Introduction to Environmental Economics
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Lecture – 53
Command and Control Approach: Type of Standards - I

Dear students in the preceding lecture I explained you the Command and Control system of regulation, I also explained the main advantages and disadvantages of command and control system.

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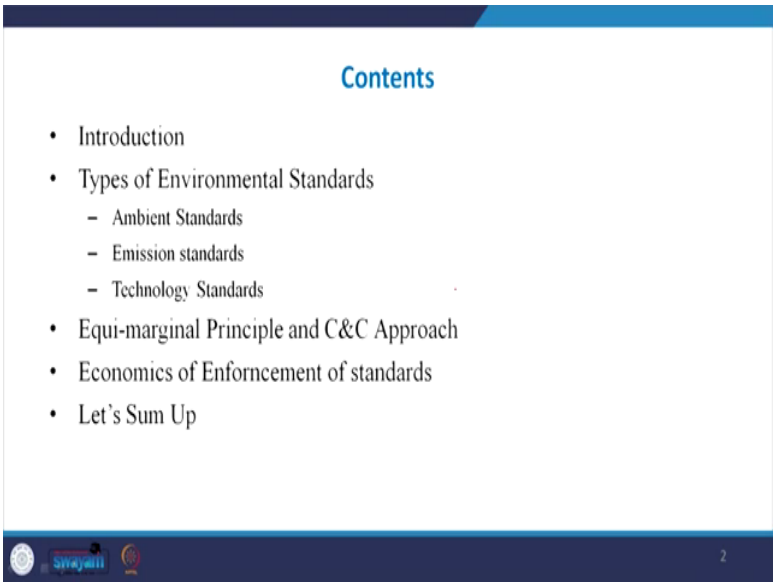

So, there are three types of environmental standards, which can be used by the government. First is ambient standards, second is emission standards and third technology standard. These standards will be discussed in detail in this lecture and we also discuss equi marginal principle

and command and control system. Equi marginal principle means that, marginal cost should be equal to the price of the product and marginal cost should be equal to in each firm.

So, if there are n number of farms then marginal cost of one firm should be equal to second firm third firm up to n firm. And then if or as I already told you in my earlier lecture that, Pareto optimality or efficiency can be achieved overall in the economy when I when a consumer is consuming at the level where marginal utility is equal to price of the product and producer is producing at the level where marginal cost is equal to price of the product. Then overall efficiency will be achieved, if this condition is fulfilled in all the farms in the market, means if and all the consumers in the market.

So, that is called equi marginal principle; means overall efficiency can be achieved in the economy when consumers are optimizing all the consumers are optimizing their utility and all the producers are optimizing their returns or production etcetera. So, equi marginal principle is difficult to apply under the command and control system, but this system can be this equi marginal principle can be applied if we have economic incentives.

So, I will explain this a bit detail about the relationship between command and control system of regulation and equi marginal principle. And I also discuss economics of enforcement of the standards.

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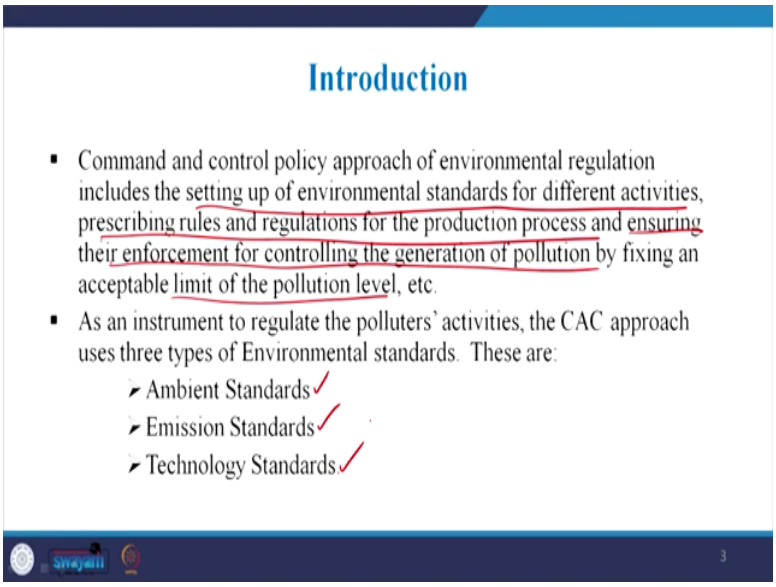

So, what is the cost and returns of different kinds standard finally, I will sum up the lecture. Command and control policy approach of environmental regulation includes the setting up of environmental standards, this is very important for different activities. So, government sets the standards for different activities and standards may vary from industry to industry or activity to activities. Second, prescribing rules and regulation for production process and ensuring their enforcement for controlling the generation of pollution by fixing the acceptable limit of pollution level.

So; obviously, in command and control system, first things is setting the standard second is that educating or implementing these standards. And third is if someone is violating or not following these standards then the regulator may have some provision of penalties, fines etcetera.

As an instrument to regulate the polluters activity, command and control system uses three types of environmental standards they are ambient standards, emission standards and technology standard; briefly we had discussed these things in the preceding lecture, but in this lecture you will study in detail all these three standards.

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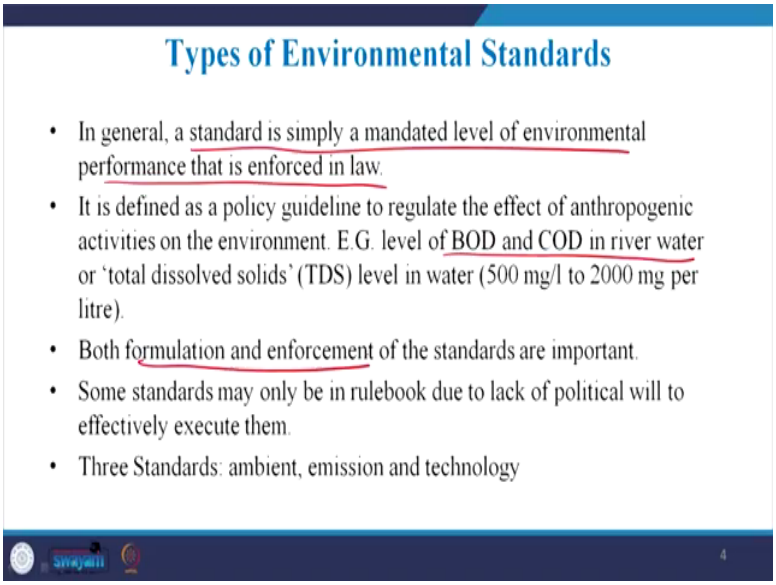

So, let me tell you these types of standards. In general, a standard is simply a mandated level of environmental performance that is enforced by law. So, this is actually the definition of any standard. So, a standard is simply a mandated level of environmental performance that is enforced by law or by regulation or by rules by the government.

It is defined as a policy guidelines to regulate the effect of at anthropologic activities on environments. Anthropology activity means, when the human beings perform various kinds of activities, consumption, production, this rise of waste, all kind of activities are known as

anthropologic activities. And due to these activities there maybe BOD or COD level in the river water.

For example, level of BOD and COD in the river water or TDS, Total Dissolved Solid level in the water, for example, 500 milligram per liter or 2000 milligram per liter. So, these are actually the standards that can be set for ensuring the quality of water. So, both formulation and enforcement of the standards are very very important.

Sometimes what happen, the government can set certain kinds of standards, but if they are not effectively implemented if they are if not effectively enforced then they remain only in the rulebook. And may not be in practice and they have certain laws even including some environmental laws which are only in rulebook, but not implemented.

Like groundwater act for example, or taking license or permission from the government before installing it to well. So, in many states they are only in the rulebook farmers are not even aware of whether such kind of rules are existing or not. So, that is why enforcement of rules is equally important as the formulation of rules. And here these three standards as I already told you we will be discussing.

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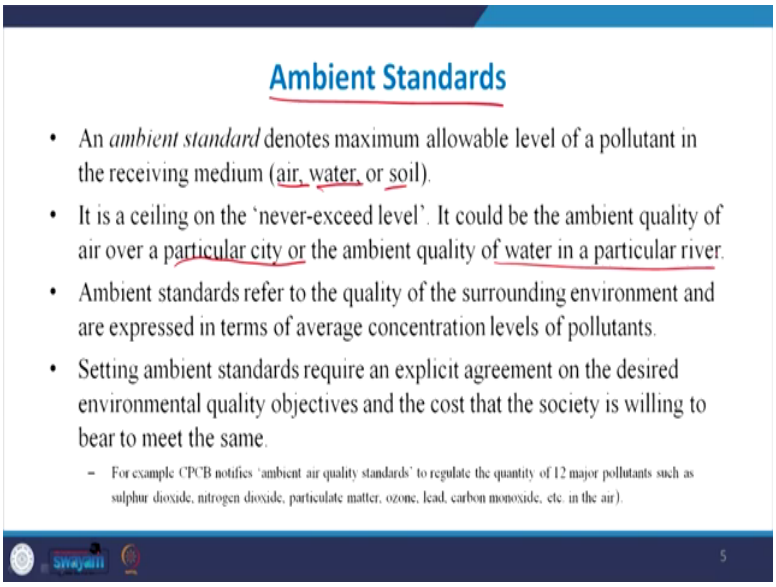

Let me first take ambient standards. An ambient standards denotes maximum allowable level of a pollutant in receiving medium.

So, how much is the maximum limit that is permissible of any pollute pollutant in any receiving medium is known as ambient standard. Missing media, the receiving medium maybe air, water and soil. So, it is actually a ceiling on the never exceeded level. So, you cannot exceed the level, which is set by the government, it could be the ambient quality of air or a particular city or ambient quality of water in a particular river. So, so ambient can be determined for a particular city or for a water quality in a particular river etcetera. So, ambient standards refer to the quality of the surrounding environment and are expressed in terms of average concentration of pollutants.

So, average concentration of pollutants in a receiving medium is actually known as ambient standard. Setting ambient standards require an explicit agreement on the desired environmental quality, objectives and the cost to the society that is willing to bear the that cost to meet the same. For example, Central Pollution Control Board notifies ambient air quality standards to regulate the quality of 12 major pollutants; such as sulfur dioxide, nitrate nitrogen dioxide, particular matter, ozone level lead carbon monoxide etcetera in the air.

So, this ambient standard is set by Central Pollution Control Board in case of many pollutants.

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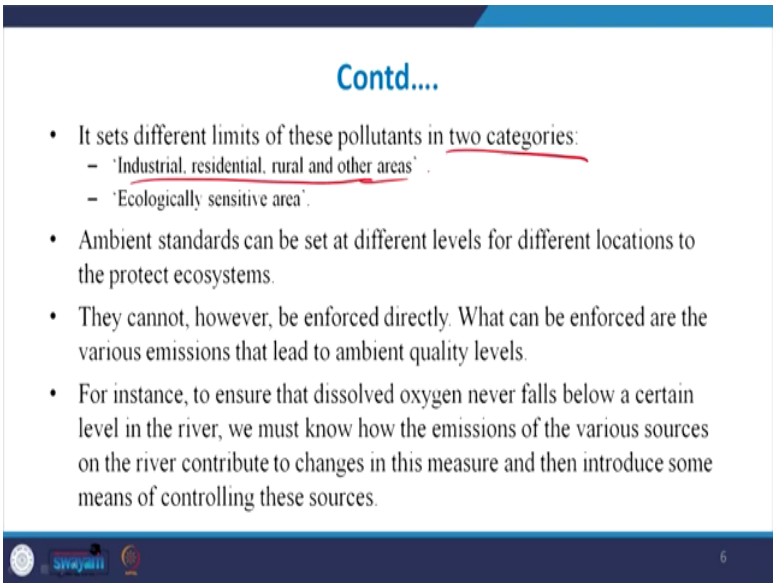

It sets different limits of these pollutants in two categories. First is industrial, residential, rural and other areas and second is technological ecologically sensitive regions. It sets different limits of these pollutants in two categories: first is industrial, residential, rural and other areas

and second is ecologically sensitive area. So, a different ambient standards can be set under these two categories. Ambient standards can be set at different level for different location to.

Student: Protect.

Protect the ecosystem. So, it is very very important. For example, if there is a ecologically sensitive area and we have to protect the ecosystem, biodiversity of that particular area, then different level of ambient can be set in that area ah. They cannot; however, be enforced directly. What can be enforced are the various emissions that lead to the ambient quality level.

So, it is very interesting that too when we talk about the ambient standards, these standards cannot be directly enforced they are indirectly enforced through emission standards and when we try to link these two kind of standards, you may get different results.

For instance emission standards may not necessarily improve the ambient standards for instance in a particular city air quality standard. So, you can set a standard for a particular vehicle that you have to maintain this particular level of emission per kilometer of run. But if number of vehicles in a particular city increases, then total emission release by all the vehicle will increase and that will affect the air ambient.

So, ambient standards maybe affected due to the emission standard. For example, to ensure that dissolved oxygen never falls below a certain level in the river we must know how the emissions of various sources on the river contribute to the charges in the in this measures and then introduce some means of controlling these sources.

So, for example, if we wanted to maintain COD or BOD in the river then certainly we have to understand what are the sources of pollutants that is coming into the river this is one aspect. Second aspect is, it is not necessary that after releasing these pollutants into the river the same level of ambient standard will be maintained at a different location; because river system or environment also provide certain kinds of services that like assimilative capacity of environment.

So, we when we are releasing certain pollutants into the river system after a few kilometers, the river can clean itself up to a certain extent. So, the ambient standard in next location maybe different from the initial level of ambient standard.

So, ambient standards not only depends upon the kind of pollutants released into the atmosphere, but also depend upon what are the assimilative capacity or up to what extent environment can absorb these waste. So, this is also important issue when we try to understand the ambient quality level whether it is in air or water.

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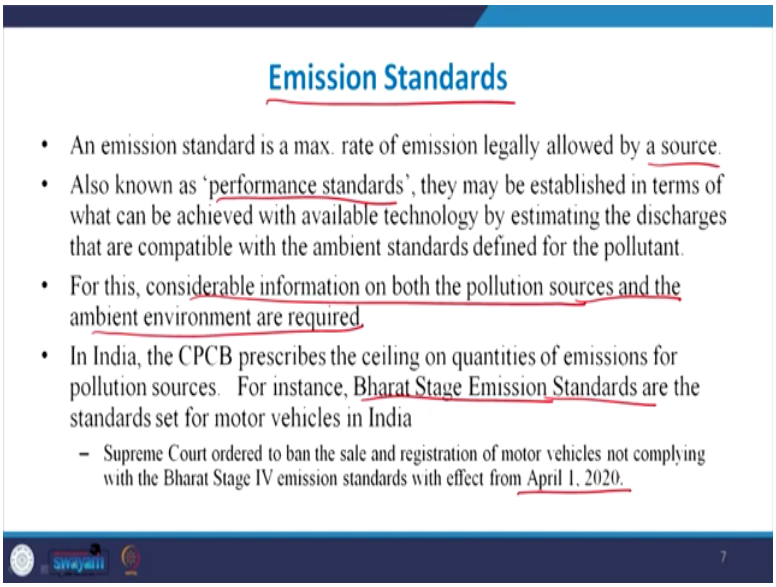

Then second is, emission standards and emission standard is a max a maximum rate of emission legally allowed by a source. So, source air means polluters. So, how much is the maximum limit of emission that can be released by a polluted firm decides the emission standard. So, emission standard actually is, the maximum rate of emission that is permissible

through regulation for a particular polluters. These emission standards are also known as performance standards.

They may be established in terms of what can be achieved with available technology by estimating the discharge that are compatible with the ambient standard defined for the pollutant. For this considerable information on both the pollute pollution sources and the ambient environment are required. So, there is a actually the relationship as I already told you between ambient standard and emission standards. Emission standards also affect the ambient of that particular location and therefore, a considerable information on both the sources of pollutant pollutions as well as the ambient environment are necessary to be gathered.

In India, Central Pollution Control Board prescribed the ceiling on qua quantities of emissions for different pollution sources. For instance, in case of automobiles we have Bharat Stage Emission Standards that are the standard set for motor vehicle in India. And recently, you know Supreme Court ordered to ban the sales and registration of motor vehicle not complying with Bharat Stage 4 Emission Standard with effect from April 2020.

So, sometimes the court may also give direction, in order to reduce the pollution in a particular city like in Delhi, the Supreme Court can say that no vehicle will be allowed to run on the road if they are not maintaining the Bharat 4 Stage Emission Standard.

So, emission standards maybe vary from a city to city also depending upon the situation or they may vary from activity to activity or industry to industry.

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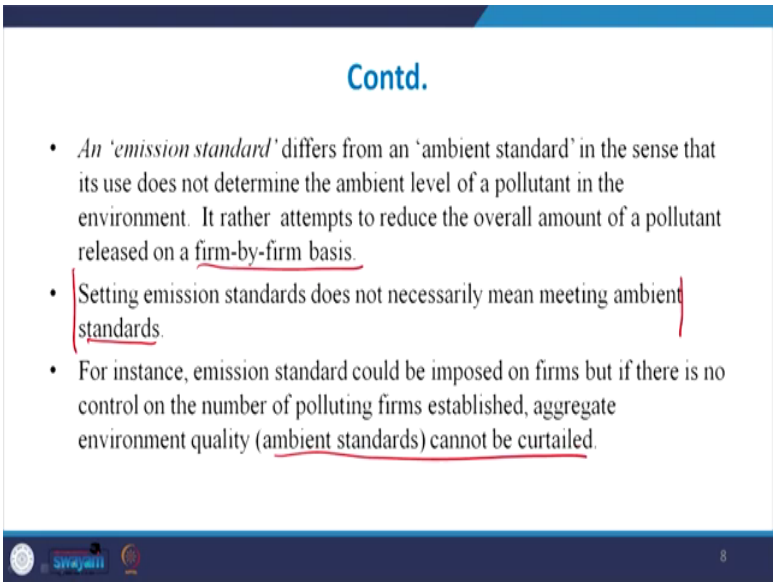

An emission standard differ from an ambient standard in the sense that its use does not determine the ambient level of pollutant in the environment. It rather attempt to reduce the overall amount of a pollutant release on firm by firm basis, which I already explained you that there may be when we set the environmental standards emission standard they are to be complied by firm.

But if number of firm in a particular locality increase then overall emission in the in that particular locality will increase and overall ambient will be adversely affected. So, setting emission standards does not necessarily mean meeting the ambient standard this is very important.

So, you can have emission you can set the emission standards, but it is not necessary that by setting an appropriate emission standard you would be able to maintain the ambient standard

and it is because ambient standard depend upon how you the quality of air. So, setting emission standard does do not necessarily mean meeting the ambient standards.

It is because when we set the emission standards these standards are to be complied by the individual polluters. But if number of polluters increases then overall emission in that particular area will increase and ambient standard may not to be met.

So, this is the relationship between ambient standard and emission standards and it is not necessary that the emission standards set by the government would be able to meet the set target of ambient standard in a particular area in the form of air or water. For example, emission standard could be imposed on firm, but if there is no control on the number of polluting firms established aggregate environmental quality or ambient is standard cannot be curtailed.

So, this is a very important things to understand that, how the environmental emission standards linked to the environmental ambient is standards. I can explain this with the help of this graph.

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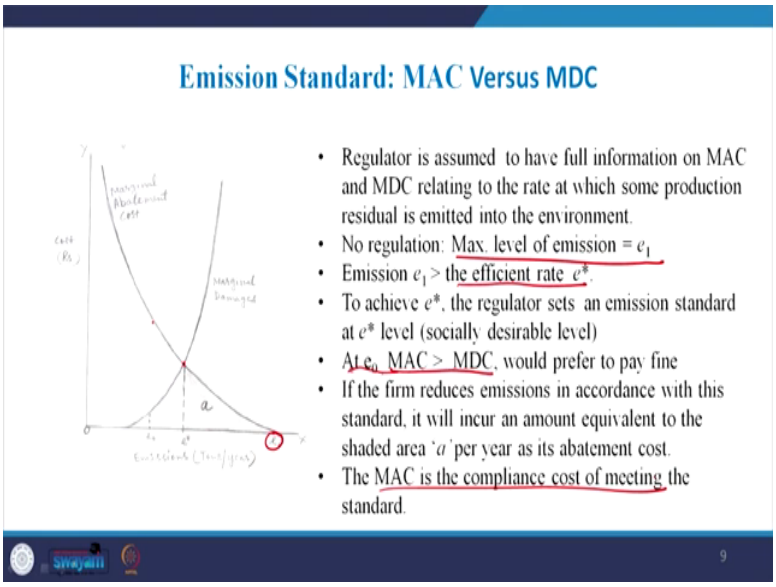

Emission standard, we have in this graph on this horizontal axis, we are taking emissions in tons per year and on vertical axis we are measuring the cost; cost is margin abatement cost and marginal damage. Here a regulator is assumed to have full information on marginal abatement cost and marginal damage cost, related to the rate at which some production residual is emitted into the atmosphere. Now, if we take that this is here this is the maximum level e1.

So, if maximum level of emission, maximum level of emission is e1; that is shown here this one, this is the maximum level of emission. And now at this point marginal abatement cost is 0, but marginal damage cost is very high. So, if emission standard e1 is greater than the efficient rate of emission standards then, what will happen?

Here this e star that is the efficient level of emission that is known as socially desirable level of emission and that is determined by the interaction of these two curves, one is marginal damage cost curve and other is the marginal abatement cost curve. Marginal abatement cost curve means how much is the cost for one additional unit of pollution to be treated. So, this is the pollution treatment cost and if you are not treating the pollution then what will happen? You have to pay the damage.

So, damage is if 1 unit of emission is not treated, then how much is the addition in the damage is indicated by the graph marginal damage cost and both are intersecting each other at this point. So, equilibrium level of emission is determined at e start. So, e star is socially desirable level of emission. Now, at e 0 marginal abatement cost marginal abatement cost is lesser than marginal damage cost.

So, the company would prefer to pay fine. So, instead of paying or treating the waste, in that case company would prefer to pay the fine or damage instead of spending money on treating the waste. So, if at e 0 here marginal abatement cost you know is above, you can see here and this is the e 0 point and here is at this level marginal abatement cost is higher than the marginal damage cost. So, what will happen?

If the company has to take into consideration or e 0 level of emission in to be control, then instead of treating this waste and releasing in into the atmosphere after treating company would prefer to pay the damage; because damage is lower than the cost of treating the waste. And if the firm reduces the emission in accord accordance with this standard, it will incur an amount equivalent to the shaded area as a abatement cost.

So, you can see this a area is the shaded area and that a shaded area is actually the area which you can see is below the marginal abatement cost and up to this level you can see the marginal damage cost is very high.

So, in this case the firm reduces the emission in accordance with the environmental standards or emission standard set and it will incur an amount equivalent to the shaded area a, per year

as an abatement cost. So, and MAC is the compliance cost meeting the compliance standards so, ok.

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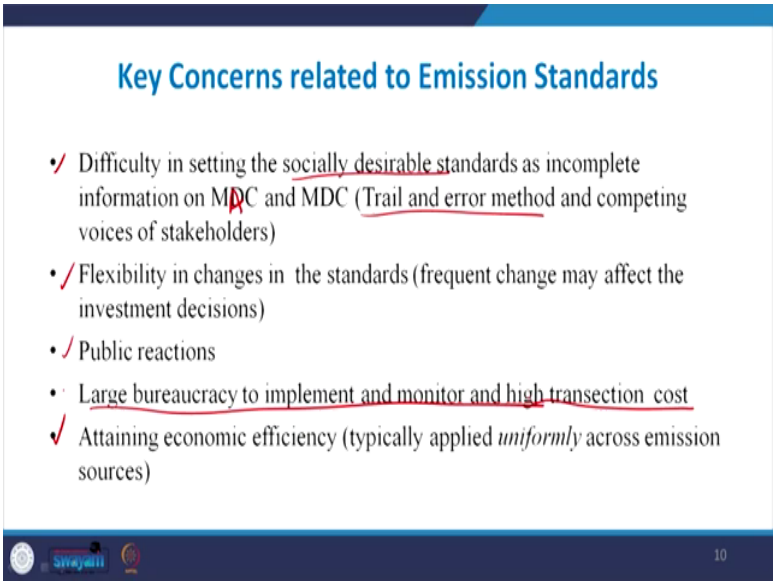

Now, key concerns related to emission standards: first is difficulty in setting the socially desirability standard as incomplete information on marginal damage cost and marginal you can correct it, marginal damage cost and that is marginal abatement cost. So, one is abatement cost and other is the marginal damage cost and in so, when emission standard are set, the then it is difficult to set these standard at socially desirable level. Because to as you can see from the previous graph to set the standard at socially desirable level you must know how much is the marginal abatement cost of the treatment and how much is the damage cost.

So, if you know the marginal damage cost and marginal abatement cost, then you can be able to determined socially desirable level of emission. But in this case, it is very difficult to know

the marginal cost of abatement and marginal damage cost. So, what the government can do? Government can follow trial and error methods and many times this can be done and also the there may be influence of many competing voices of stakeholder as I already discussed both browns and greens lobbying with the government.

So, there may be this lobbying of the governments lobbying of the corporate sector with the government lobbying with the environmentalist with the government. And due to this it becomes difficult to determine the socially desirable level of standards and governments can follow trial and error method and sometimes standards maybe reduce sometimes standard maybe increase to come out at the appropriate level.

Flexibility: so, this is the one difficulty, second is flexibility in changing in the standard frequent change may affect in the investment decision. So, if there is a frequent change in the standards then that may also affect that investment decisions. So, companies investments may be badly affected or affected due to the frequent change in the standard.

So, public reaction is another issue when we set certain standards there may be opposition from the public and therefore, while setting the emission standard government not only take into consideration the voices of corporate sector, but also take into account the voices of other stakeholders. Then another issue related to setting the environmental standards emission standard is large bureaucracy to implement and monitor the and high transection cost.

So, it is very difficult to implement standards because a large bureaucracies is required, a large team of engineers environmentalist are required to implement and monitor the standards and a transection cost would be very high. And the next issue is attending the economic efficiency, typically the standards are applied uniformly across different emission sources and that may also affect the efficiency economic efficiency in instituting these environmental standards.

So, let me now wind up this lecture. So, far you all studied about the command and control system of regulation. And you have studied two key environmental standards; first is ambient

standard and second is emission standard. In next lecture I will discuss technology standards and some other issues related to command and control system of regulation.

Thank you very much.