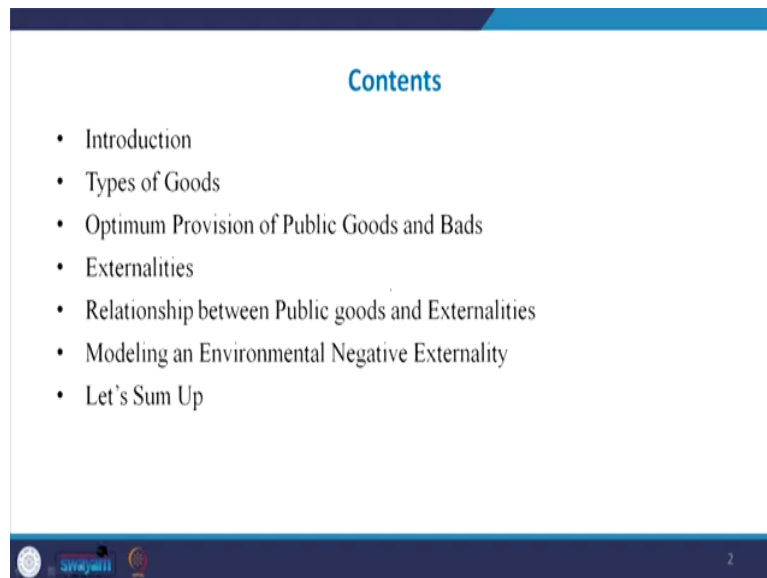


Introduction to Environmental Economics
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Lecture - 43
Optimal Provision of Public Goods and Bads-I

Dear students, in this lecture; I will explain Optimum Provision of Public Goods and Bads. This lecture is divided into various points. First I will introduce the topic then I will explain the different types of goods.

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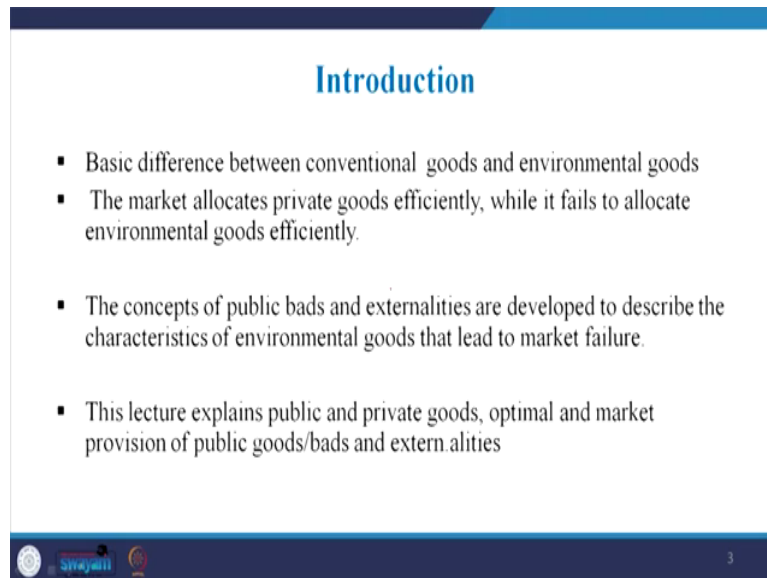
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Then optimum provision of public goods and bads. Externalities will also be discussed and we will try to establish the relationship between public goods and externalities and later on by

taking an numerical example, I will explain the effect of externalities on output and prices of polluted industry and then finally, the topic will be sum up.

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The slide is titled "Introduction" in blue text. It contains four bullet points in black text. At the bottom left, there are logos for "swayam" and "MOE". At the bottom right, the number "3" is displayed.

- Basic difference between conventional goods and environmental goods
- The market allocates private goods efficiently, while it fails to allocate environmental goods efficiently.
- The concepts of public bads and externalities are developed to describe the characteristics of environmental goods that lead to market failure.
- This lecture explains public and private goods, optimal and market provision of public goods/bads and externalities

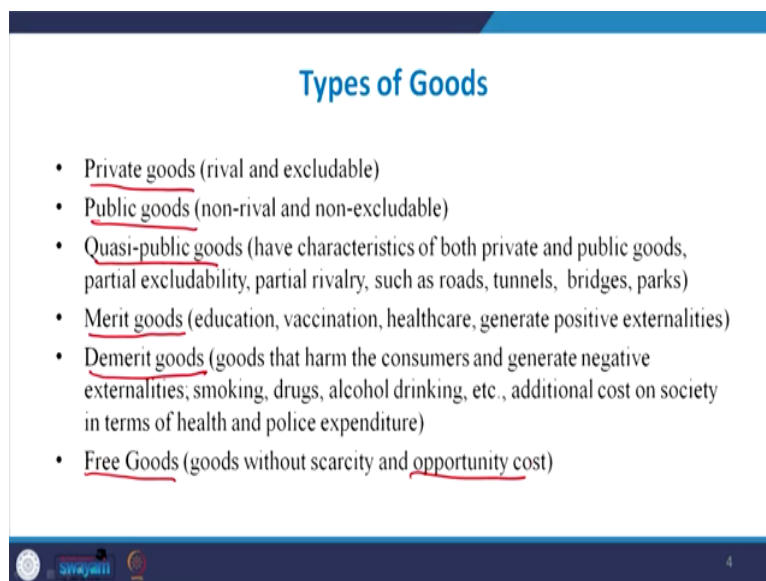
You know that the basic difference between the conventional goods and environmental goods is that in case of environmental goods market exist, like toothpaste, bathing washing soap, color TV or any other product which we buy from the market; their prices are determined by the interaction of supply and demand. So, market exists in case of conventional goods.

But in case of environmental goods, it is very difficult to determine the price of such goods as well as the quantity because, most of the environmental goods as well as bads are non rival and non excludable. I will explain later on, what is non rival product and what is non excludable product, but because of this feature of the environmental product and or public

goods market does not exist or if market exist, market under provide these kind of product or market fails to deliver effectively or efficiently the environmental goods as well as bads.

So, concept of public bads and externalities are developed by the economist to describe the characteristics of environmental goods that lead to market failures. The goods we consume can be classified into various categories.

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Types of Goods

- Private goods (rival and excludable)
- Public goods (non-rival and non-excludable)
- Quasi-public goods (have characteristics of both private and public goods, partial excludability, partial rivalry, such as roads, tunnels, bridges, parks)
- Merit goods (education, vaccination, healthcare, generate positive externalities)
- Demerit goods (goods that harm the consumers and generate negative externalities; smoking, drugs, alcohol drinking, etc., additional cost on society in terms of health and police expenditure)
- Free Goods (goods without scarcity and opportunity cost)

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First is private good. Private goods are rival and excludable. Rival means that if you consume some quantity of a product the same quantity cannot be made available for other to consume. So, the product is rival. Just opposite is non rival product like clean air. So, if you are consuming clean air then, you are not reducing the quantity for others to consume. So, clean air is non rival product.

Similarly, private goods are excludable for example, if you have produced a particular product and if someone want to consume that product you may provide that product only when the price of the product is paid. So, you can exclude the consumption of a particular product if someone is not willing to pay the price of the product.

But same things may not be applicable in case of environmental goods for instance, if in a particular localities; a particular entrepreneur want to clean the air and once the clean air is cleaned, now he want to supply the clean air to the consumers some consumer may be willing to pay the price of the clean air and some may not be willing to pay. In that sense, once the air is cleaned whether you are willing to pay or you are not willing to pay you will equally consume. So, product is non excludable.

Similarly, there may be number of such examples like free download and restricted download. So, you can exclude the download of a research paper by restricting the download through technology if the price of the research paper is not paid. As far as public goods are concerned they are non rival, non excludable it means that these products can be consumed without paying the price of the product and consumption of these product will not reduce the quantity for other to consume.

So, products are non rival and non excludable. For example defence law and order situation police services. All these kind of public goods provided by the governments can be equally consumed by all the members of the society. There are some goods which may also be called quasi public goods. They have characteristics of both to some extent private as well as public goods characteristics or they may be partially non rival and partially non excludable and partially excludable and partially rival such as road, tunnels, bridge, parks.

So, if roads are the made by the government and roads may be considered as public goods, but the restriction may be imposed by the government by imposing toll taxes etcetera and in that sense the product may be quasi public goods. There are another kinds of goods which are known as merit goods. So, merit goods are those goods which increase the welfare of the society and these goods also generate positive externalities in the economy like education

vaccination health care they generate positive externalities for example, if someone acquired education.

So, not only that benefit the person who acquired the education, but it also have the some spill or effect on the other members of the society. So, education has some positive externalities and these products must be promoted in order to generate more positive externality in the society. Then another category of goods are demerit goods. Obviously, they are opposite of the merit goods. The goods that harm the consumers and generate negative externalities are called non merit goods; like smoking, drugs, alcohol drinking etcetera.

So, this conjunction of these products not only are injurious for the health of the people who are consuming, but the consumption of these products also put additional cost on the societies in terms of health and police expenditures because when someone is becoming drug addict or alcohol that he or she may also lead to commit some crimes and then additional police arrangement would be made. So, it would be additional burden on the society.

Similarly, smoking not only create health problem for the person who is consuming, but it also generates negative externalities for others. It pollutes the environment, people inhale that smoke and health is badly affected and so you can see merit goods demerit goods, quasi public goods, then public goods, private goods and there is another kind of goods which is known as free good.

Free goods are those goods which are having zero opportunity cost or the goods without scarcity are known as free goods. And like water from the stream in the upper Himalayas can be consumed by a person without paying any price opportunity cost of consumption of water at that level is almost zero.

Similarly, air. Air is provided free of cost by the nature and if we are consuming air then we are not paying any things and there is no any opportunity cost imposed on the consumer due to consumption of such kind of products. So, they are called merit goods.

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Characteristics of Public Goods

- **Non-excludability**: once supplied, potential users or consumers cannot be prevented from deriving benefit.
- **Non-rivalry**: once supplied, individuals do not need to compete with each other, given that it become 'freely available' once it is produced.
- **Non-diminishability**: when one consumer uses the good the stock available to others does not diminish.
- **Non-rejectability**: once a public good is supplied it cannot be rejected by beneficiaries.
- **Non-marginal cost**: once supplied, the marginal cost of supplying another individual is zero.

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Now, after understanding the different types of goods let me now focus on public goods there are several characteristics of public goods you should know. First is non excludability which I already explained you. Non excludability means; once a product is supplied to the consumer, the potential users or consumers cannot be prevented deriving a benefit from such kind of product. So, you cannot exclude any product for consuming a particular product once it is supplied in the market, that product is known as public goods.

Public goods are also non rival. Non rival means; once these product are supplied in the market. Individual do not need to compete with each other to consume these kind of product. So, they are freely available once they are produced. So, the consumption of public goods may be considered non rival. Similarly, non diminish ability or the utility or quantity of such kind of

products does not diminish for other to consume because all consumers can equally consume such kind of product.

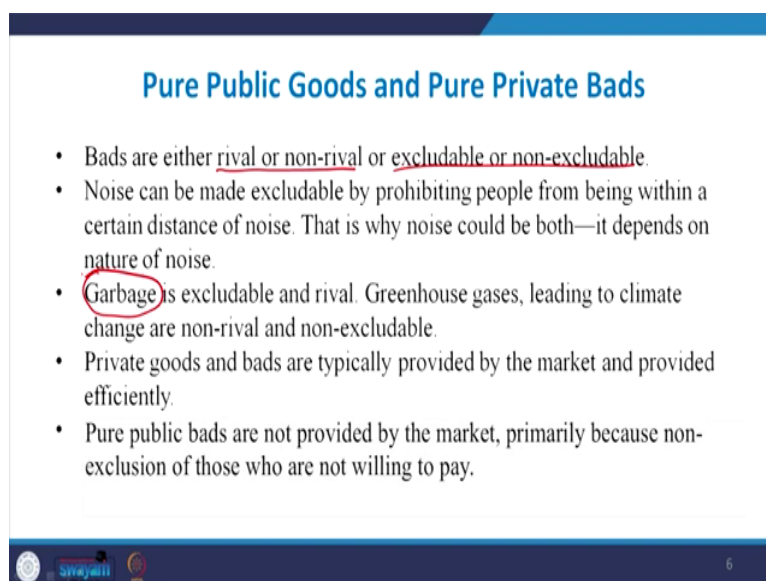
So, when one consumer uses the good the stock available for others does not deplete, does not diminish. So, that is also the characteristics of public good. Then non rejectability. This is another characteristics of public goods. Non rejectability means; once a product is supplied by the government for the society, the consumers cannot reject that product like in case of private goods, when you are going to buy a particular product say color TV and if the color TV is not working well then you can reject it and you can replace it.

But in case of public goods once the public good is created for the society even if the quality of public good is bad you cannot reject it like the condition of road. So, once the road is created by the government. So, you have to consume that road you have to drive your vehicle on the road whether the condition of the road is poor or good. So, you cannot reject and you cannot say to the government that replace this road because the quality of the road is poor.

Then marginal non marginal cost, non marginal cost. So, public goods does not have any marginal cost. Marginal cost means; the cost of one additional unit of the product consumed. So, once the public good is supplied in the market, the marginal cost of supplying for another individual is 0. So, that is why the products are considered as non rival and non excludable.

So, these are the main characteristics of public goods and based on these characteristics you can identify certain kinds of goods which fulfil these characteristics and if the goods are fulfilling these characteristics then you can say these goods are public goods, like road is a public good.

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Pure Public Goods and Pure Private Bads

- Bads are either rival or non-rival or excludable or non-excludable.
- Noise can be made excludable by prohibiting people from being within a certain distance of noise. That is why noise could be both—it depends on nature of noise.
- Garbage is excludable and rival. Greenhouse gases, leading to climate change are non-rival and non-excludable.
- Private goods and bads are typically provided by the market and provided efficiently.
- Pure public bads are not provided by the market, primarily because non-exclusion of those who are not willing to pay.

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Now, pure public goods and pure public bads. So, you can also classify the pure public goods and pure public bads. Bads are bad means here the negative products or simple in simple term you can say pollution. So, pollution is generated in the economy and consumers consume these pollutions and the pollution is termed as bad product. So, pure public goods and pure private bads; bads are either rival or non rival. So, there may be both types of bad product or excludable or non excludable like noise.

Noise can be made excludable by prohibiting people from being within a certain distance of the noise. So, if they just sound pollution or noise. So, you can escape yourself for consuming the noise by keeping yourself away from that place. So, that is why noise could be called excludable. So, you can exclude yourself for consuming the noise. That is why noise could be

both non excludable and but a non rival it actually depend upon the nature of the product noise.

Garbage; for example, garbage is excludable and rival, for instance household garbage. So, if you are supplying the household garbage then and some are demanding that household garbage by paying the negative price then the same quantity will not be available for others to demand. So, garbage is excludable product and as well as rival product. The quantity of garbage safely dispose by a person cannot be used by others to do the same things. So, the product is rival.

Now, take another example like greenhouse gases. Greenhouse gases is non rival product leading to climate change. So, climate change, global warming, these are the bad products and they are non rival and non excludable. Private goods as well as bads are typically provided by the market and market can provide them efficiently. We know that the price of private goods is determined by the interaction of supply and demand.

So, at the point where supply and demand intersect each others at that point the market price of the product is determined and if market is competitive then the market can allocate the resources in the production of various goods and services efficiently. So, private goods as well as bads can be provided by the market and they can be provided efficiently if certain conditions are met or if market is competitive.

Pure public bads are not provided by the market because, non exclusion of those who are not willing to pay. So, since pure public bad products are non excludable and non rival in that case market is not able to provide these goods; because once a company is creating such kind of product whether a consumer is willing to pay the price of the product or not willing to pay the price of the product in both the cases consumer may consume such kind of product even without paying the price.

So, in that sense the product is non rival non excludable and therefore, market cannot work in such kind of products. So, let us now conclude this lecture. In this lecture, I discussed types of

goods. They are different types of goods like public goods, private goods, merit goods, demerit goods, quasi public goods and free goods.

I also explained you the main characteristics of public goods. Actually, public goods are non rival and non excludable and therefore, it is very difficult for the market to provide public goods and most of the environmental products are non rival and non excludable and therefore, market fails to provide these public goods.

I also explained you the difference between pure public goods and pure private bads. For example, air pollution is a pure public bad and road without toll is pure public good. And most of the goods which we buy from the market are non rival and non excludable and therefore, they are called pure private goods.

Thank you.