Introduction to Environmental Economics
Prof. S. P. Singh
Department of Humanities and Social Science
Indian Institute of Technology, Roorkee

Lecture – 41
Consumer and Producer Surplus-I

Dear student, in this lecture you will study about Consumer Surplus and Producer Surplus. These are the very useful concept in contest of Environmental Economics.

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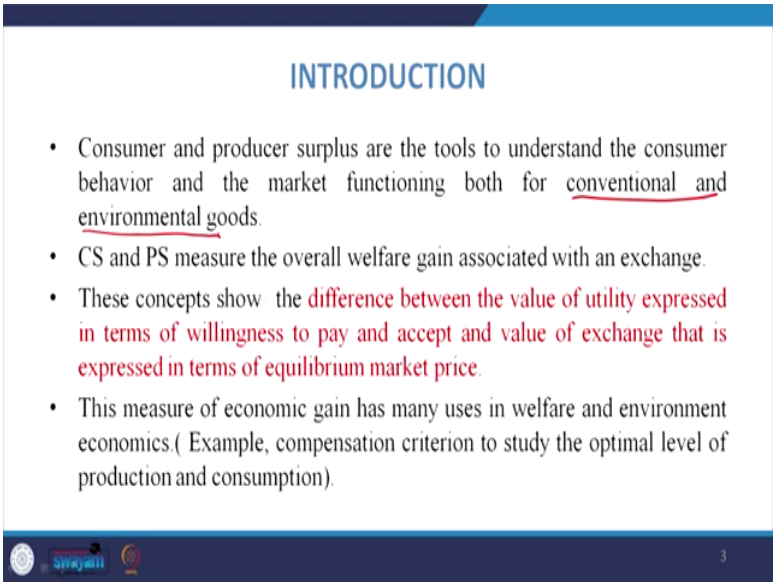

I will explain these two concepts then I also will explain you how to estimate how to calculate consumer surplus and producer surplus and how can we apply these two concepts in environmental economics will also be discuss. Consumer and producer surplus are the tools

to understand the consumer behavior and the market functioning both for conventional and environmental goods.

So, that is very important here that this concept of consumer surplus and producer surplus can be applied not only in case of conventional goods like production of car, production of color TV, but it can also be applied in case of environmental good products like construction of a park and demand for visiting a particular park etcetera.

Consumer surplus and producer surplus measures the overall welfare gain associated with the exchange of goods with the money in the market. These concepts shows the difference between the value of utility expressed in terms of willingness to pay and accept and value of exchange that is expressed in terms of equilibrium market price. In fact, this concept was given by marshal initially and then it was also extended by a other economist.

So, consumer surplus means how much the consumers are willing to pay for a particular unit of a commodity and how much they actually pay to acquire that particular commodity, that difference between the two is consumer surplus. For example, if a consumer is willing to pay 15 rupees for a particular unit of the output to be purchased from the market, but when he goes to the market and if he gets that commodity from 10 rupees then 15 minus 10 would it be the consumer surplus.

In the same manner the same concept is applied in producer surplus, in case of producer surplus when a producer would like to supply a particular product how much price he is willing to take for a particular commodity? It is the willingness to accept the price of the product and how much actually he receive the difference between the two is called producer surplus.

So, this measure of economic gain has many uses in welfare and environmental economics for example, compensation criteria to study the optimal level of production and consumption. So, when we apply this in environmental economics we know when certain kinds of goods

are produced they also produce pollution. And when pollution is consumed by the society the welfare of the consumer degraded.

So, how much consumer are willing to except as a compensation if there is a loss of the environmental goods. And how much actually is the price of that particular environmental goods. So, difference between the two maybe termed as consumer surplus.

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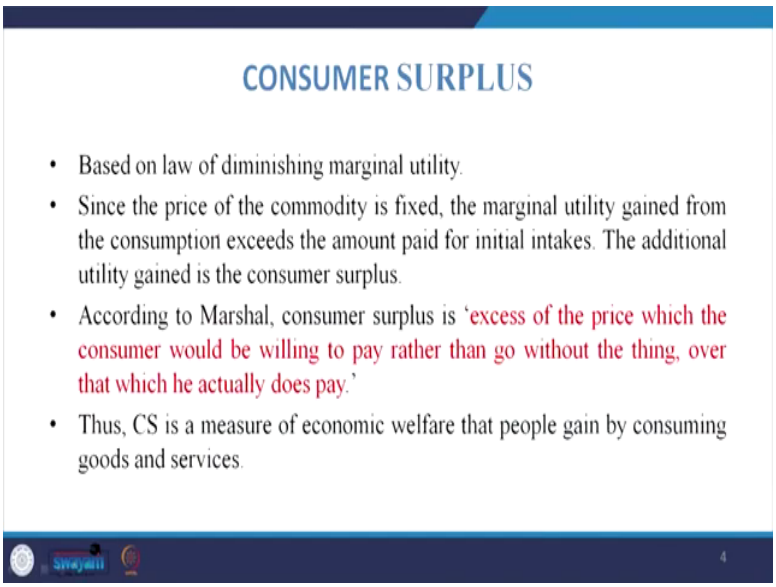

Let me now discuss it in detail based this consumer surplus is based on the concept of diminishing marginal utility. So, when a consumer consume different units of a product successfully, then every additional unit consumed by the consumer would provide lesser and lesser satisfaction or the utility to the consumers.

So, obviously, the since the first unit being purchased by the consumer and being consumed by the consumer is having higher utility then the second units so, obviously, that will provide more utility to the consumer as compared to the second units. So, in that sense the consumer would be willing to pay more price for the first unit of the product to be consumed by the consumer as compared to the second unit, third unit fourth unit etcetera, but all units which the consumers are purchasing from the market have the same price.

So, price is determined by the larger market where supply and demand intersect the each others. The equilibrium level of price is determined at and at that equilibrium level of price a consumer will buy the commodity. So; obviously, the price which the consumer is willing to pay and the price which is determined by the market.

The difference between the two is known as consumer surplus. According to marshal consumer surplus is excess of the price which the consumer would be willing to pay rather than go without things over that which he actually does pay. So, in simple term we can say that the consumer surplus is what the consumer is willing to pay minus what the consumer is actually paying.

And when a consumer is purchasing different units of a commodities, then if you take the sum of various marginal willingness to pay then total willingness to pay can be estimated. So, total willingness to pay minus total money spent by the consumers to buy the different units of commodity is consumer surplus. So, thus the consumer surplus is a measure of economic welfare that the people gain by consuming goods and services.

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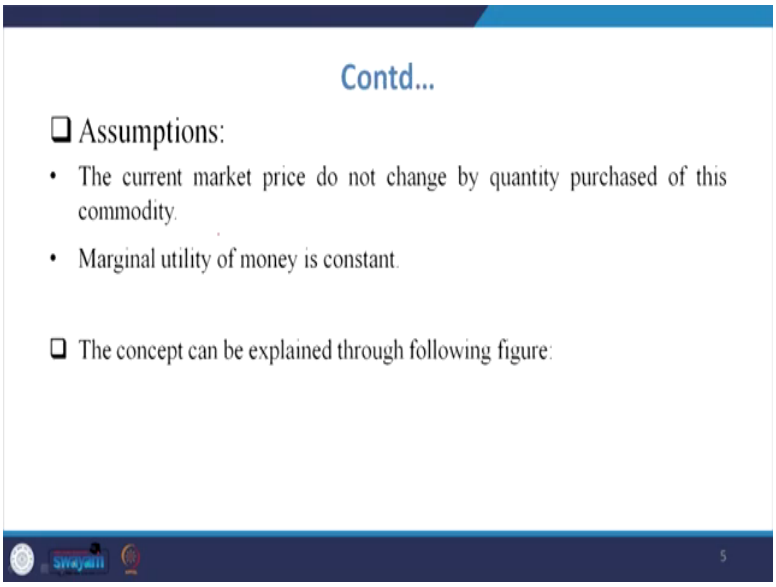

This is based on some assumptions. First the current market price do not change by quantity purchase of this commodity. So, we assume when we estimate the consumer surplus does that market price is given. And it is not varying due to the change in the unit of a commodity purchased by the consumers. Second is marginal utility of money is constant. So, marshal concept is actually based on constant utility of money.

So, marginal utility of money will not change when we spend more and more money to buy a particular product. Although in reality this may not be true, but these are the two assumption on which the consumer surplus is based. The concept can be explained by a simple demand functions and curve.

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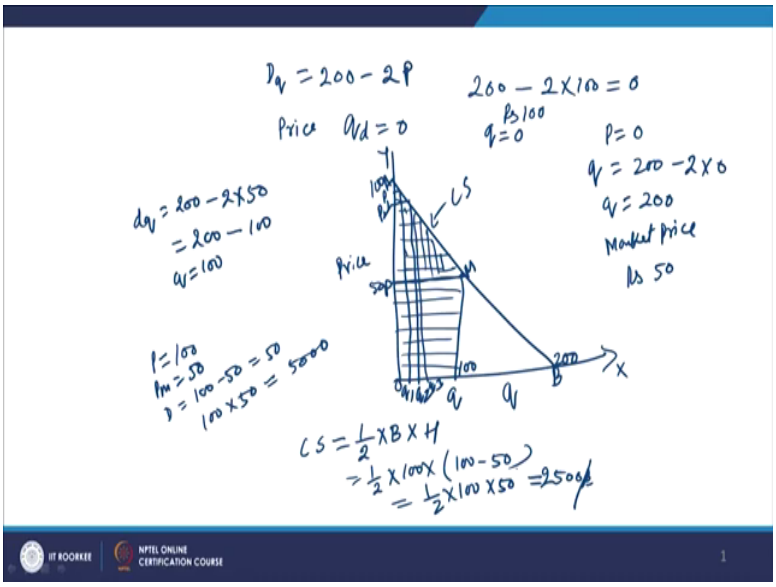

Let me take a simple demand function that D q is equal to say 200 minus 2 P. So, this is a simple linear demand function here. Now, from this demand function you can calculate the price at which; price at which the quantity demanded would be 0, means the maximum price at which quantity demanded would be 0. So, price at which q d is equal to 0. And that is you can say 200 minus 2 into 100 equal to 0.

So, you can see that a if market price of the product is rupees 100. Then the consumer under reference is buying 0 quantity. So, this is the one extreme case. And if you draw a linear demand curve like this at A and B. So, maximum if price is here 100, q is 0. Similarly you can also convert it into the price function and you can also see the maximum quantity when price is 0.

So, if p is 0; if p is equal to 0 how much will be the q? Q will be 200 minus 2 into 0 q equal to 200. So, now, these are the two things when price is 0 quantity demanded q which we are measuring on x axis. And price of the product we are measuring on y axis. And here when the market price is 100 q is 0. And when market price is 0 q is maximum 200 demanded by the customer.

Now, if a consumer goes to the market and buy a buy quantity of the product. And if market price; market price here is say rupees 50. Then quantity demanded you can easily see this is price is 50 quantity demanded is q and you can calculate. So, d q put the value here d q equal to 200 minus 2 into 50 equal to 200 minus 100 q equal to a 100.

So, q is 100 when p is 50. So, now, to understand consumer surplus you can see how much the consumer is willing to pay because this curve is also known as marginal willingness to pay. So, consumer if you take 1 unit consumer is paying this p 1 price for q 1 quantity if price reduce q 2 p 2 then q 3 etcetera.

So, obviously, now, you can see that if consumer is buying 100 units at market price rupees 50. Then how much consumer is actually paying? You can see this area I can put here say m point; m point. So, this is the area which is the amount of money actually the consumer is paying for purchasing 100 units.

But actually the consumer is willing to pay this 0 a m q. So, this upper triangle is actually known as this consumer surplus. And that area can easily be estimated because this is the triangular area and this triangle area can easily be estimated and we can know how much will be the consumer surplus when the market price is p. So, the difference here is maximum price which is consumer is willing to pay for 0? Quantity is p equal to 100, actual price is market price is 50.

So, difference is 100 minus 50 equal to 50. So, this is actually the difference and now consumer is consuming 100 units. So, market price is 100 multiply this multiplied by 50. That is the total amount that is being is spent by the consumer on the commodities. So, above

portion is consumer surplus and you can easily estimate it by taking a simple formula that c s here is 1 upon base into height. Base is this p m this is the base means quantity.

So, quantities so, 1 by 2 into base is 100 and height. Height is the difference between what the consumer is willing to pay the maximum price and what is the market price? So, that is here 100 minus 50. So, consumer surplus can be estimated, but in this example we arbitrarily taken the market price, but in reality market price is determined by the interaction of supply and demand.

I will take this issue later on when I will explain you the equilibrium price and equilibrium quantity by taking both the curve supply and demand, but right now you can easily see that the consumer surplus is how much the consumer is willing to pay and how much consumer actually pay as the market price is given.

So, this is the consumer surplus. So, you can easily estimate the consumer surplus according to the formula you know 1 by 2 into base 100. And the price is 100 this net change in the price is 100 minus 50 equal to 50. So, 1 by 2 multiplied by 100 multiplied by 50 is equal to 2500. So, 2500 in this example is the consumer surplus.

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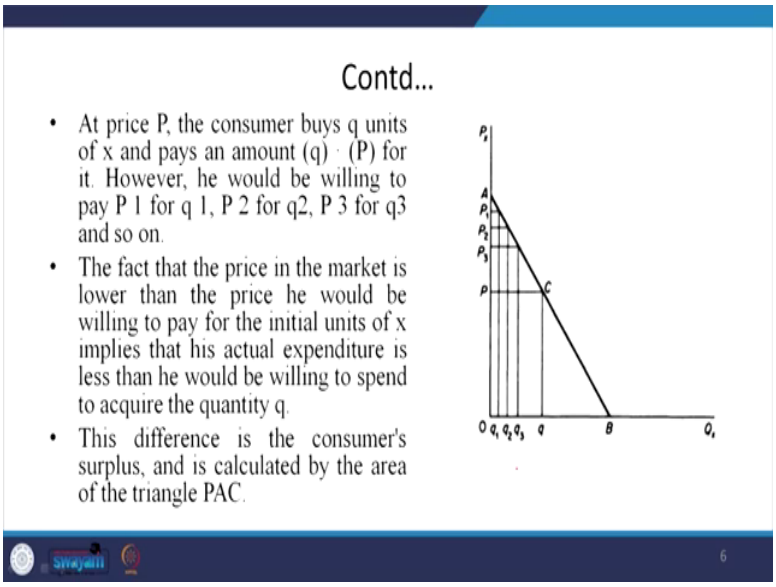

Now, this since I already explained you from this graph you can al see the same things that when the maximum price at which the quantity demanded is 0 is all A, but when market price declines and becomes o P 1 consumer is willing to consume o q 1. When market price further goes down to o P 2 consumer is willing to take o q 2. And in this way and this demand curve is showing inverse relationship between price of the product and quantity demanded. And it is because the marginal utility is falling.

So, when we successfully consume more or more unit of the commodity so, marginal utility declined. So, for every successful unit to be purchased or consumed by the consumer; consumer is willing to pay lesser and lesser price. And if market price is o P then all the area in it a above point P that is o P that is oPcq is the total expenditure made by the consumer and PAC is actually the consumer surplus.

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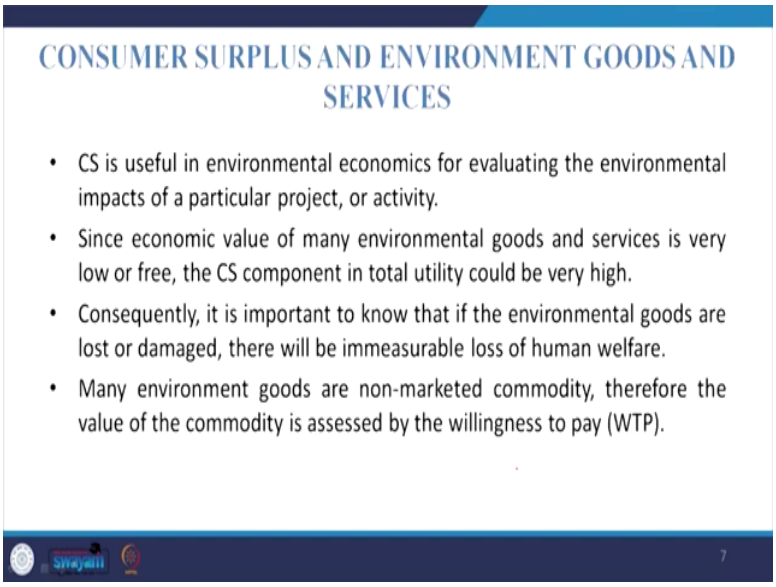

So, now consumer surplus can also be related with the environmental goods and services. So, environment provide us different kinds of goods and services some environmental goods are outside the market, some may be traded in the market. So, most of the environmental goods and services are not traded in the market, but even then we can see or can apply this concept of consumer surplus in case of environmental goods like C S a this consumer surplus is a very useful for evaluating the environmental impact of a particular project or activity.

Since economic value of many environmental goods and services is very low or free the consumer surplus component in total utility could be very high. So, in this case when an environmental service or a product is having although a very low price or a 0 price or freely available even then if there is a degradation in the environmental goods although goods are provided free. So, consumer is forced to spend some money on other goods.

So, welfare of the consumer will declines, as we already discussed taking the indifference curve. When we have two product one is convictional goods and other is the environmental goods and there is a some sort of trade off. So, obviously, when environmental goods degrade due to pollution etcetera, then welfare of the consumer false. So, in order to compensate the government can either provide subsidy or can evolve some other methods to compensate the consumer for loss of the welfare.

So, consequently it is important to know that if the environmental goods are lost or damaged. There will be immeasurable loss of human life. Many environmental goods are non marketed commodities therefore; the value of commodity is assessed by the willingness to pay. So, many times economist researchers try to assess the value of the environment from the consumers perspectives by asking question to them how much they are willing to pay?

For instance, if a particular environmental goods is created in a particular locality, say if a park is to be constructed in a particular locality how much consumers are willing to pay? And actually in some cases of in some parks some fees may be fixed. So, how much they are willing to pay and how much they are actually paying the difference can be termed as consumer surplus. Here in this graph you can see marginal willingness to pay can be assessed through this graph we have this demand curve price is taken on vertical axis and quantity taken on horizontal axis.

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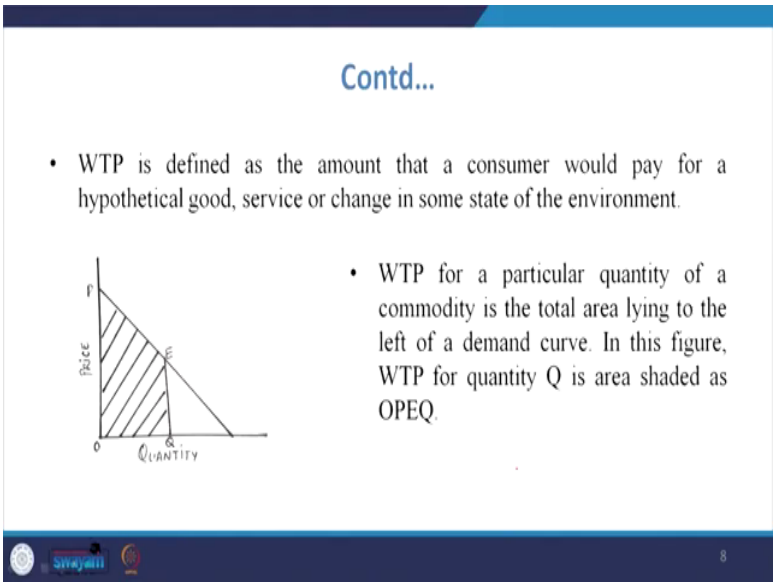

And marginal willingness to pay is defined as the amount the consumer would will be willing to pay for a hypothetical goods or service or change in some estate of environment. As I have already discussed that if quality of environment is improved, if quality of water in the river is improved how much the consumers are willing to pay.

So, that willingness to pay can be transformed or represented by graph like this. So, marginal willingness to pay for a particular commodity of a particular commodity is the total area lying to the left of the demand curve. In this figure total marginal willingness to pay is shown by the this shaded area.

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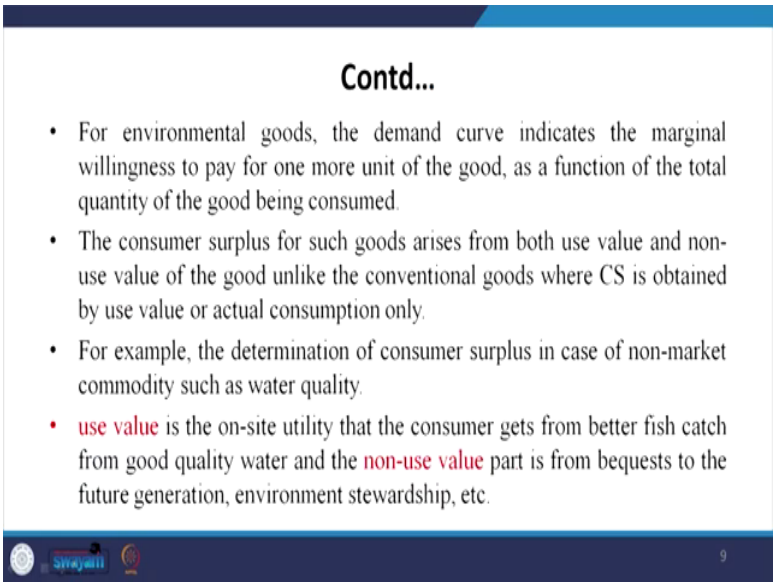

For environmental goods, the demand curve indicate that marginal willingness to pay for one more unit of output as a function of the total quality of the goods, being consumed the consumer surplus for such goods arise from both use and non use value of goods unlike the convectional goods where we have only use value and consumer surplus is obtained or assessed only on the basis of actual consumption of such kind of commodity. For example, the determination of consumer surplus in case of non market commodity such as water quality.

So, here we can have use value as well as non-use value of water quality. Use value is on site utility that the consumers gets from better fish catch from good quality of water; obviously, when the quality of water improves the aquatic life is also positively affected. And the

production of aquatic life or fish etcetera will increase when the oxygen level in the water is high quality of water is good.

So, there would be more generation of aquatic life or like fish or some other aquatic animals. And due to this if someone is going to catch the fish from that particular water bodies then production will increase.

So, that is an improvement in the you can say directly the livelihood of the people when quality of water in a particular water body lake or river improves, but in addition to this there is also non-use value of the water. Quality we have already discussed a use and non use-value in the past like bequest values for future generation we may be happy that our water body is clean neat and flowing uninterrupted.

So, we also draw welfare just without consuming the directly consuming the water. So, we also there are certain non-use values when we see our environmental products are intact or improving day after day ok. So, this I can also explain with simple example of consumer surplus in the case of environmental products actually the method is same.

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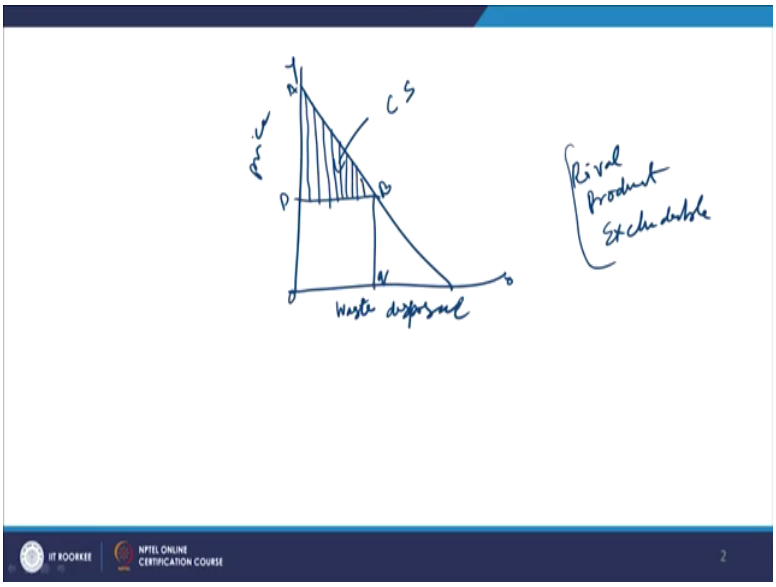

I can take a simple example of say demand for we can take waste disposal; waste disposal and price of waste disposal. So, waste disposal is a good quality of product how much you are willing to pay for every every success unit waste to be disposed by the disposal company.

And how much is the market price which you determined by the interaction of supply and demand for example, if market price is o P then consumer is willing to dispose of the waste by o q if market price is high then waste disposal demand will be less. So, here A P B that is actually the consumer surplus in case of waste disposal, similarly you can take other example of environmental product.

I have deliberately taken this example because waste disposal is a rival product and rival product is similar to the conventional product because here we know the quantity and it can be excludable also excludable. So, since the waste disposal is both rival and on excludable.

So, therefore, you can apply the same method as we apply in case of convictional goods like toothpaste or wheat rice or whatever.

So, this is a consumer surplus because the market price is o P and the consumer is willing to pay the different units of waste disposal and that is why this is called consumer surplus. So, we can apply this concept in environmental economics.

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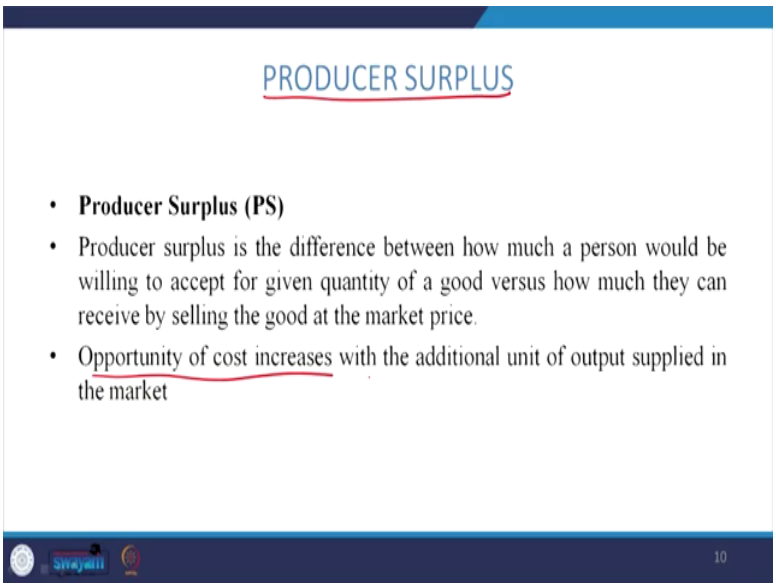

Now, let me explain what is producers surplus. Producer surplus is the difference between how much a person would be willing to accept for given quantity of a good versus how much they can receive by selling the goods in the market. So, producer surplus is the difference between how much the producer is willing to accept the price of his product and how much he actually received.

The difference between the two is called producers surplus how and that actually depend upon how much is the opportunity cost of every successive units being manufactured being produced by the producers. And here concept is just opposite of the diminishing marginal utility. Here opportunity costs actually increases as we increase more or more unit of a product to be supplied in the market.

So, marginal costs mc marginal cost rises after the point particular point. And most of the managerial decisions are taken above the point where marginal cost is having a positive slope, and marginal cost is actually the supply curve of a firm. So, since supply curve is rising and this rising supply curve is clearly indicate that additional unit of output can be produced can be supplied by the producer only when the price is increasing.

So, for every success units the producer will be willing to get more price, but at the point where the price is willing to accept. And price he is actually receiving the difference is called producer surplus. So, I will discuss this concept in the next lecture. Let me just briefly conclude what I had discussed in this topic so, far I explained you the two concepts.

One is consumer surplus and other is the producer surplus. Producers also get surplus when a producers supply a particular product in the market he will supply at a minimum price, if price is there may be some price at which the producer would not be willing to supply a particular product. So, what is the minimum price at which the producer is willing to supply and how much the price actually the producer is receiving after selling the goods in the market the difference between the two is producer surplus.

And since opportunity cost of production increases with the increase in production then the supply curve or marginal cost will be rising and for every successive unit being produced by the producer will bring additional cost. So, producer would be willing to accept higher and a higher price for every additional unit to be supplied in the market.

But actual price in the market is determined when these two forces one is marginal willingness to pay by the consumer, which is represented by the demand curve. And then

marginal willingness to accept that the price which is represented by the supply curve, when these two curves intersect each other equilibrium price is determined. And consumer surplus is above the equilibrium price and actually the producer surplus is below the market price, but above the supply curve of the producers.

Thank you very much, I will continue this topic in the next lecture.