Environmental & Resource Economics
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Lecture 53
Economic Valuation of Environmental Goods and Services – Different Valuation Approaches Part -13

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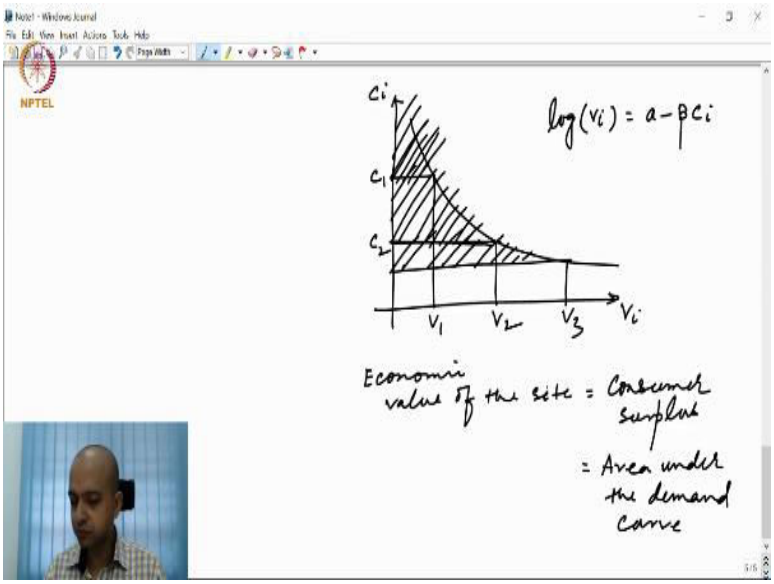

And then we will estimate the function and once we estimate the function, we can easily calculate area under the demand curve as consumer surplus and that is used as a measure of economic value of the site.

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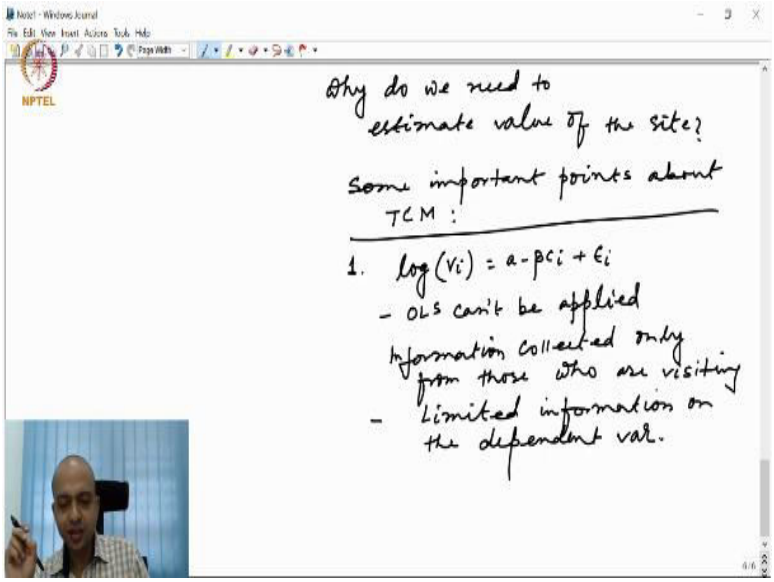

Now, the question is why is it required, why do we need to estimate value of the site? This is common for all type of economic valuation, basically by economic valuation we are trying to do some kind of cost benefit analysis, because any site, any environmental goods and services might be having n number of other competing demands.

For example, in the place of naturals in that site what we are talking about, it is possible that the local authority might be thinking to build a five-story building or a shopping complex or a flyover, before building that what we need to know is what is the cost and benefit of building such of converting that natural site into some other developmental activities.

Now, how do you compare the value of that site? The value is basically the total consumer surplus that we need to compare with the benefit of the shopping mall that we are thinking of in place of that natural site, unless we know what is the value of that site it would be difficult for us to take any developmental activities in that place, always we have to go by cost and benefit analysis, in that regard we need to estimate the economic value of the site so that we can compare this value with the benefits of other developmental activities and then come to a conclusion, that is why it is required.

Now, there are certain important points that we need to keep in mind while estimating the demand for the environment using Travel Cost Method. So, some important points about TCM, first of all we said that we will be interested in estimating this type of function by simple least square, ordinary least square technique, this type of function but there is a problem in applying OLS, so OLS cannot be applied, why this is so?

See here when we estimate the value of the park, we collect information only from those who are visiting the place, so that means information collected only from those who are visiting but there might be some potential visitors who are not visiting at that place but given a chance they might also visit, we do not know, so that means limited information on the dependent variable.

We are asking those individuals who are visiting, but we do not know that there might be others who are also planning to visit that place, so in that case the information in this equation, the dependent variable Vi we have only limited information, limited to the visitors only, that means this type of situation can be modeled in this way.

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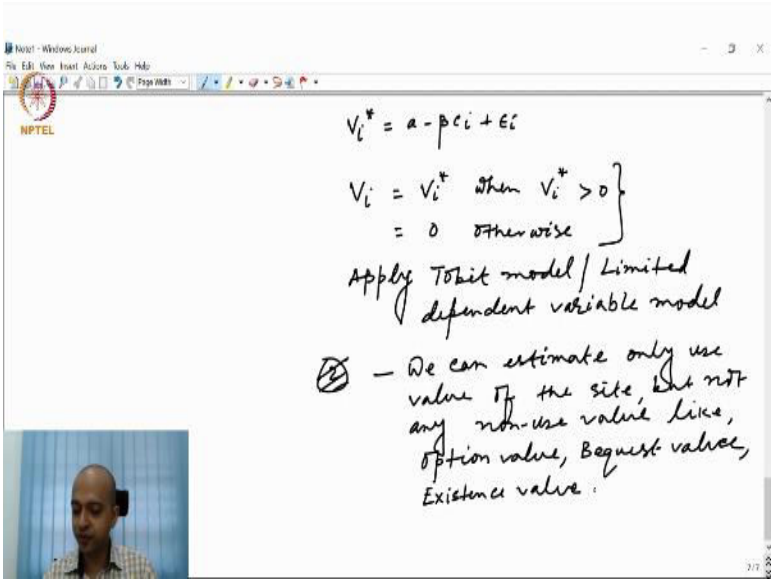

Let us say that Vi star is a latent variable which we cannot observe because every individual we will calculate in their mind, what is the cost and benefit of visiting the place. If the benefit is higher than the cost then only the individual will make a trip, if the

cost is lower, cost is higher than the benefit then the individual is not visiting the place, so that means the 0 visit for a particular individual is not because it is not at all interested but the cost is not permitting him on the heart, that means that individual might also have some value, I cannot say that those who are not visiting, first of all we are not able to capture potential visitors and those who are not visiting we cannot say that just because they are not visiting their willingness to spend is 0, no.

For example, it may so happen that to visit that place cost per trip is 2000 rupees but the individual can afford only 1500, so since the 1500 is less than 2000 we are not able to visualize, we are not able to observe number of trips for that individual and putting it as 0, so it this 0 is not actual 0 so that means this 0 is because the amount of cost per trip is not permitting the individual to make a trip, so that is why this Vi star which is basically a minus B Ci is a latent variable this Vi is unobserved, so this Vi is related to the actual trip in this way when Vi equals to, Vi equals to Vi star, when Vi star greater than 0, 0 otherwise and these type of situation when we have limited information on dependent variable then we need to apply Tobit model or limited dependent variable model.

So, this is the first problem about estimation, so that means we can also say because of this problem, so we can also say that in travel cost method we estimate only the use value, so that means we can estimate only use value of the site but not any non-use value like option value. I am not visiting the site right now but I may visit 2 years, 3 years, 5 years down the line, I am not able to capture the bequest value also that means I may preserve the forest or the site for my future generation or I may still feel that the site should be preserved as it is and not be converted to any other developmental project because of its existence value.

So, this is about the estimation of the model, there is limited dependent variable, model should be applied, it captures information only from the visitors, that means those who are using it. So, non-users value are not captured, like option value, bequest value, existence value not captured, this is true for any type of reveal preference approach like the hedonic pricing also we discussed, that value of quality improvement in air quality improvement is captured only by those who are having a house in that place. So, we are

capturing only the use web unlike the stated preference approach CVM and choice experiment wherein we were able to use both use value as well as non-use value because we are asking the individual how much would you like to pay.

So, while deciding about the payment, individual are thinking both of their use value as well as non-useful, so while reveal preference can capture only use value, stated preference approach can capture both use as well as non-use value, so this is the first point and limitation of this travel cost method.

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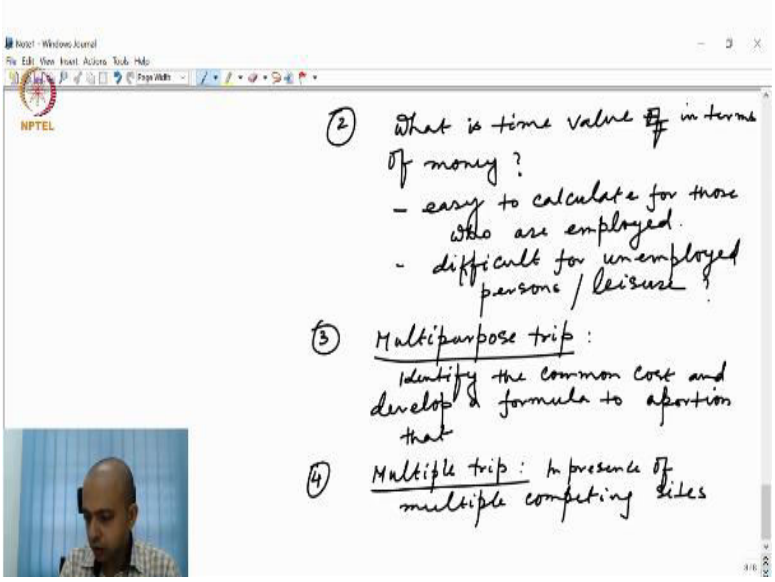

Then secondly, we have included time also in the component of total cost, what is the time value of money that we need to decide. So, easy to calculate for those who are employed, difficult for unemployed person or for leisure instead of visiting that place I can simply take spend the time as my leisure time, so what is the value of that?

It is difficult so if a visitor is unemployed or if the visitor was enjoying the time at home leisurely, somebody forced him or her to come to that place and I am asking you how much time you spend, let us say 10 hours, what is the time value of, value of the time in terms of money for that 10 hours for a person who is not employed.

So, that means what is the value of time in terms of money, instead of saying what is the time value of money what we can say that, what is the time value in terms of money, in terms of money, which is easy to calculate for the employee but difficult for the unemployed person that is the second limitation or observation about the travel cost method.

Thirdly, as we mentioned the individuals might be making multi-purpose trip, multi-purpose trip, so in case of multi-purpose trip for example, I have some other works or I am visiting some other place as well while visiting that place, so what do we need to know identify the common cost, we need to identify the common cost and develop a formula to apportion that.

If I have some other works for example, I am visiting a particular site but I have some work, some official duty while coming for the official duty or some other work I am visiting a place, so the cost that I incur is not purely to visit that place rather I have some work also, so what is the common cost that I need to apportion from the total cost then I need to find out what is the site specific cost that need to be included.

Multiple trip, as I mentioned earlier that means while visiting the place A, the visitors might be interested to visit nearby other places as well, so in presence of multiple alternatives, competing sites, in presence of multiple competing sites one needs to develop.

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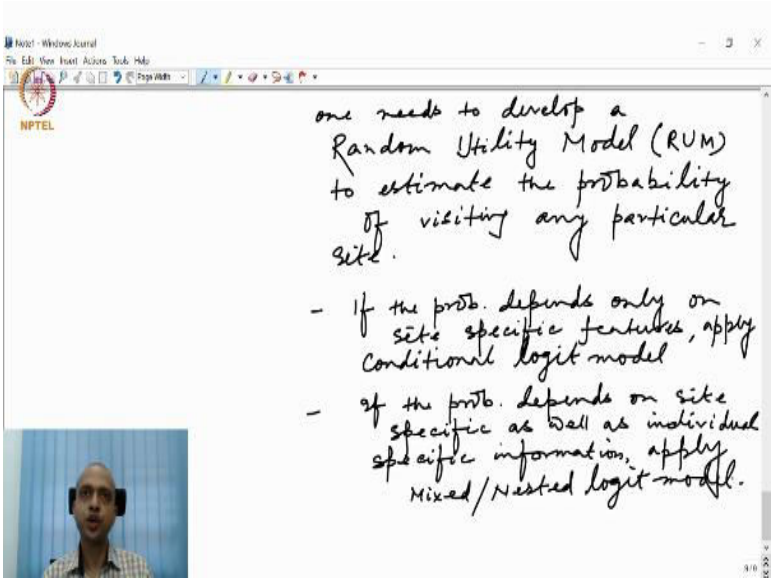

One needs to develop a Random Utility Model or in short RUM to estimate the probability of visiting any particular site. So, we need to develop a model which is random utility model to estimate the probability when I have competing sites, what is the probability that the individual will visit a particular location that we need to estimate and if the probability depends only on site specific features, that means when I am visiting as park, recreational park the probability of that visiting that part depends only on the features of the part, what is the size of the park, what is the greenery, what is the entry fee or how many species are there so on and so forth, so if probability depends only on site specific features apply conditional logic model.

If probability depends on site specific as well as individual specific information, apply mixed or nested logic. So, these are the observations of the travel cost method, so that means basically the idea here is in short in travel cost method what we use is the total cost incurred by a visitor to visit a particular place as a proxy for the demand, for the environment.

Now, what we generally do we go to the place and we ask thousands of individuals that how many trips they made in the last one year and what is the cost they have incurred, what is their income, family size, whether they are visiting any competing sites or not, whether they came only to visit that place or there are some other purposes, then we need

to basically estimate a function, demand function very simple demand function where demand that means trips made in last 12 months, we take log of Vi is a function of Ci, log of Vi equals to a minus B Ci this is the function we need to estimate by the regression.

Once we estimate the demand function, the value for that park is basically the consumer surplus area under the demand curve, very simple to estimate but certain observation, certain points we need to keep in mind that we should not apply OLS technique to estimate this type of function because we have information only for those who are visiting, that means limited information on the dependent variable, that is why a limited dependent variable model or Tobit model is appropriate here and since we are collecting information only for the visitors, travel cast method can capture only the use value of the part, no non-use value can be captured, this is true for even hedonic pricing model as well.

So, non-use value like option value, existing value, bequest value cannot be captured unlike the CVM and choice experiment wherein we are able to capture even the known use value also and then while calculating the cost we need to be very, very careful since we have included time also as one component. So, for those who are employed we can easily calculate the opportunity cost of time but for those who are not employed, unemployed or spending time as leisure for them it is difficult, we need to find out alternative ways to find out the opportunity cost of time for unemployed people.

Then if they are visiting the place as a purpose of some other activities, then we need to find out what is the common cost that we need to apportion from the total cost, if they are visiting multiple sites not only a particular site, then what we need to do we need to develop a model which is called random utility model, when competing sites are available with their own features what is the probability that the individual will visit a particular site and that can be estimated using multinomial regression model which are of two types.

If we believe that probability of visiting a particular site depends only on-site specific feature we apply conditional logic model, if we believe that probability depends both on site specific as well as individual specific like their age, gender, income so on and so

forth, then we use multinomial logic or mixed logic, sorry mixed logic or nested logic model.

So, this is all about the travel cost method of estimating the value of environment. With this we are closing our discussion on TCM and our next model that we are going to discuss under this reveal preference approach is production function approach that we will discuss in our next session, thank you.