Introduction to Environmental Economics
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Lecture – 46
Externality and Market Failure

Hello everyone. Today, we will be discussing Externality and Market Failure. So, first of all, we will be discussing what is the market failure and what are the causes of market failure; then, we will be talking about a special case of market failure that is the externalities. So, there we will be relating the externalities and market failure. Again, we will be discussing what are the different typologies of externalities in common. And at last, we will be talking about how to internalize these externalities.

So, let us start with the market failure case. So, what is the meaning of market failure and why we are saying that this is a problem and then, we are talking about what are the probable causes of market failure, so that we can correct this case.

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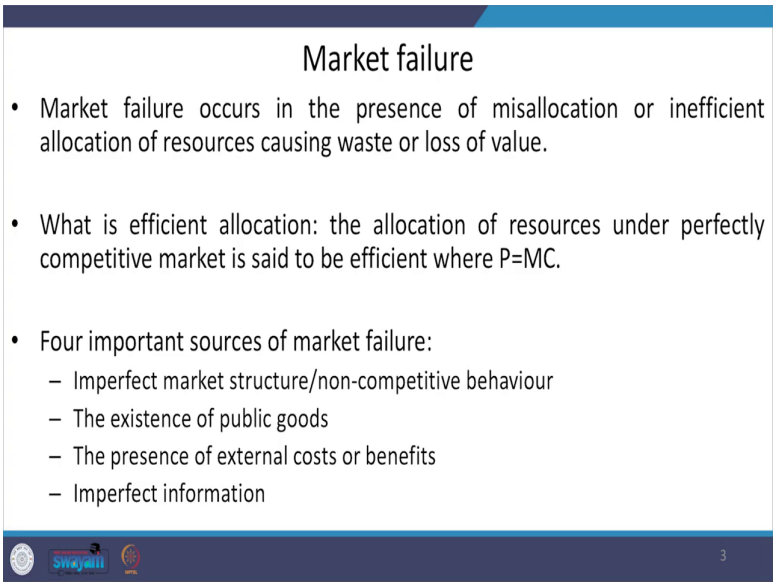

So, market failure generally occurs, when there is some misallocations or inefficient allocation of resources. When some misallocation or inefficient allocation of resources happens, it will be leading to loss in terms of waste or loss in terms of value. So, that is why this market failure is not accepted. And when you are saying that in market failure, we are having a case of misallocation or resources are not efficiently allocated. So, what is the meaning of this efficient allocation of resources?

So, the allocation of resources can be termed as efficient so, that is under the perfectly competitive market. So, when the this conditions that price equates the marginal cost of production, then the if this condition is fulfilled, we are saying under the perfectly competitive market would you have this efficient allocation of resources. But when this allocation of

resources do not fulfill this conditions, price equivalent to marginal cost then it will be leading to inefficient allocation of resources.

So, here in this context, we will be discussing four important sources of market failure although we will be only talking about the externality itself. So, what are the different causes or different sources of market failure? So, the first one is, market failure can happen in case of imperfect competitions. So, apart from perfectly competitive market, the rest of the market systems like your monopoly, oligopoly or monopolistic, they are under this imperfectly competitive market. Under this imperfectly competitive market, this condition that is price equivalent to marginal cost is not fulfilled. So, because of which the resources are said to be inefficiently allocated.

And the second source of this market failure is the case of public goods. So, that means, in case of privately private goods, where a market can dominate or markets can fix the price ah; but in case of public goods, it is very difficult to have this market price for these public goods. So, therefore, if in case of the public goods, this market failure may happen. And the third source of the market failure is the externality; that is presence of either the external costs or benefits external benefits. In either of the cases this market fails.

And the last cause of this market failure is imperfect information which in microeconomics, we are saying asymmetries of informations or lack of perfect information to everyone engaged. But however, in this case, we will be only focusing one of the source of market failure that is the externalities.

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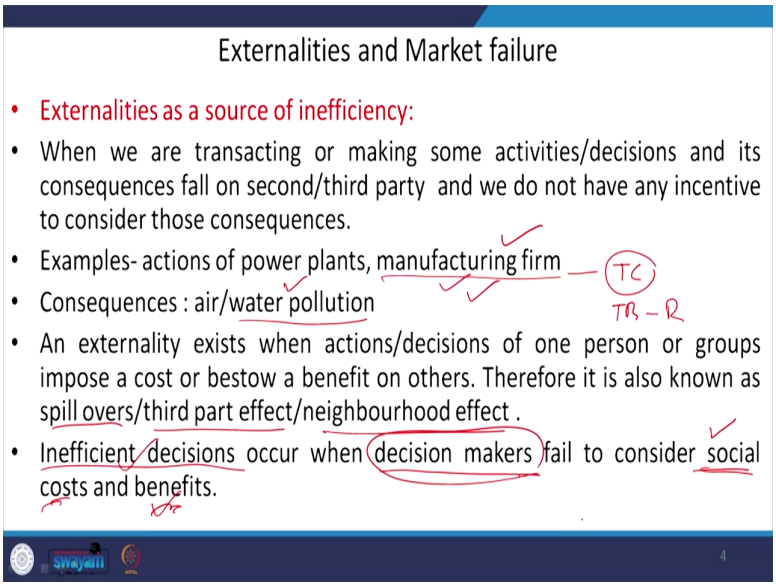

And in environmental economics, this externality is a very a renowned case or very common case in to be talked about and that is why externalities has its own scope in environmental economics. So, now, let us talk about externalities as a source of inefficiency; how externalities is leading to inefficiency in the market or inefficiency in the resource allocations. So, let us start with the very meaning of externalities. So, you are here, we are trying to understand the externalities in terms of one example.

So, suppose say when you are transacting or doing any kind of activity or taking any kind of decisions; obviously, the repercussion of this actions or activities or decisions is having is affecting the others right. So, when one's action is or one's decision is impacting others that is others means maybe it is second party or third party and we do not have any incentive to consider this impacts or consequences. So, in that case externalities may happen.

So, we can take a specific example. Let us talk about the actions that the power plants are taking or the manufacturing companies, how they are functioning. So, whatever from their functionings or from their actions, we can find that it is impacting the air or quality of the air is degrading or the quality of the water is degrading, causing air pollution and water pollutions. So, here in this example what are the actions or activities done by person or first agent?

So, they are they are in terms of generating power or in terms of in case of this manufacturing firms, they are producing products. Because they are producing products or generating power as a result the air or water pollution cases are happening. So, in this case, we can say that externality is existing when the action or decision of one person or a group or a company or a firm imposing cost. Cost to whom? The others and or it can also generate a benefit to others.

So, in both the cases whether the action of a person is imposing a cost or bestowing a benefit to others and that is why this case is known as the externality and sometimes, this externality is also known as this spill overs or third party effect or neighbourhood effect. And here, in this case inefficient decisions occur when decision makers fail to consider what is the social costs and social benefits.

So, now, let us talk about this particular example that is the a manufacture manufacturing company or a firm is producing a product. So, because of which because the manufacturing company is producing a product and the waste materials are dumped into the water. Let say into a river; so, which is causing the water pollutions.

So, in this case, the inefficient decisions occur because decision makers that means, that the company itself, it fails to understand what is the social cost of its production and what is the social benefit of its production. What the firm is bothered about only the private cost and private benefit. So, what is the private cost in terms of its total cost that the that which is which the firm is making or you can say the total benefits that in terms of revenues the firm is making. But here in this in this case of inefficient decisions or the particular activities can lead to inefficient decisions in the presence of externality, when the external cost or social costs and social benefits are not taken into account by the decision maker that is the firm.

So, what is this what is in these example of your manufacturing firm producing a product; what is the social cost here? The social cost is the water pollutions, that is caused by the air the production of this companies. But however, the cost of this waterfall pollution air it is not taken into account by the firm itself. So, when the social costs and social benefits are not taken into account in the decision making process, then the decisions becomes inefficient.

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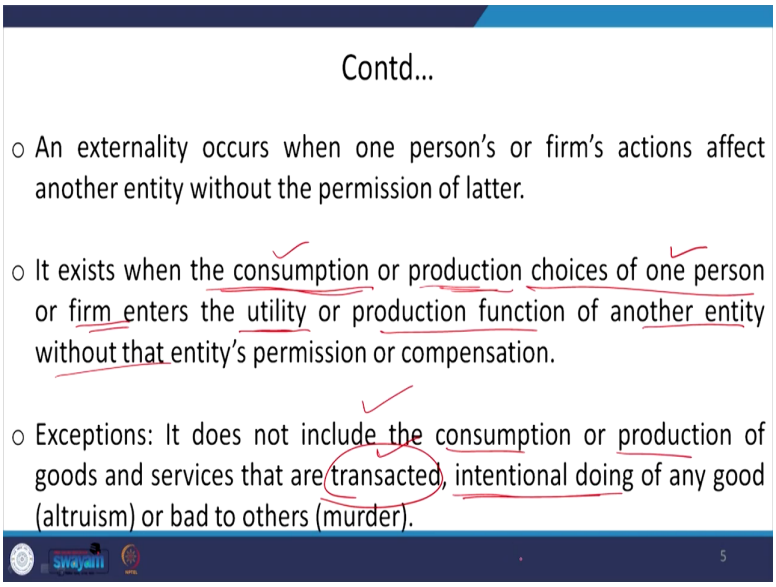

So, now after discussing this example let us have a definition of this externalities; how the externalities is going to be defined. So, you can say the externality can occur when one persons or one firms actions affect another, another person or another firm or another group of persons in the society without the latter's permissions. So that means, the person who is who is the victim, he is not giving the permission, that I am ready to tolerate whatever the cost you are putting.

So, in this case the externality occurs when the consumption or production choices of a person or a firm, it enters the utility or production function of another person or another firm without their permissions or having compensated. So, in this case what you can say let us talk about the consumption first. So, if the consumption choices of a particular person or a particular firm, it enters into the utility or production functions of another person or another firm without their permission or without having adequate compensation. Then, we are saying this externality may happen.

In this case, when you are saying that we are taking a case of a particular person and if the choice of the particular persons consumption is affecting the utility of another person, then and without his the latter's permissions or without getting any compensations or adequate compensation, then we are saying this externality is present. So, similarly if the case of production, when a particular firm is producing and its action is reflected or it is impacted on the production function of another firm without any compensation or without getting permission from the latter. Then obviously, the externality will be happening.

So, in this case the first case that is consumption related externality is known as the consumption externality and in case of this production functions when it is affecting the production function of another firm, it is known as the production externality. However, we do have certain exceptional cases. So, what is the exceptions that we need to take into account in case of consumption or productions? So, if the consumption or productions are transacted in the market, then this externality is not taken into account.

Because they are included in the consumption functions or production functions and that is why they are transacted or if the agent is doing something any good or bad to the third party intentionally, then also this act this act is not taken into account as an externality or this cannot be termed as externality. So, in this case what we are saying that externality may not occur or we cannot actually say it to be external economies or external diseconomies.

When the impacts of the consumption and productions of a particular person is impacting this third persons and however, they do have some negotiations and they are transacting these

consumptions and productions with each other or this impacts are intentionally being done to affect the third person, then it is not taken as cases of externalities.

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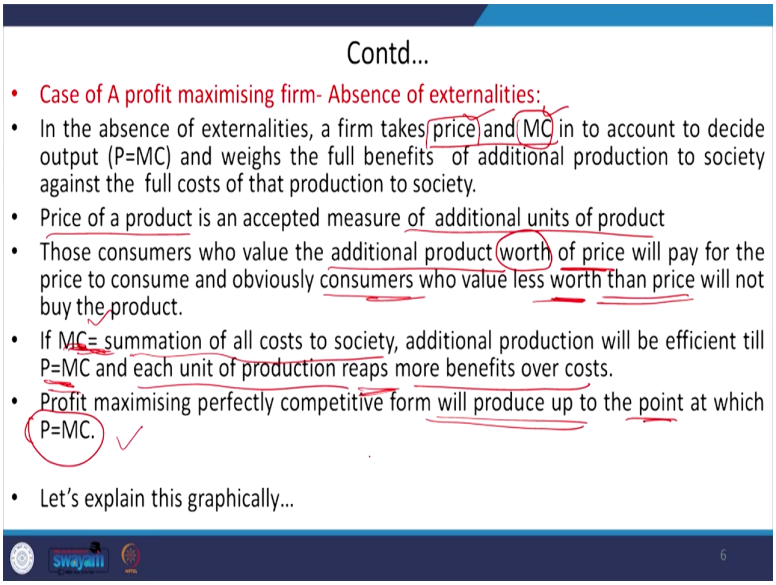

So, now after understanding this case, the what is externalities and what is the definition of externality? Now, we can say if there is no externality then, how the firms are behaving. Whether the functions are whether the resources are efficient efficiently allocated or not? So, what will be the case? So, here we can say if there is no externalities; that means, whatever the costs are there, it is reflected in terms of total cost and additional cost of a production of 1 unit extra production its reflected in terms of the marginal cost. And the benefits are reflected in terms of the revenues or you are saying the marginal benefits right or you can say it is in terms of the price even.

So, when the benefits are reflected in terms of price and the additional costs are the cost incurred for additional 1unit production is reflected in terms of marginal cost and there is no externalities, you are saying. Then, the firm takes into account this two things that is price and marginal cost to decide what to produce or what is the output that needs to be produced. So, for this decision what amount of output to be produced, the firm takes into account two variables that is one is the price and the second one is marginal costs. And then, the firm compares and weighs the full benefits of additional production that is to the society and with respect to the full costs of that particular production activity and how it is impacting the society.

And as you understand from the common microeconomics principles, this price of a product, it is accepted as an as a measure of additional units of the product. Therefore, those consumers who are valuing this additional product worthy or worth of price, they will be ready to purchase it and obviously, when those consumers who are valuing this worth to be less than the price, then they will not go for purchasing the product. So, in a simple case you can say if marginal cost is equivalent to price, then the production will be efficient. So, what is the marginal cost?

So, here you can say the marginal cost is summation of all cost that is borne by the society or which is affecting the society and the if this marginal cost is equivalent to price, then the production will be efficient and each unit of production, it will be generating more benefits over its costs. And if you are considering a profit maximizing perfectly competitive firm, they will be continuing continue to produce till the point at which this conditions get satisfied. So that means, production can continue can be continued up to the point, where price is equating with the marginal costs right and that is why you can say that the allocation of resources are efficient.

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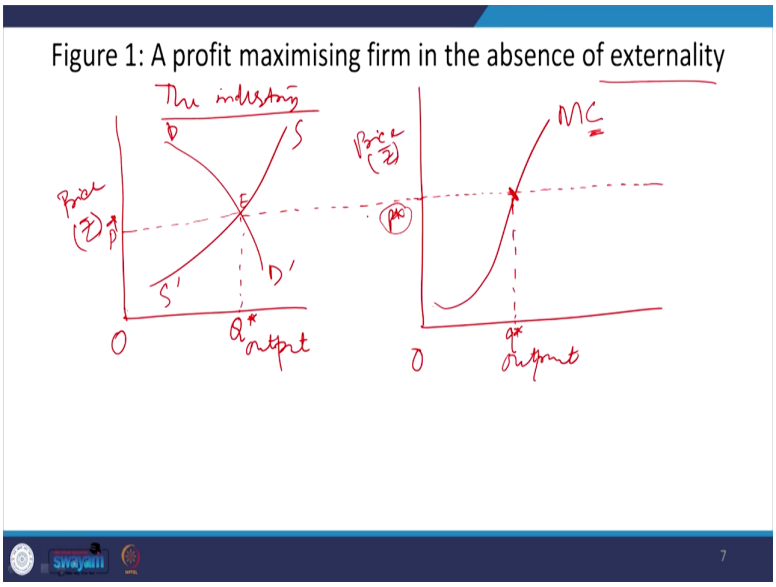

So, now let us understand this the same logic in terms of a graphical representation. So, here, we are taking this case of profit maximizing firm, in the absence of externality. So that means, we are saying there is no externality to be present. So, how the firm will be behaving and how the industry is going to set its prices. So, let us say in the horizontal axis, we are representing the output; quantity of output and in the y axis, we are representing the price for this output. It is in terms of rupees.

So, how the price is determined for the industry? It takes into account the demand factors, demand for that output and supply of that output. So, this is your demand curve and this is your supply curve. And as you understand from the very micro fundamental of economics that is microeconomics, intersection point of demand and supply curve gives us the equilibrium in price level or and equilibrium in the output level. So, as a result you can say at this point of the demand when the demand cost intersects with supply costs, so the production is in equilibrium

and that is why the equilibrium price can be known as P star and equilibrium quantity can be named as Q star. This is for the industry.

How the industry is setting equilibrium prices and how much to produce and as you know that industry is a combination of firms; that means, a number of firms are there in a particular industry and we are saying that there is no externality for a particular firm. So, in this case how the firm will be behaving or how the firm will be setting its equilibrium price and quantity. So, here similarly, in the horizontal axis, we are representing the output level and in the vertical axis, we are showing the price level in terms of rupees. So, from the perfectly competitive market if you remember how the price is set for a for a particular firm?.

So, in perfectly competitive market a particular firm is a price taker not a price maker; that means, whatever the price is there or is set through the market mechanisms in the industry, the same price the particular firm is just following. So, this OP price will be the price for the firm itself and how the output will be set? So, now, you know this is OP star is the price for the output, but what is the amount of output? It will be decided by the marginal cost itself. What is the marginal cost? That is the cost that the firm needs to bear or the firm is incurring for producing 1 more unit of the output.

So, the equilibrium output is set when this marginal cost curve is intersecting the price level at this point and thereby, we can find the equilibrium output as well. This is small q star. So, what we discussed that there is no externality. So that means, all the costs are reflected in terms of this cost, total cost or additional for producing one additional unit of the product, this is the marginal cost and all whatever the whatever the benefits we are getting out of this output is just represented by this price. So that means, here we have not taken into account any externalities to be present.

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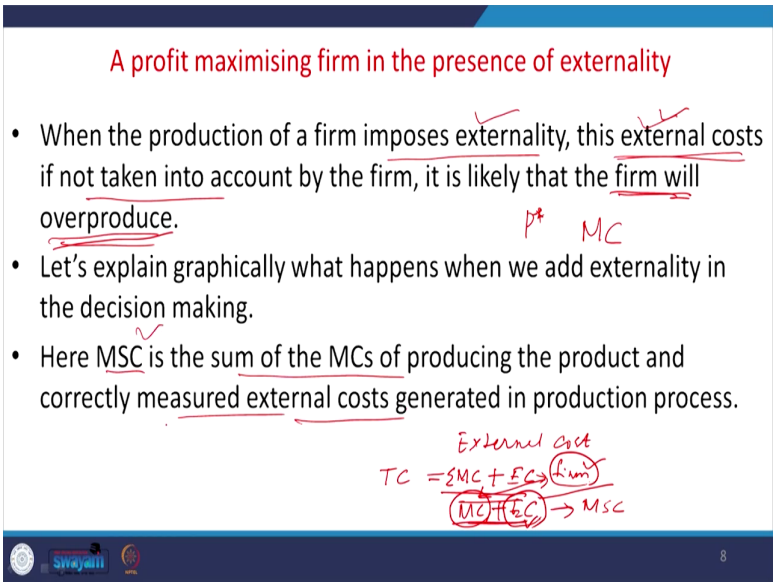

So, now let us take the second case, when externality is present. Then, how the profit maximizing firm is behaving? So, in this case when you are saying that there is the presence of externality, then this externality this external costs if it is not taken into account by the firm itself, then the firm will be over producing its output. So, what is the context? So, in the in the last in the last diagram, we have presented that there is no externality itself and how the firm is producing to what is the level of the production the firm is producing. So, that is 0 right; small q star.

So, now you are saying that the firm is also generating the externality that is negative externalities. And however, this negative externality to the society the firm is not take into account. That means, this external cost is not reflected in the price level and also in terms of the additional cost that the firm is putting to the society by producing one more output right.

So, because of this situation, the firm will be over producing because it has not taken into account the externality.

So, now, we can also discuss this explain this same thing in terms of the a graph and here, I just wanted to say that in case of this externality, when externality is present, then it is in terms of external cost let say. So, now your total cost must be if you if the firm is going to take the total costs, then this total costs is known as this is your marginal costs plus your external costs summations of marginal costs and external costs. And this is also known as when you are taking this marginal costs and external costs into account, this is known as the marginal social costs right.

So, here this is marginal cost means this is the cost which is borne by the firm itself for producing its output and this external cost is the cost that is imposed on the society because the firm is producing something; producing its output. So, this external cost are the byproducts of the production of the firm right. So, this marginal cost is the summation of the marginal cost producing the product and it correctly measures the external cost that is generated in the production process. So, truly you can say this marginal social cost is the correct measure of the externality.

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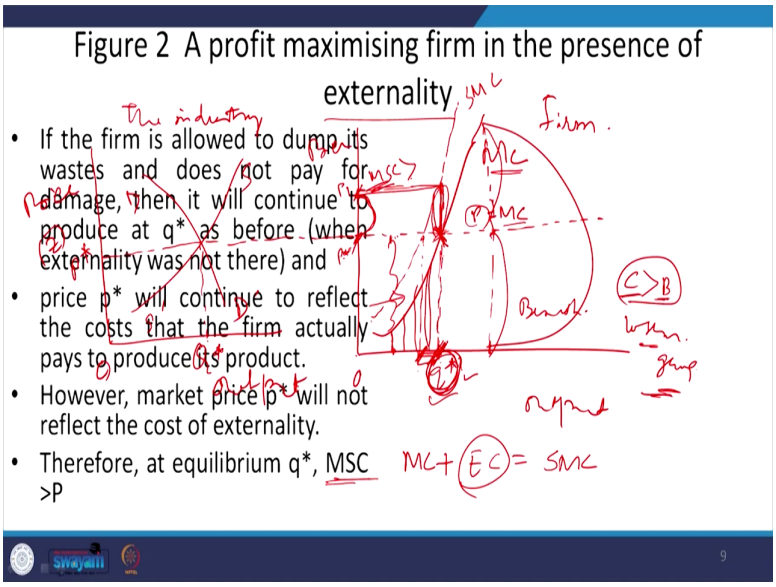

So, now we can graphically explain this. So, here we are saying externality is present, then how your profit maximizing firm is behaving right. So, similarly we can draw this diagram. So, as you understand that this is the case of the industry right. So, this is your output, this is your price; how the equilibrium price and equilibrium output is decided? It depends on the intersection point of demand and supply curve. So, this is the point of intersections and thereby, you are finding the equilibrium price and equilibrium quantity for the industry.

Now, you are saying how the prices and output equilibrium prices equilibrium price and output are being determined. So, this is again the same price; this is the output and this is for a particular firm right. So, firm is a price taker. So, industries price is the price of the firm itself. So, what is the output the firm needs to produce, depends on the marginal cost of the production. So, when marginal cost is intersecting the price level or price equivalent to

marginal cost the firm is producing, the output or deciding this is the level of output to be produced right.

So, now the question is why the firm will be continuing to produce till this point. So, that o q star will be the equilibrium quantity. Because if the firm is thinking to produce at this level right, then what is the marginal cost? This is the level of marginal cost and what is this? The price; so that means, this much of the benefits the firm is losing that is why the firm can expand its productions right till this point where the marginal cost is equivalent to price.

So, as a result the efficient allocation of resources can happen, but if the firm is continuing to produce beyond this q star point, let say this point. At this point what is the price? This is the price. What is the what is the cost that the firm has to incur? So, this is the cost; this is the price; this is the cost; that means, this is the benefits and this total one is the cost. So, here obviously, you can say the cost is greater than the benefits. So, as a result the firm will not be interested to produce further because when costs are greater than benefits, the firm will be incurring the losses right.

So, here if the firms are expanding its production, it is actually gaining; profiting right. So, this is how we can say the things are the firm is choosing that what level of output it has to produce. Now, the question is that there is presence of externality right. So, in case of externalities as you understand we need to take into account the external cost right. So, now, instead of taking this marginal cost, what else we need to take? We need to take the external costs itself; marginal cost plus external cost is your social marginal cost right.

So, how you are finding this? That means, we need to take into account this external cost let say and external cost is more than this price or marginal cost. So, what you are saying that, this much that is this much of externality or external cost is also imposed when the firm is producing o q star level of output. So, as a result what will happen? Your marginal cost will be taking into account the external cost and it will be shifting in order to reflect the external cost. Now, it is known as the marginal cost plus external cost is known as the social marginal cost right.

So, now, if the firm is reflecting this or including this externality in its decision making, then what will happen that the prices would be more; this is how we will be saying that externality is this much; this is how the prices would be more right. And this same level of output is to be produced and if the firm is not willing to produce this much of q star, then it will be at this intersecting point the firm will be producing right at this point ok. So, as a result the output would be less than the produced output. So that means, are in the presence of externality the firm is over producing, it should have produced this much of level of output.

But because of the externality, it is producing and here the firm is producing here and that is why this you can say this level, this much of level is the over production that the firm is doing right. So, in this case, what you are actually comprehending? What you are understanding is that, in case of this externalities the firm is over producing the product right and its price should have been high, but it is it is charging the same price that is set by the industry itself.

So, now, we can say that if the firm is allowed to dump right, the wastes and it does not pay for the damage, then it will be continuing to produce the same level that is q star as before, when there is no externality. Because the firm is allowed for dumping and price P star the same price P star will be continued to reflect the costs that the firm is actually paying to produce the product that is q star level of product.

However, this market price P star will not reflect the cost of externality. So, if the externality needs to be taken into account, what to what should have been the market price? So, this should have been the P 1. So, this is the external cost and this should be the extra prices that must be added in your market price. Therefore, you can say at equilibrium price equilibrium quantity, equilibrium output q star the marginal social cost is greater than the market price that is P star. So obviously, this P 1 is your marginal social cost. So, this marginal social cost is greater than your market price P star right.

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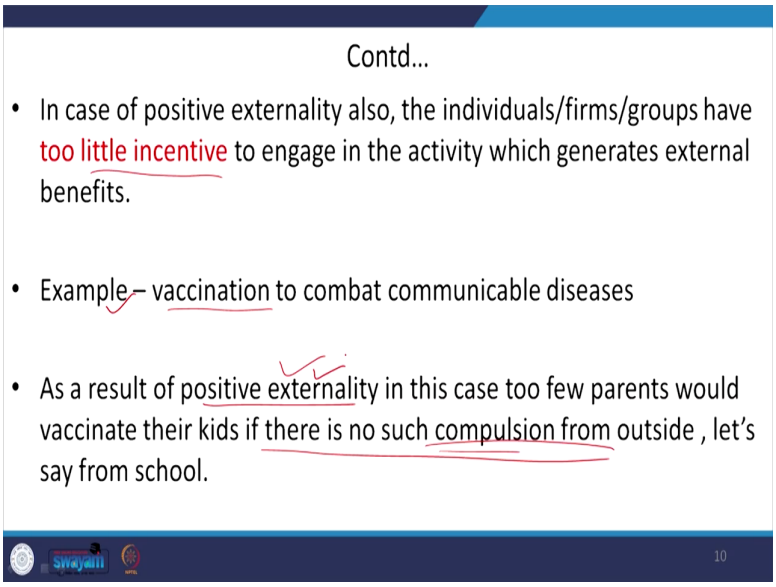

So, we discussed the things that is under the negative externality; that means, the actions of a particular individual or firm is adversely impacting the other, which is known as the negative externality. But externality may be may be positive as well; that means, action have a particular agent, it may positively or favorably benefit the other. So, in case of positive externality, the individuals they do have very little incentive to continue with their activity which generate the external benefits. So, we can take the case of the vaccination to the to children and which objective is to combat the communicable diseases.

So, because this vaccination to children those parents who are vaccinating their children. So, it is a kind of positive externalities right and because this positive because of this positive externalities, they do not they do have very little incentives right. Sometimes the parent they will not be interested to continue their positive externalities right and if there is no compulsion from outside, let say from school itself there is no strict guidelines that you need to the parents

need to vaccinate their children so that the communicable diseases will not spread right. So, if this is this is not the case if some compulsions are not made from outside, then this positive externalities will not get enough incentive to continue their activities.

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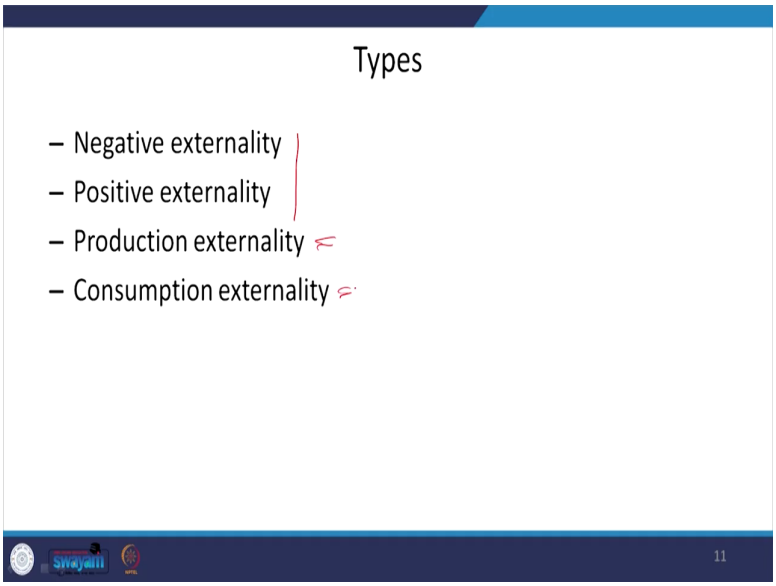

So, this is the loophole of the positive externality as well. So that means, not only in the negative externalities we are having inefficient allocation of resources, in positive externalities also we do have some limitations. So, now let us talk about different types of externalities. So, the first two cases negative and positive externalities, we have already discussed. Now, let us talk about the production externality and consumption externality.

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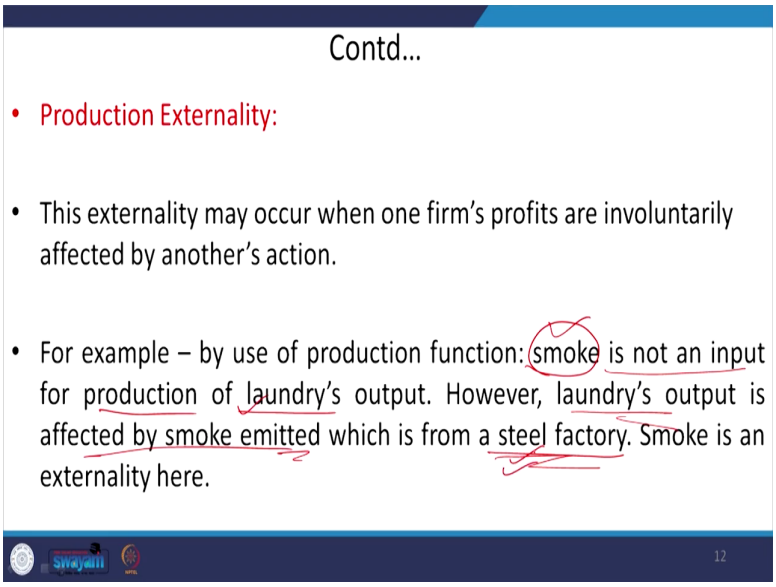

So, what is Production Externality? So, this production externality may occur when a firm's profit are affected by another firms action right. We can take an example. So, let us talk about the case of a steel factory and the laundry shop right. So, there are two firms one is producing the steel and the second one is doing the business of laundry business right. So, when the steel is produced; then obviously, smoke will be generated and this smoke is negatively impacting the laundry. Because smoke is black in colour, then obviously, the laundry person when they are washing the clothes. So, it will be adversely impacted.

So, here smoke is not an input for the production of laundry's output, but still it has the smoke is included in the laundry's output and however, this laundry's output is affected by this smoke. So, this is how you can say that how the one's one firms productions or profits are being affected by another firms actions by producing the steel; here.

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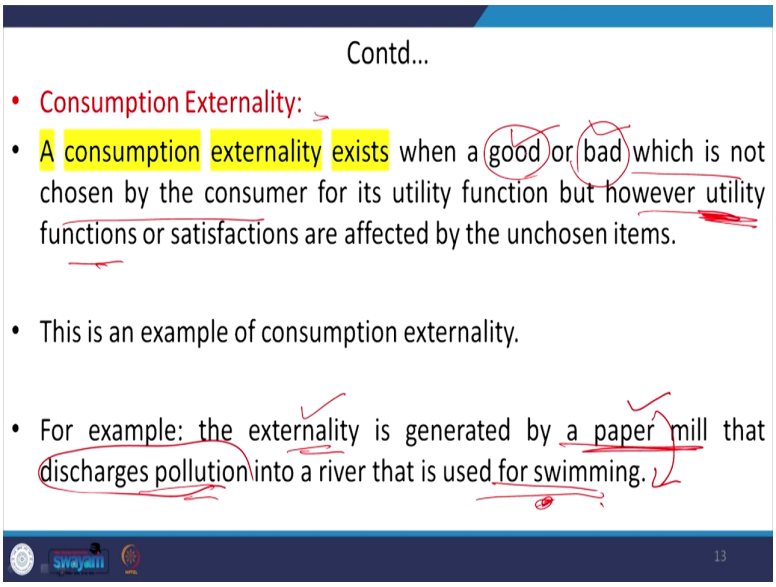

Then, what is the Consumption Externalities? So, you can define this consumption externality can happen when a when a particular good or bad right, which is not chosen by a consumer. But however, this is reflected in the utility functions. So, what is the meaning? So, when you are choosing the consumer is choosing is not choosing a particular good right or a particular bad, but still this utility or disutility is reflected in the utility functions, then it is known as the consumption externalities.

So, you can take this example of the externalities that are generated by paper mill right and obviously, it is a bad externality or negative externalities in terms of this pollution that is dumped into a river and the same river is also is also used for swimming for recreational purposes right. So obviously, the swimmers they do not want to consume this the pollution

discharged by paper mill; but however, this is entering into the utility functions or satisfaction level of the swimmers. So, if this is the case then it is known as the consumption externalities.

That means, consumption externality may happen when a good or bad which is not chosen by the consumer that is swimmer itself, but this utility the satisfaction or satisfactions are reflected in the satisfaction level of the consumer.

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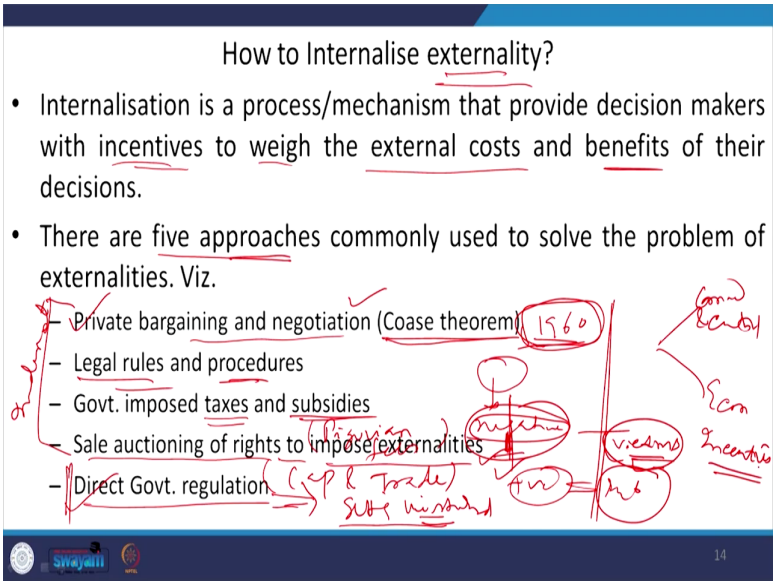

So, in the next discussion we will be talking about how to internalize externality? Because you are now convinced at not only the negative externalities are bad, they are misallocating the resources or resource allocation are not efficient. But in case of positive externality also resource allocations are not efficient as well. So, how to solve this issue of externality or how to internalize the externality so that the market can function well. So, you can define this internalization of externality, it is a kind of process or mechanisms right.

So, this process or mechanisms provide decision makers with incentives to compare and weigh the external costs and benefits right of whatever they are doing. So, if the decision makers are weighing the incentives right or they are actually taking into account the incentives by weighing the external cost and external benefits out of their activity or decisions, then it is known as the internalizations. Then, how it is possible how this external and costs? External costs and external benefits can be included.

So, it generally we are having five different approaches for solving the problem of externalities. The first approach is known as the private bargaining and negotiation. That means, the those who are suffering and those who are generating the bad they can negotiate it, they can bargain, they can count together, they can negotiate it, negotiate and accordingly the problem can be solved. So, this there is a there is a very well-defined model which is propounded by Ronald Coase that is known as Coase theorem which he propounded in 1960 and got the Nobel Prize for this externality and total cost.

So, this can be one of the mechanisms through which we can internalize the externalities and this portion, we will be we will be discussing in the next lecture in terms of your regulatory mechanisms. And the second approach can be in terms of legal rules and procedures. What kind of rules and procedures need to be formed right so that the internalization may happen. So, they are will be and again these are the processes will be take into account and there we are just saying we need to find out or we need to set the rules and procedures.

Just example who is owning the Ganga River. Because Indian government is very much interested to pure to make the Ganga water pure and because right now the status of Ganga water is really very in a dangerous stage right. It is polluted and who is polluting? Obviously, the industries are polluting right. The users are also different users, they are also polluting.

So, now the question is that who is having the right over Ganga water right and this. So, that when the person is doing any kind of action and is impacting the water quality of Ganga, there should not be any problem. So that means, making this legal rules and procedures in defining the property right is also important and that also we will be discussing in Coase theorem.

So, another mechanism is government imposed taxes and subsidies. So, the it is one of the popular methods, that if the someone is doing some negative things and impacting the other person, then obviously, his activity because of his activity the others are affected negatively and they are the victims. So, what the government can do? Government can interfere here interfere here and impose taxes right. So, it is a case of that this generator the units which generating this pollution, he needs to compensate the victims because he has done the wrong deeds and the victim is impacted because of his wrong actions.

So, that is in terms of taxes; putting the taxes. So, here we this one we will be discussing in Pigovianfees. And moreover if some one's action is positively impacting right, so he the government must be interfering and giving subsidies right so that he can he can get enough incentive to carry on its activity or action. So, another approach to internalize the externalities sale auctioning of rights to impose the externalities. So, we do have the mechanisms of caps and trade that we also be discussing in our next classes.

And the last one is the direct government regulations. So, all this four one that we have discussed is the indirect measures by the indirect measures. This first one is for the purely private persons without intervention of the government. The private bodies who are creating the problem and who have to who has to tolerate the problem, they are coming together and bargaining and negotiating right. But this last one is the case of direct involvement of the government so that is in terms of direct government regulations.

So, here the government is setting the standards right, in order to internalize the extremities. So, all these will be discussing in the regulatory mechanisms. So, which is divided into two parts the first one is the command and control approach and the second one, we will be discussing in terms of economic incentives; economic incentives under this a regulatory approaches.

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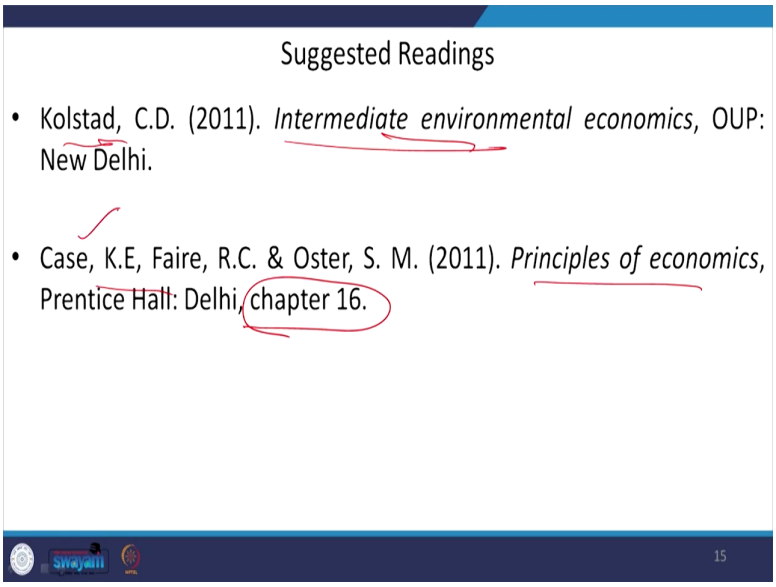

So, now you are done with this market failure and externalities. So, the suggested reading are the Kolstad; so, this is the basic reading. Apart from this, you can follow chapter 16 from Principles of economics from this case and Faire and Oster book.

Thank you very much.