Environmental and Resource Economics
Professor Sabuj Kumar Mandal
Department of Humanities and Social Sciences
Indian Institute of Technology Madras
Lecture 38
Economic Valuation of Environmental Goods and Services – Different Valuation Approaches Part – 2

Welcome to our discussion on economic valuation and we started our discussion on stated preference approach. Today what we will do? We will start our discussion on contingent valuation method, which is the two methods. Among the methods, if you recall we said that stated preference approach basically comprises of two approaches, contingent valuation method and choice experiment. So, let us start our discussion on contingent valuation method today.

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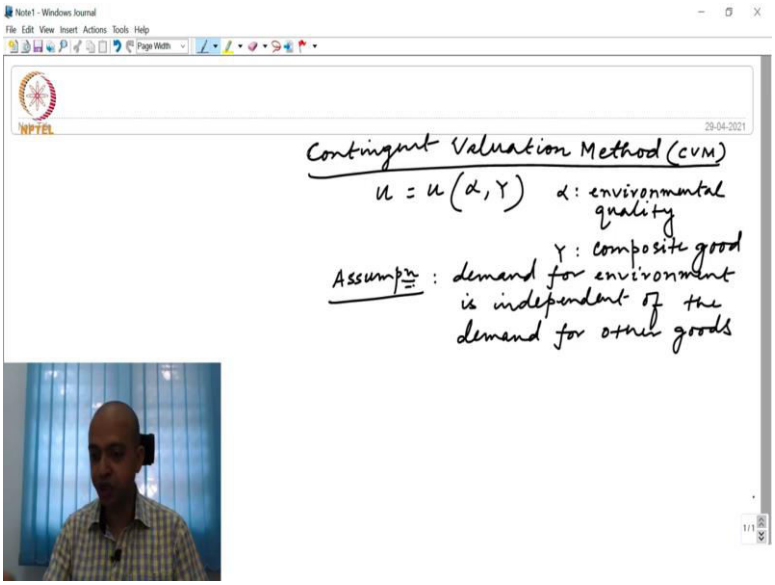

Contingent valuation method: Here in short Contingent Valuation Method it is known as CVM. So, at the core of this methodology there is an utility function; wherein we assume that individuals utility is actually a function of environmental quality. Let us say that is alpha0 and or let us say alpha, and individual's income y which is known as composite commodity.

So, utility is a function of environmental quality; here alpha is environmental quality and y is composite good. So, why it is called composite good? Because with y, you can actually buy any commodities. That is income or money is known as composite good in literature, and we also assume what is the assumption here.

The assumption that we make is basically when I write this type of utility function, we assume that demand for environment is independent of the demand for other commodities. Demand for environment is basically independent on other commodities; so that means individuals derive utility separately from the environment and separately from the composite good.

It is not that you have to buy both in a certain proportion; then only you will derive some amount of utility. And the relationship individuals derive some amount of value or satisfaction or utility from this environmental quality alpha and the composite commodity y; and the individuals total value curve looks like this.

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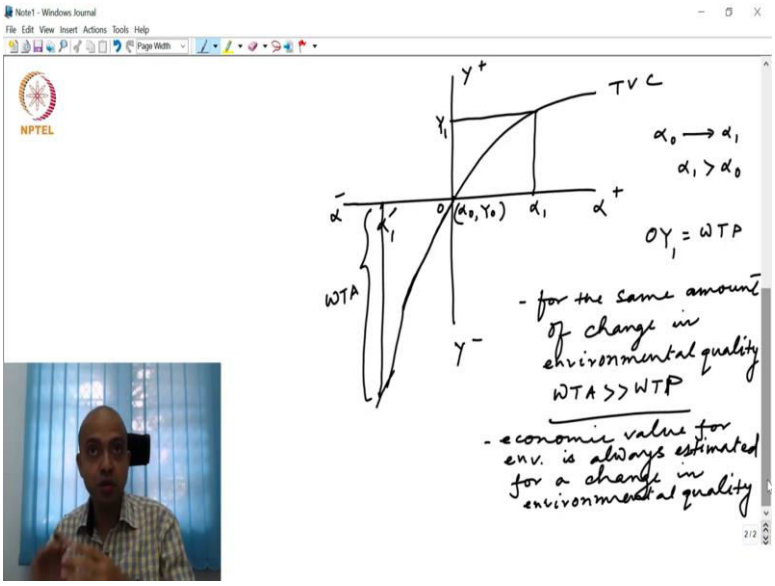

So, let us say that this is a four quadrant diagram. Here I am measuring alpha plus; that means an improvement in environmental quality. Here it is alpha minus that means a reduction in environmental quality. And then here it is y positive let us say, and here it is y negative; and individuals total value curve looks like this.

This is called total value curve is nothing but different combination of alpha and y. So, let us say that initially the consumer is at this point, wherein alpha0 is the environmental quality; and let say y0 is the composite commodity, this is the point. And from here there is an improvement in environmental quality from alpha0 to alpha1.

Now, the question is in this contingent valuation method as I said that we are going to ask the respondent. We are going to ask the respondent to state their preference for certain amount of

change in environmental quality. So, here there is a change in environmental quality from alpha0 to alpha1.

So, what is the change here? From alpha0 to alpha1, where we assume that alpha1 is greater than alpha say. So, obviously when alpha1 is greater than alpha0 for a positive improvement in environmental quality, individual's utility will go up. So, then for this much of change in environmental quality what would be the amount that the individual would like to pay?

How will you determine that? We have to draw a perpendicular from alpha1 to this total value curve; and then we have to add this, let say this is y1. So, that means this y1 is the amount the individual would like to pay for a positive improvement in environmental quality from alpha0 to alpha1.

Now, suppose there is a negative change in environmental quality; let us say from alpha0 to alpha 1 prime, same amount of change but in negative direction, denoted by alpha1 prime. So, for this what would be, so this is basically y1 is then this amount y1; let say this is 0. So, 0 y1 is willingness to pay.

Now, when there is deterioration in environmental quality; that means when there is a degradation in environmental quality, similarly we can ask the respondent, what is the compensation that the individual would like to accept? So that is called willingness to accept. So, obviously when environmental quality degrades from alpha0 to alpha1 in the negative direction; individual will like to accept compensation.

And how will you determine that you have to again draw it diagram we have to; so, this is the amount. This is the amount which is let us say this amount is actually willingness to accept compensation. So, from the diagram itself is very clear that the for the same amount of change in environmental quality, what is the point we can make?

Observation for the same amount of change in environmental quality, willingness to accept compensation is much higher than willingness to pay. This is the simple observation we can make; but it has profound implication about the individual's preference. And why does this happen?

Why for the same amount of change in environmental quality willingness to accept is much higher than willingness to pay; that is something which needs further attention. And we will discuss in detail about the reasons for willingness to pay is much higher than, willingness to

accept is much higher than willingness to accept. Sorry, willingness to accept is much higher than willingness to pay; this we will discuss in detail later on.

So, here in this contingent valuation method, our objective is to estimate the total value curve of the individual; so that we can understand individual's preference, and also we can estimate the economic value of certain environmental goods and services. And one thing we must keep in mind always that whenever we are eliciting information about individual's preference for environmental quality.

So, we are estimating economic value for a change in environmental quality. For example, here we are measuring willingness to pay or willingness to accept for a change from alpha0 to alpha1 in the positive side, or alpha0 to alpha1 prime in the negative side. So, economic value that is also something we have to keep in mind, economic value for environment is always estimated for a change in environmental quality.

Since, there is no direct market exists. What we have to keep in our mind when we create the hypothetical market, we have to create the market in such a way that the individual understands clearly what exactly is the change in environmental quality. That is something we have to keep in mind.

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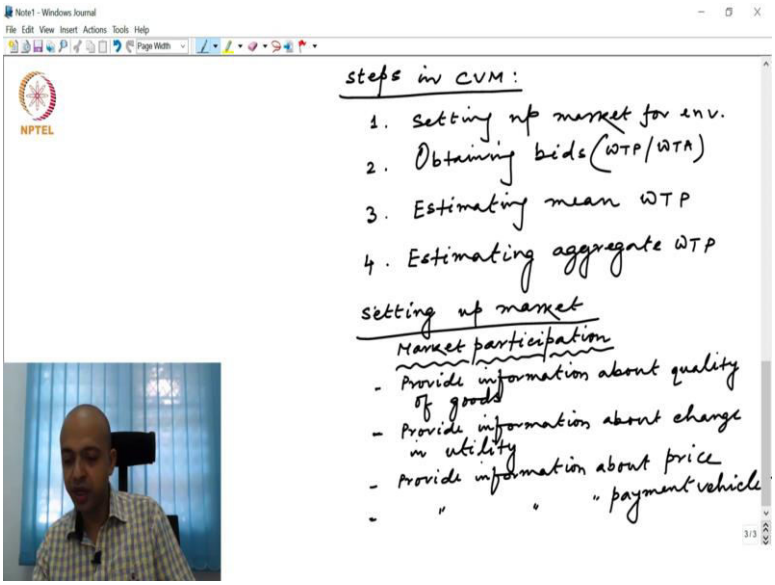

In contingent valuation method there are certain steps. So, steps in contingent valuation method or CVM. What are the steps? The first step itself, step one is basically setting up the market, setting up a market for environment; that means environmental goods and services. Since, there is no direct market we have to create, we have to set a hypothetical market.

Then number two is obtaining bids, number two is obtaining bids and these bids are willingness to pay or willingness to accept. Another name for willingness to pay or willingness to accept is called bid, which is used in the literature of environmental economics. That is why once we set up the market; we will collect the bids from the respondents. That means we will ask them about their willingness to pay or willingness to accept for a positive or negative change in environmental quality respectively.

Then number three- once we obtain the bids we have to estimate, estimating mean WTP mean willingness to pay. And at last we have to get the estimating aggregate WTP; so, these are the steps that we must follow in contingent valuation method. Now, we will discuss all these steps in detail one by one. So, what you mean by setting up the market?

So, when we say the setting up the market, setting up the market is again, involves certain steps. So, this is setting up the market, so that means this is step one. And in setting up market that means we are asking the respondents to participate in the market; so, that means this is market participation. And in market participation again when we set up the market, how do you create the market?

So, what type of information we need to provide to the respondents, so that the individual can easily participate in the market. So, these are the points we have to keep in mind. Market participation in this setting up market requires what do we need to do? We need to provide information about quality of goods.

So, that means whether; we have to first describe the commodity and then we have to, we have to clearly explain in which direction the quality of good is changing. Whether there is a positive change in environmental quality or negative change in the environmental quality, environmental quality or environmental goods and services.

For example, let us say we are interested in estimating willingness to pay for drinking water. Then we have to explain to the respondents that let us say from next month onwards instead of water coming two times a day. Let us say that it will come four times a day; so that means instead of 50 liters per day, let us assume that you will get 100 liters per day.

So, that means there is a change from 50 to 100 that we need to by providing information about quality of goods. What it means is this is 50 to 100 is the change in environmental quality or change in environmental good. So, that is the good we are talking about. Then, we have to tell them that in which way provide information about change in utility.

So, we have to clearly explain the respondents that let us assume that you will get 50 additional liters of water. With that 50 additional or additional liters of water what you can do? You can use it for drinking purpose, you can use it for cooking purpose, you can use it for washing your clothes; or you can use that water even for small irrigation.

So, how the additional good is going to be utilized and then what would be your utility chain that also we need to explain to the respondents. So, that is why we need to provide information about change in utility. Then, we have to ask them what is the provide information about the price.

So, that means for this additional 50 liters of water, how much you are going to pay? 100 rupees, 150 rupees, 200 rupees or whatever; that also we have to tell them. And then lastly we have to ask them how you are go, how you are going to collect the money? So, that means payment vehicle inform provide information about payment vehicle.

So, how will you collect the money? Sometimes it may be collected through your electricity charge, when you pay money for electricity bill. So, this water additional, water charge may also be added with your electricity bill; that is one way of collection. Or you can separately collect water charges individually and independently from each and every household.

So, in which way you are going to collect the money that is called payment vehicle. So, when we set up the market, these are the information's, these are the piece of information that we need to provide to the market. First of all, we need to clearly describe the commodity whether you are estimating the value for wetland or is it a vale for additional drinking water or is it value for preserving biodiversity whatever.

There are several environmental goods and services for which we can actually apply this contingent valuation method. So, the good or services in question needs to be explained clearly; and we also need to explain them where is the change, where is the change. If it is wetland, we have to tell them that this wetland is going to be increased from 100 acres to 150 acres; or, maybe if it is a negative change from 100 to 75 acres because of some developmental change.

And then we need to provide information if there is a change in quality of environment; how it is going to impact your utility or satisfaction. And then we have to also ask them what is their willingness to pay for a positive change in environmental quality, or willingness to accept for a negative change in environmental quality.

And then we have to ask them what is the price they are supposed to pay; and then lastly what is the payment vehicle. So, that means how you are going to collect the money; that is called payment vehicle.

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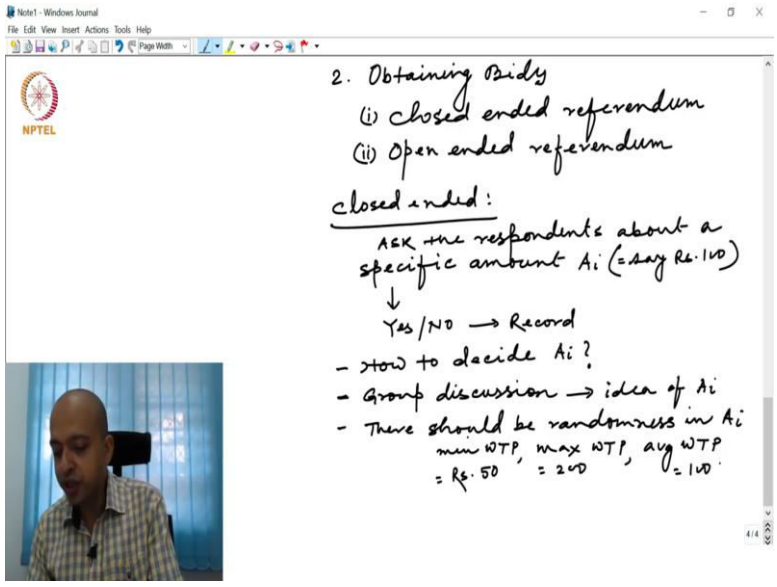

Now, obtaining bids let us say that this is this is the second step. Once you create the market, the next step is obtaining bids. Obtaining bids: So, there are two ways, by which we can obtain the bids; and these are closed ended referendum. And secondly open ended referendum; these are the two methods.

So, first we will discuss about closed ended referendum and then we will go for open ended referendum. So, what is closed ended, this is closed ended. So, in closed ended referendum we ask a specific amount, ask the respondents about a specific amount. Specific amount let say Ai, so we will ask. Let us say for this additional 50 liters of water are you willing to pay additional 100 rupees per month? So, we will ask would you like to pay Ai or let us say 100 rupees per month.

And then what they will do? They will either say yes or no. When I ask the respondent would you like to pay 100 rupees per month for this additional or additional water; then they will say either yes or no. This yes or no we have to just record it. Now, something we need to discuss in this particular case, when you talk about this closed ended referendum; so, we are saying that we will ask the respondent about a specific amount.

Now, the question is how will you decide whether it is 100 rupees. So, that means how to decide, the question is how to decide Ai. So, we have to keep in mind that before conducting

the survey, the final survey at household level. What we need to do? We need to go to that place where we are going to conduct the study. And we need to conduct some pilot survey, let us say group meeting kind of thing.

And then in group discussion, in those group discussion, from group discussion we need to understand, we need to have some kind of idea about the people's willingness to pay for drinking water in that particular region. When you discuss the people in a group in several groups in that location; that group discussion will lead to some idea about, idea of Ai. If we do not go to that place, if we do not talk to the people, we do not discuss; then it is very difficult to have some idea about Ai.

We will be thinking should we ask to pay 100 rupees for this water, should we pay it 150 rupees. So, sometimes this is this Ai is also decided about how much they are paying in general per liter of water, when they are buying it from the market. Whatever, when you discuss with the people, then some idea will definitely come up about the Ai; the specific amount what we are going to ask.

And then we are going to survey around 200 households in that particular location. So, we should not go and ask the same bid or same amount for each and every household. So, that means there should be randomness in Ai; and how will you generate Ai randomly? How will you ask the bid randomly?

From the group discussion we have to formulate some idea about the minimum willingness to pay; then maximum willingness to pay and some average willingness to pay. Let us say that minimum is 50, rupees 50 and maximum is let us say 200, and average is let us say 100. Now, when we go to each and every household, we have to randomly take value from this 50, 200 or or 100 average. So, what we generally do?

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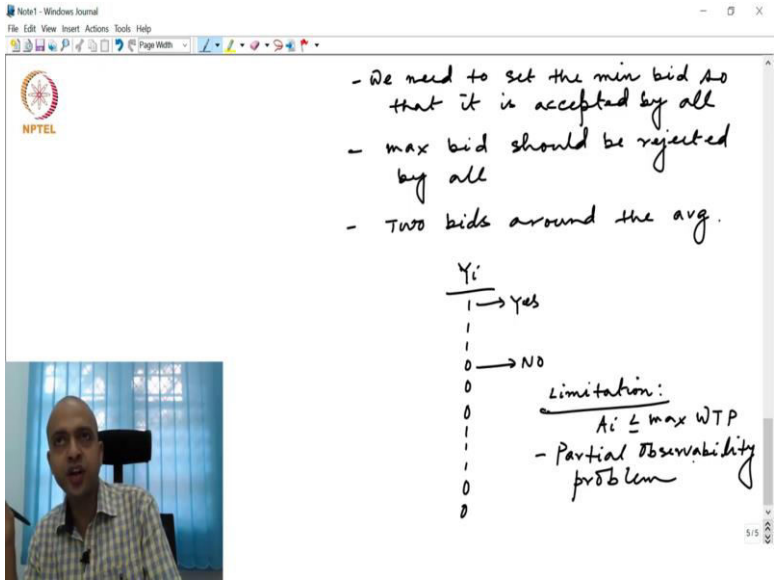

Regarding the minimum value, we need to set we need to set the min bid amount, so that it is accepted by all. So, when you are carefully selecting the bid, we need to select first the minimum bid amount. And then the minimum bid amount should be selected in such a way that it is accepted by all the respondents in that sample.

And then maximum bid should be rejected by all; minimum should be accepted by all, maximum bids should be rejected by all; and then some two bids around the average. So, we have 4 bids; minimum, maximum, two from the neighborhood of average. From these four bids we have to select one bid randomly and ask the individual; and then individual will say either yes or no, and then we will note down that.

So, that means in that way what will happen? If we generate if we go each and every individual and then convert that yes or no type question into a dummy variable; let us say that we are generating our dependent variable is now Yi. So, that means you will get let us say this is Yi is your response variable; so that will take 1, 1, 1, 0, 0, 0, 1, 1, 1, 0, 0 like that.

So, this is, these are the values; so, that means this 1 is for yes, and this 0 is for no. So, when I go to a household and ask whether the are you ready to pay, are you willing to pay 50 rupees for this additional water? They will either say yes. If it is yes, we will note down as 1; if it is no, we will note down that response as 0.

So, you will have only 1, 1, 1, 0, 0, 0 as your dependent variable when we are estimating that bid function, when you are estimating the average bid value. So, this is how we need go to and ask the individuals about their willingness to pay. Now, we will discuss in detail about

the estimation procedure; but, one thing we need to keep in mind, in this closed ended referendum what is the limitation of this?

The limitation is Ai is less than equals to maximum willingness to pay. Ai is basically less than equals to maximum willingness to pay. That means when I am saying are you ready to pay 50 rupees, the consumer will say yes. Now, it may so happen that the consumers would have been paid even higher than 50 rupees. But, since I am stopping the game there itself, I am not able to estimate or get the information about the maximum willingness to pay.

Similarly, for a particular bid amount let say 150 when the respondent is saying no; I am not able to collect information about their actual payment. That means it would have been the case that if we would have asked little lower than 150 rupees, the respondents would have been agreed to pay that. So, that means since it is one shot game, we are noting the response at that stage itself either yes or no; so there is a partial observability problem.

So, that means this is called, since Ai is less than equals to maximum willingness to pay; this is called partial observability problem; which we actually overcome in open ended referendum, which we will discuss later. So, for the time being we are going to discuss, in this course we are going to discuss only this closed ended referendum for estimation purpose; because it is easier to estimate the bid function and mean WTP, when we assume it is a closed ended referendum. Open ended referendum is little complicated than this closed ended one.