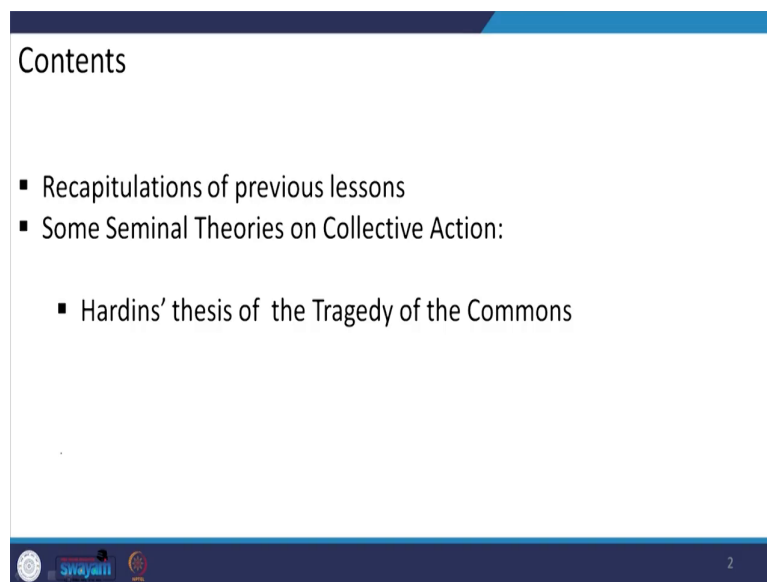


Introduction to Environmental Economics
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Lecture – 06
Commons and Collective Action Problem: Seminal Theories-II

Welcome to this online platform. So, in the last lecture we discussed about the typology of course, in the context of Commons and Collective Action Problems.

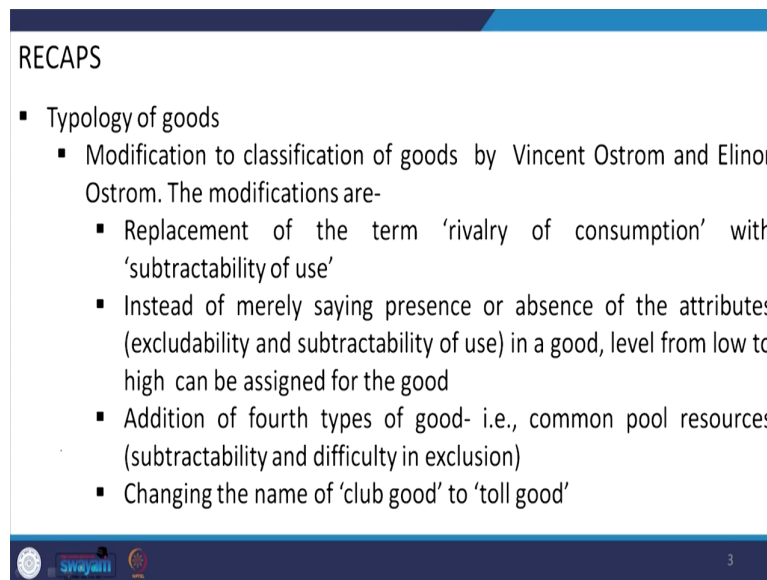
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Today we will be discussing about some recalls that we have already discussed in the last class. So, the contents would be broadly recapitulations of previous lessons along with some of these theory, seminal theories on the collective actions. So, in seminal theories as we have already understood that we will be talking about three theories; the first one is the Garrett

Hardin's Tragedy of the Commons. So, today we will be discussing this thesis of the tragedy of the commons itself.

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RECAPS

- Typology of goods
 - Modification to classification of goods by Vincent Ostrom and Elinor Ostrom. The modifications are-
 - Replacement of the term 'rivalry of consumption' with 'subtractability of use'
 - Instead of merely saying presence or absence of the attributes (excludability and subtractability of use) in a good, level from low to high can be assigned for the good
 - Addition of fourth types of good- i.e., common pool resources (subtractability and difficulty in exclusion)
 - Changing the name of 'club good' to 'toll good'

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So, if you analyze and recall the last lecture that we are talking about it is about the typologies of the goods. So, there we talked about we started with the typologies of the goods and discussed Samuelsson two fold classification of the goods that is public goods and the private goods, which he talked in his article that is Pure Theory of Public Expenditure in 1954.

So, along with that, along with this twofold classification of the good that is public good as well as private good, we also added another type of goods in this category, in this classification that is named as club good. So, if you see this club good classifications, the credit goes to Buchanan which he talked about this good in his An Economic Theory of Clubs in 1965. But however, if you see the another category of the a goods that is collectives or

commons; so, it has its traditions and its conceptions are found in the philosophical literature in the writings of the Plato, Aristotle, John Locke, Rousseau, David Hume, Adam Smith as well as John Rawls.

So, in economic literature this concept of the common goods, commons or collective goods is pertinent to the subfield of economics that is welfare economics. So, moreover you can say that if you want to see the development of this concept, commons that is also his application in the subfields like environmental economics and ecological economics as well.

And, then we talked about the attributes of non-excludability and non-rivalry, by taking to account the terms by (Refer Time: 03:00) contributions of these two attributes to classify different typologies of the goods. By then along with this, then we need to talk about the modification to the classification of the goods, by a these two authors. The first one is Vincent Ostrom and the second one is Elinor Ostrom.

So, what are the modifications? So, we talked about the public goods, we talked about private goods and the third one we talked about is the club goods which was contributed in the theory of Buchanan's theory in 65. So, what is the modification is he they proposed, both of them proposed that is Vincent Ostrom as well as Elinor Ostrom? So, the modification are this the fourfold; the first one is replacement of the term a rivalry of consumptions with this subtractability of use.

So, if you see the categorizations or the terminolization developed by (Refer Time: 04:00) that is known excludability and non-rivalry. But however, in this modification of the goods, in defining this club goods Elinor Ostrom as well as the Vincent Ostrom. They talk about some changes, that instead of using this rivalry of consumption we can use this subtractability of use of the use of that particular resource. So, this is their contributions in the in the classification of the goods itself.

The second contribution in this classification of the goods by this couple is that instead of talking about the mere presence and absence of this particular attributes, that is whether the excludability characteristics is present in the particular good or this subtractability of use or

you can say rivalry or non-rivalry attribute is present or absent in a particular good. We can say we can actually have a level, have a skill that instead of saying mere presence we can actually level their presence that what is the to what extent this particular level of attribute is present in that good. That is we can categorize and level them from low to high which can be assigned to that particular good.

So, this is the second modifications and suggestions both of the authors, they have talked about. And, the third one is they wanted to add the fourth type of good which is known as the common pool resources. When we talk about the typology of the goods for the first time we talked about these three kinds of goods: one is private, public and the third one is the club. So, this is the fourth in addition to all these, this is the fourth categorization of good, this suggested for the categorization and the classification of the goods.

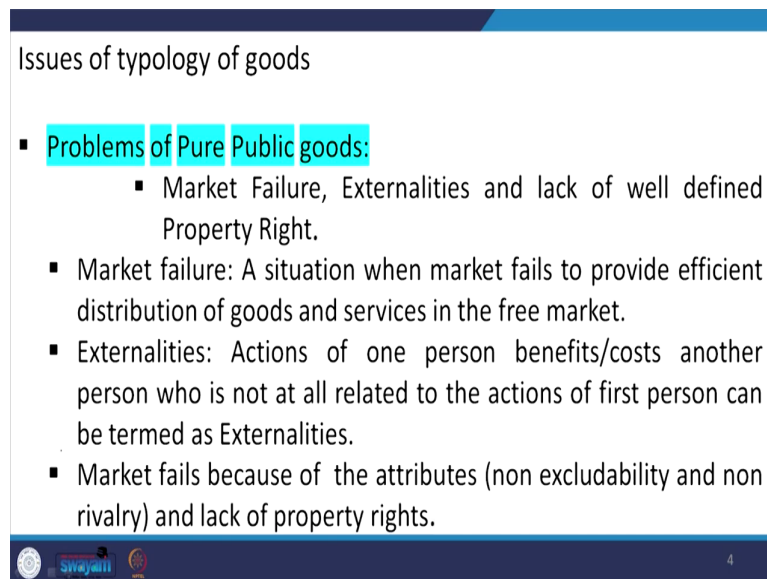
So, if you see this common pool resources; obviously, it is having its two types of attributes: one is subtractability in use and the second one is difficulty in its exclusion. So, difficulty in the exclusion is the same as known as excludability and the subtractability in use is the same as the rivalry. So, and the last one that was also suggested by both the authors in the classifications of the goods is changing the name of the club good to toll good. Why they want to change the name of the good? Because the attributes are same, whatever it was suggested by Buchanan.

So, only we are we are replacing this rivalry of consumptions with subtractability of use. But, why then we need to change the nomenclature or name of the good itself from the club good to toll good? Because, this facilities is provided by very small units, organizations may be private may be government sometime. So, when this kind of facilities is provided by the government let us talk about or some governmental small governmental organizations; then let us talk about the case of the toll tax. And, the second one is let us talk about some society, let us say a cultural a science society like your Tamil Society or your Bengali Society.

So, if you are member of this particular society based on a cultural heritage then there is a facility that you can actually access to this first benefit or second benefit. So, in this case the non-members who are let us say they are not they are not belonging to the Tamil society or the Bengali society. So, someone is from Maharashtra or someone Gujarati then; obviously, he or

she will not having any membership to the society and as a result she or he will not get any benefit out of this society. So, this is this is the example that how this kind of toll can actually be provided by a public group or the governmental organization, small organizations or a private group or private organizations as well.

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Issues of typology of goods

- **Problems of Pure Public goods:**
 - Market Failure, Externalities and lack of well defined Property Right.
 - Market failure: A situation when market fails to provide efficient distribution of goods and services in the free market.
 - Externalities: Actions of one person benefits/costs another person who is not at all related to the actions of first person can be termed as Externalities.
 - Market fails because of the attributes (non excludability and non rivalry) and lack of property rights.

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So, in this context we will be discussing about the issues of this typologies of the goods. So, generally we are talking about these issues and problems are because of these two attributes itself. So, let us talk about in addition to these two attributes that is excludability and rivalryness; so, the other problems of this classification of goods, let us talk about the public good itself.

So, these issues are the market failure cases or the externalities cases and the third may be due to the lack of old defined property rights. So, in this context you will you just think about

what all these problems are or how these issues are actually related to the classification of the goods and the first classification of the goods is our public good.

So, if you if you want to actually analyze all these all these concepts then we need to define it, then we will be saying whether these are the problems that we are finding in this classification of the goods as well. So, let us talk about the first concept that is market failure. So, what is market failure? That means, these the very word actually says that market fails right. So, what does it mean market fails? So, generally in economics we are saying that market can function when there is two functions or the two forces present in for that particular good or for that particular service.

So that means, the demand and supply concepts are necessarily related to the market situations which actually establishes the price systems. But, here when you are saying market fails; that means, this mechanisms that is that is supply and demand they are not a functioning in a free manner or they actually cannot, we cannot actually define this demand and supply functions. So, that is why the market fails because we cannot actually find any price systems in this context. So, and just to define, it this market situations this market failure is a situation when market just fails.

To what? To provide some efficient distribution of goods and services in the free market. And, if you want to see this the second concept; what is the definition of the second concept? That is externality, the externalities means when the action of one person's benefits or cost another person who is not at all related in this transactions or action of the first person. Then this thing can be termed as externalities; that means, if my action is affecting you, but you are not related to my work in any manner then; obviously, it is a case of externality.

So, externalities may be positively benefiting or negatively affecting you. So, externality can work in both the ways; positively or negatively accordingly it will be known as positive externality or negative externality. Then the third one that we wanted to discuss that why what are the issues related to this public goods is the well defined property rights.

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Features of Property Right

- Exclusivity (no externalities)
- Enforceability (secured for involuntary seizure and encroachment)
- Transferability
- Comprehensibility (property rights be owned privately or collectively)
- Universality

So, apart from these two attributes, we are which you are saying because of which the market fails that is the two criteria: non-excludability and non-rivalry. This well defined property rights is also responsible for failing the market or it can actually bring the market failure as well. So, what are the very features of the property right that we are saying and because of which we are facing the cases of market failure in the public good itself.

So, the very feature should be the exclusivity; that means, no externalities would be present, whatever the benefits or whatever the cost you are occurring; so, it must be included in your production function itself. It should not affect the second one either in production nor in neither in production nor in consumption as well and the second one is enforceability. So, what is the meaning of this enforceability? So obviously, this is the second features of the property right, well defined property right.

So, there we are assuming that if you do have well defined property right then; obviously, if you are owning this property and you do have property right; that means, the second cannot encroach. So, the legality is there and you can secure your property. So, you can actually protect your property because there would not be any kind of encroachment by the second person on your property itself. On the third of features of this property right is the transferability. So, what is transferability here? So that means, if I am owning a property or a good and I do have property right so; that means, if I want in my necessity out of my choice then I can actually transfer to you.

I can actually sell you, give it you right and this is how you and you can say there and there would be no problem in transferring the ownership from my ownership to your ownership. And, another characteristics of this property right is comprehensibility so; that means, the property rights should be owned either privately or collectively. So, if it is privately then; obviously, it is you who is having ownership and if it is collectively then a group of persons are or a communal person or a community, they are having this ownership. No one is having ownership individually, but yes a society or a particular group they do have ownership rights of that.

And, the and in some of the literature we can also find another characteristic of the property right. So, it is universality so; that means whatever the characteristics that we have discussed under this property right, it should be inversely acceptable. Everyone should accept this, that yes it should not have any negative externalities or positive externalities. And, if I am having this ownership then; obviously, no one would be allowed to encroach it and it will be I can also easily transfer to you if I use.

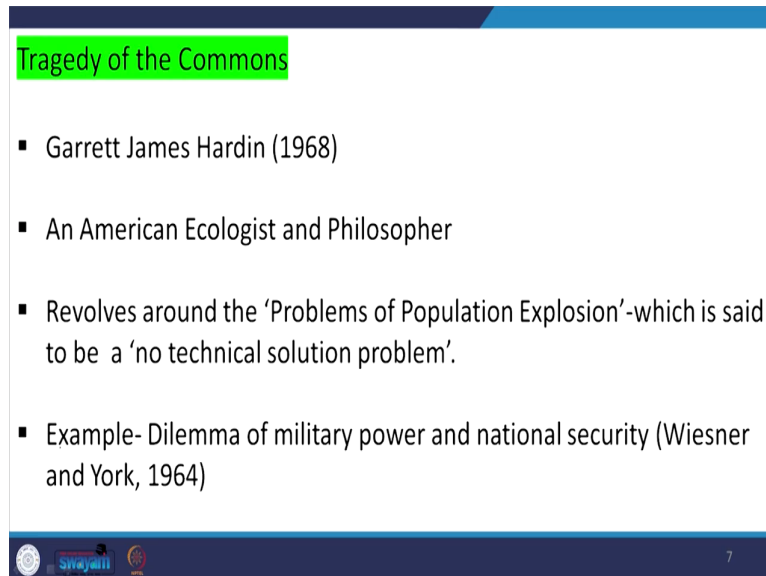
And, the property right would be owned either privately or collectively. So, these are the characteristics which are accepted by everyone. So, this is a kind of universal accessibility acceptability of these characteristics. So, apart from all these that we are discussing about these issues in this classifications of the goods or the very nature of the goods that we have classified; based on these we can actually talk about that why the first case is occurring; that is the case of market failure in case of the public goods.

Why market fails? We have just talked about that the demand and supply functions will not be well defined and that is why it is leading to the case of market failure. But what kind of problem we are actually facing? So, it is a supply side problem, not a demand side problem. Why it is not a demand side problem? Because, when the public goods should be provided by the public authority or the government then everyone would be interested to consume. And, if someone is not interested even he can it will be freely available to him.

So, it is not a demand side issue; however, it is a supply side issue. Why it is supply side issue? Because, no private person would be interested to produce this public good. Because, it will not be getting or the person would not be getting any profit out of this provision of the public goods. Again why? Because, here the marginal cost of producing this good is 0, if the public good is provided to you then they say and if the some other person wants to consume the same thing, then it can be provided to this the third person or the second person without any additional cost right.

So, that is what you can say if the marginal cost is 0, then here it is leading to the case of no profit. And if it is no profit case then obviously, the private person they would not be interested to provide the good. And, because of which we are facing a supply side constraint or supply side problem in providing the public good. So, this will be leading to the case of market failure. So, after understanding this recapitulation as well as some of the additions to the typology of the goods and some of the problems, let discuss about the first theory in the collective actions. That given all this these attributes of this course, given the classification of the goods we are getting some problems right.

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The slide features a title 'Tragedy of the Commons' in a green box at the top left. Below it is a bulleted list of four points. At the bottom left, there are logos for 'swayam' and 'swayamprakashan'. At the bottom right, the number '7' is displayed.

Tragedy of the Commons

- Garrett James Hardin (1968)
- An American Ecologist and Philosopher
- Revolves around the 'Problems of Population Explosion'-which is said to be a 'no technical solution problem'.
- Example- Dilemma of military power and national security (Wiesner and York, 1964)

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Then what would or what are the seminal ideas or what are these seminal theories that are already existing we talks which talks about the very nature of this a collective action problems and how they can be actually solved? So, the first theory that is the Tragedy of the Commons which is narrated by Garrett James Hardin 1968.

And, if you see the biography of Garrett Hardin; so, he is an American ecologist as well as philosopher and if you go through the original article, that is the Tragedy of the Commons; so, whole of the article is revolving around the problem of overpopulation which he saying it is a case of population explosion. And, then after knowing that it is a case of overpopulation or population explosion, he is explaining; then he tries to find out what are the solutions to this ever over population or population explosion.

However, he is not finding any solution to this over populations. So firstly, he is saying that there is no technological solution to this problem. So, why he is saying that he is assuming that there is no technical solution to this problem because, he has taken the articles of Wiesner and York which they have published in 1964 regarding the Dilemma of military power and national security. So, it was on it was on the nuclear power and the national security.

So, there they are try to find out that there is a dilemma between these two goods, sorry between these two words. The first one is the military power and the second one is national security. So that means, when the military power is increasing steadily then what will be happening to the national security of that particular country? So, it will be steadily decreasing. Why again? So, when you are saying suppose say our country is actually increasing the military power so; that means, it does not necessarily lead to the increasing national security rather than decreasing national security because, the enemy countries they would be also increasing their military power.

So, as a result the very security of the country is getting threatened not getting secured. So, that is why there is they have found this dilemma that there is no tech technical solution to this problem. Because, when you are possessing your technology or your actually bringing new technologies and new innovations in your military power. And, you are thinking that you are actually increasing the strength of the military power; as a result the national security will be increasing, but the same thing can also be followed by your enemy country.

So, that is why instead of saying that your national security is increasing, it actually happens that the national security is decreasing. That is why for this problem of the military power and national security the both the authors they talk that that there is no technical solution to this problem. So, just like this example Hardin also thought that there is no technical solution to the problem of population explosion.

Again why? So, in his article by taking into account by explaining different examples, he actually opposed and probed that how there is no technical solution to this population explosion.

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- Thomas Robert Malthus
- Jeremy Bentham and
- Adam Smith

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So, first of all he try to probe and try to explain the theories or the very approaches of three learn and people who worked on the population itself or who talked about population explosion itself. The first one is Thomas Robert Malthus, the second one is Jeremy Bentham and the third one is Adam Smith. So, how this how their theories or how their perceptions and the assumptions is applicable to this and how this how their ideas are taken into account in explaining this population explosion by Garrett Hardin.

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The Population Problem as a Metaphor of Commons

- **Problem:** Population naturally tends to grow geometrically (exponentially)
- **Consequences:** *Per capita* share of the world's goods must steadily decrease in the finite world.
- **Solution:** Technology?? Can technology solve this problem?
- **Constraint:** A finite world can support only a finite population.
- **Conclusion deduced:** And therefore, population growth must eventually equal zero.
- **But However,** in practical world this scenario is not found. Why??

So, let us talk about this. So, the first one is this is the Malthusian problem of population explosion. So, what he actually preached about and during this during his writing that population naturally tends to grow geometrically or we are saying exponential growth of population is there he is preached about. And, the second thing is that when the population is increasing exponentially, what is happening to the supply of food? The supply of food is also increasing, but it is arithmetically; so obviously, they cannot balance.

When something is increasing geometrically, it cannot balance when some other things is actually increasing arithmetically. So, this is the problem that how nobody the repercussions of the population explosion. So, that is why he talked about this metaphor of commons. So, as a result or as a consequence, he talked about that, that when population explosion is there, when

the in growth of the population is geometrically increasing and the food supply is arithmetically increasing.

So, as a result the per capita share or per capita availability of world's resources they must be decreasing, steadily decreasing; because again we know that we do have a finite world. And in a finite world; obviously, the production or the supply of food cannot be infinite because we are saying the population is exposing; that means, we are saying we are trying to say that population would be growing infinitely. So, if the population would be growing infinitely and we cannot actually produce the supply of food or we can produce we cannot actually produce the food in infinite manner, because we are assuming that or we do have this finite world.

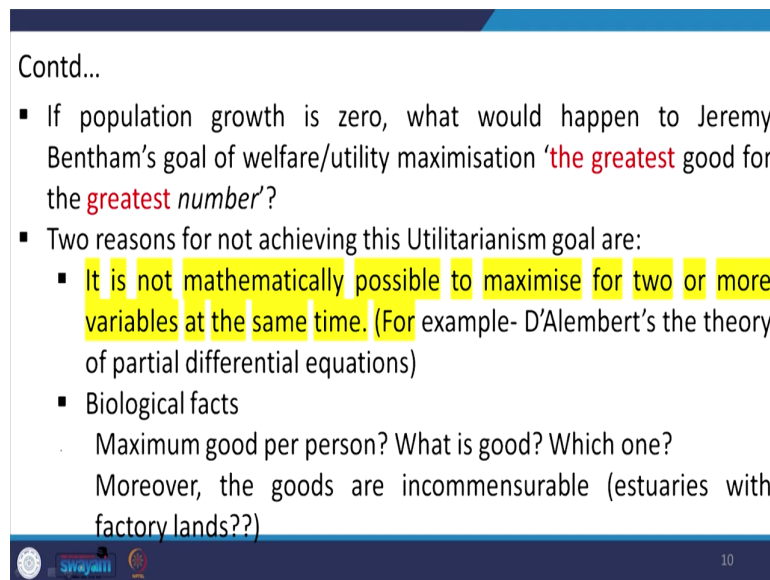
So, what is the solutions? Because, this is the problem we are facing. Then what would be the solution? Though is it the technology that can solve the problem or we can say who else can be can able to solve this problem? And what is the constant here? The constant here is we are actually talking about a finite world and a finite world can only support a finite population. So, what would the conclusion out of this scenario that we have narrated? That the population growth must eventually equal to zero, otherwise we will be facing this problem or the problem is not actually going to be solved.

So, this is what in brief Malthus has talked about in his theory. But however, in practical world if you see the scenarios across the countries and nations and continents, this scenario is not found. What is the scenario? We are not actually realizing That population is increasing and this the food supply is not increasing at that level and we do have a finite world. Therefore, the assumptions or conclusions that we are that Malthus talked about that population growth must eventually equal zero, this is not realized.

So, this is the first thing Hardin talked about related to the commons that is here he talked about the commons ask the case of the population explosion. Thus, the then he talked about the second ideas by which was talked about by Jeremy Bentham. So, what is his ideas or what is his assumptions he talked about? He is known for its utility maximization or which is known as utilitarian concept; that means, according to him or according to this schools of thought

those who are believing this utilitarianism, they are saying the maximum benefits must be achieved.

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- If population growth is zero, what would happen to Jeremy Bentham's goal of welfare/utility maximisation 'the greatest good for the greatest number'?
- Two reasons for not achieving this Utilitarianism goal are:
 - It is not mathematically possible to maximise for two or more variables at the same time. (For example- D'Alembert's the theory of partial differential equations)
 - Biological facts
 - Maximum good per person? What is good? Which one?
 - Moreover, the goods are incommensurable (estuaries with factory lands??)

So, in this what he can say that, the greatest good for the greatest number; how to achieve it? These are the two things: the first one is the greatest good and the second one is greatest number. So, in this context if the population growth is zero, what would happen to his assumptions of this maximization of benefits for the greatest good for the greatest number, right. And, then if you see the sentences that is how to achieve this greatest good for the greatest number, then we are actually finding two obstacles in achieving this the greatest good for the greatest numbers.

So, what are the obstacles? The first one is that this is not feasible because, of these reasons: one is mathematical reasons and the second one is your biological written. So, what is the

mathematical reason behind this that you cannot actually maximize the greatest good for the greatest number? Though if you see mathematical then we can say that it is not possible to maximize for two or more variables at the same time. We can talk about; we can take the examples of partial differential equation or we can talk about the game theory.

So, if you are taking into account these two examples then we are finding that; obviously, in mathematics we cannot actually maximize two or more variables at the same time, at the same point of time. And, that is why you cannot actually achieve this maximization of the greatest good for the greatest number because these are two variables and we cannot actually maximize both and the second reason is that biological facts.

So, what is the biological facts? When you are saying it is the greatest good and we are trying to maximize the benefits out of it. So, what is the maximum good per person? Is it defined what is the maximum number per person? And, if it is defined that this would be like 100 number of goods per person; but which kind of goods right? Then what type of goods? Because, nature of goods are different and accordingly which type of goods one is requiring is different. Then how to say that how to maximize the good for person?


So, just for example, we can take that for a person or a particular person is interested in two goods here. Let us say one is estuaries with the factory lands right, but if you are trying to say that the person is maximizing this amount of estuaries with the maximize, he also want to maximize the factor lands. Then these two goods: one is estuaries and the second one is factory lands, they do have different attributes. The nature of this goods or if you see believe in this classification of the goods, then you can assign to the attributes; then you will be find they are totally different goods.

Then how can you maximize it? Because, they are measured in different units or they do have different characteristics. So, this is the second reason because, of which we can actually achieve the greatest good for the greatest number.

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- Adam Smith (1776, Wealth of Nations) contributed to a dominant tendency of thought that the tendency to assume that **decisions reached individually will in fact, be the best decisions for an entire society.**
- If this assumption is correct, laissez-faire in reproduction can be continued and we can assume that **human being will control their fertility to produce optimum population.**
- But, if the above assumption is not correct, we need to re-examine our individual freedom of reproduction.
- This may be termed as **tragedy of Freedom in the commons to reproduce.**

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And, the third logic or the third idea Hardin had taken from Adam Smith. So, again what is the assumption of Adam Smith or how he is he has put forth his assumption? That decisions reached individually will in fact, be the best decisions for an entire society. So, what about the decision a particular individual takes that is the best decision for the society itself and that is why the societal benefit should be maximized that is what he assumed. But, again is it the fact that if you have you are maximizing your benefits by taking a particular decision, further it will be leading to maximize societal benefits as well.

Then again if this assumptions is correct then this non-intervention of the government, that is laissez-faire in the reproduction system itself here population explosion we are talking about, this can be continued. And, we can assume that when human being will control their fertility to produce the optimum population. Because here what is the assumption? That decisions reached individually will be leading to the best decision for the society; that means, a single

individual he knows what would be the optimum level of population itself. But, if it is the case then the case of population explosion would not have arrived.

But however, if you see these the (Refer Time: 30:35) of the realistic terms and we are actually in real world facing some different scenarios regarding this population explosion. And, this may be termed as the tragedy of the freedom in the commons to reproduce. So, what is the tragedy here? The tragedy of the freedom, every individual is having the freedom, freedom to take his own decisions. And, again it is assume that these decisions are the best decisions for the society itself and that is why it is leading to the tragedy in the commons itself, in terms of over in terms of population explosion.

So, in this lecture we discussed how Hardin defined the problem of population growth or population explosion. And, in the next lecture we will be continuing with the this same topic to discuss how Hardin has taken the metaphor of commons, in order to explain the population growth problem as well as the pollution problem. So, that is what we will discussing in the next lecture.

Thank you.