forests. So, that is the replacement cost method. You look at the cost of the replacement.

The other option is the "damage cost avoided". So, if you take this example of the of the forest that is protecting you is the tsunami, what would be the amount of damage that would have happened if you did not have these forests? So, if you remove these forests and there is a tsunami, there would be some damage that is happening to the local areas. What is the cost of that damage?

So, that is the damage that is being avoided by these forests. So, that is the value that you are deriving out of these forests. So, you can very easily make a computation of the rupee value or the dollar value by looking at the damage cost that is being avoided by having the forest there.
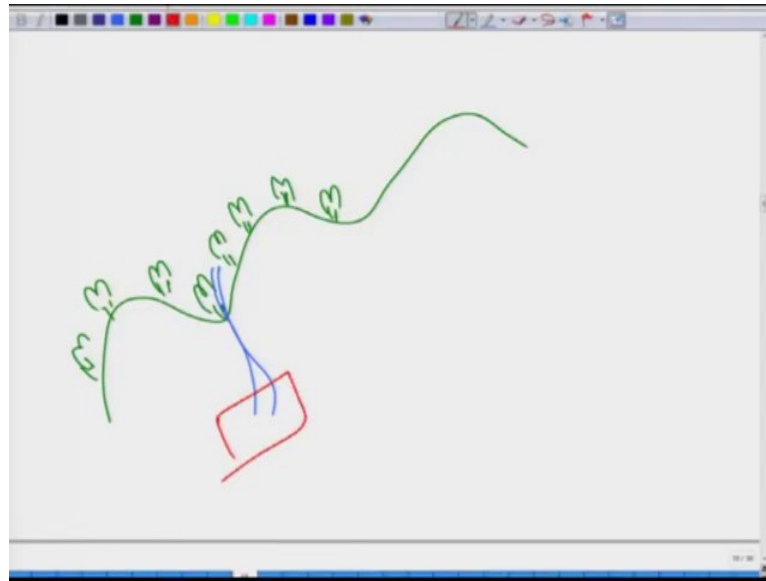
Or suppose, you are having these hilly areas, where you are having the forest. Now, because of these forests, the rivers that are flowing through this area are not laden with sediments. Now, if you did not have these forests here, there would have been a huge amount of soil erosion, and your rivers would have been full of the sediments, and later on here you have a dam that was constructed.

Now, if you do not have the forests, the sediments will fill up the dam. There would be a huge amount of silting in the dam and the life of your dam would go down, or for instance, you would have to pay for desilting operations in this dam. Now, if you are having the forest you are avoiding that damage, you are avoiding those cost of desilting this reservoir every year. What is the cost that you are, that what is the amount of money that you are saving if you compute that that will give you an indication of the damage cost avoided!

Similarly, if you do not have a forest, if you have if you have an area when you where you know, because this area is devoted of forest, you are having more amount of dust, more amount of smoke in this area. So, people are getting sick. Now, what is the amount of money that the government is spending in different hospitals to treat these people? Now, that is a damage that that is happening because you do not have a forest. So, if you have a forest you can compute that let us suppose the government for spending say 5 crores of rupees in treating people. So, you are talking about 2 areas.
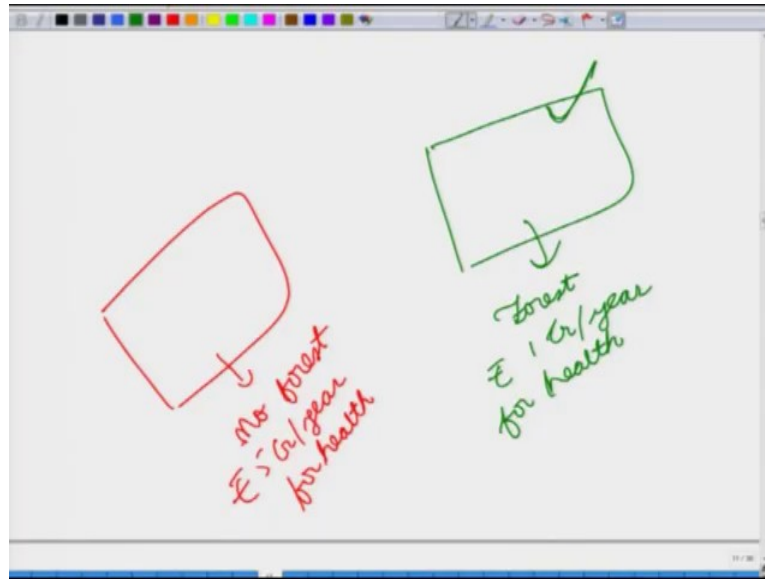
So, in this locality, there is no forest and the government is rupee, is spending rupees 5 crore every year for health, because people are getting sick more often. Now, you have another area where you have a forest, and probably, the government is spending only 1 crore rupees every year, for equal number of citizens in this area, for health.

So now, in this case if you do not have the forest, the damage to the people increases by 4 crores every year, because of it you have to spend 4 crores of rupees more. So, the value of these forest is at least 4 crores every year, because it is, it is avoiding the damage to the health for which case you would have to spend more and more money. So, this is another example of using the damage cost avoidance method, of circumstantial evidence or the imputed willingness to pay.

So, in this case, you are the you do not have a situation in which people are actually paying for it, but you are looking at a scenario that if you did not have the forest, how much I want would you have to pay by looking at similar circumstances in other areas. How much money would you have to pay for water purification, how much money would you have to pay for sewage treatment, how much money would you have to pay for health benefits, how much money would you have to pay for - if there was a damage because of the tsunami?

So, you add all of these together, and you are getting an estimate of the damage cost that is being avoided by your resource, such as the forest. So, this is another way in which

you can put a rupee or dollar value to your forest. Now, the third approach is known as 'service or the expressed willingness to pay'. So, you are asking people how much are they ready to pay for something, and a good example is the 'contingent valuation method.' Now, how do you do such a survey?

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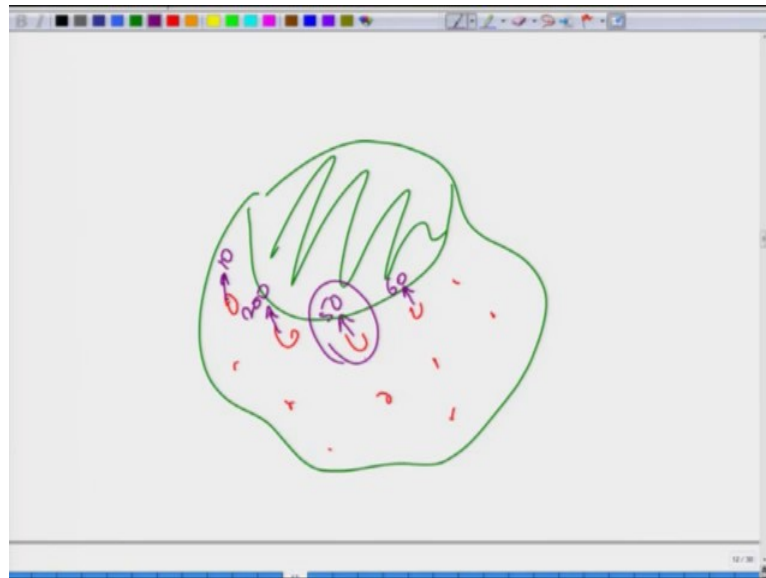
So, for instance, you have an area in which you have these forests, and then, there are people who are living in the vicinity. Now, you go to every person and you ask this person that suppose the government is a making a plan to remove this forest, and suppose, the government is removing this forest to gain some money. So, we want to sell off this land to a private developer so that he will cut these trees, and he will pay to the government some money.

Now, if you were to ask the government that you should not be selling these forests, then in that case you should be ready to pay an extra tax to protect this forest. So, you give every person this scenario that the government is saying that either we are going to convert these areas into a barren land, or into a into a barren land for the developer, or else, if you want to protect these lands, if you want to maintain them as far as the citizen should be ready to pay something, as an extra tax, because we are out of funds.

Now, if that is the situation how much money are you willing to pay in the tax? Are you willing to shell out, say 10 rupees every year; are you willing to shell out 20 rupees, 30 rupees, or say a 100 rupees, or 500 rupees, every year? So, now, this is the question that

you are asking to each and every resident of that area. So, suppose the first person says I will only shell out 10 rupees. This one says I am ready to pay 200 rupees. This one says 50 rupees is something that I am able to shell out, if the government asks me to pay more than 50 rupees, it is better to cut this forest. So, now, what your what you are making an assumption here is that for each and every person, if this person is ready to shell out 50 rupees, it means that in the eyes of this person the value that this person is deriving from the forest is at least 50 rupees, otherwise he would not be ready to shell out 50 rupees for tax.

Now, mind you the government is not cutting anything, in this case the government is not putting up any taxes, but you are just giving a scenario to the two different people. Now, when you give this scenario, do you take a survey how much money are you ready to pay to protect your forest, and you come up with a figure. So, the figure would give you the value of the forest in the eyes of these local people.

Now, it is not just these local people. You can even perform this study at a at a location that is far off from that place. So, for instance you can ask people in India, how much are you ready to pay to protect the polar bear? So, suppose you say that the government wants to have a contribution for from every person, and will give it to the United Nations for a program to predict the polar bears. How much will you be ready to pay?

So, you are not asking people to pay; you are just asking them how much will you be ready to pay. So, this is neither an actual or a reveal willingness to play, or to pay this is not an imputed willingness to pay, this is just an expressed willingness to pay. So, people are just expressing; ok, I will be ready to pay this much. So, this is the contingent valuation method, and by using one or more of these methods, you can put a rupee or a dollar value to the forest.

So, in this lecture, we saw that the total economic value of the forest is a sum of the use value and the non use value. The use value comprises of the direct value, indirect value and the option value. The non use value comprises of the existence value, altruistic value and bequest value. And, you do all of these valuations you add them together and you get the total economic value.

And, the ways in which these valuations are done actually is one of these three - You can go with market prices, or the reveal willingness to pay such as market price method/

hedonic pricing method or the travel cost method. Or, you could go with circumstantial evidence or the imputed willingness to pay, such as replacement costs, substitute cost or the damage cost that is avoided. Or, you could take surveys - ask people to express how much they are willing to pay that is express willingness to pay - such as the contingent valuation method.

And, by using one or more of these methods, we can find out the rupee or dollar value of a forest, and in that way, we will be able to say that if there is a plan to remove this forest that this plan must be at least giving you this much amount of value, in which case you would be ready to part with your forest, otherwise not. So, that is all for today.

Thank you for your attention [FL].