Introduction to Environmental Economics

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Lecture – 12
Environmental Goods and Ecosystem Services-I

In this lecture you will study about Environmental Goods and Ecosystem Services. This lecture is outline into various points. First I will explain what is environmental good, what are its characteristics, what do we mean by ecosystem and what do we mean by ecosystem services.

Then you will also study about the different types of ecosystem services. These services maybe, competitive in nature and complimentary in nature, so this aspect will also be discussed. Moreover, you will also study about the 2 forms of these services. One is intermediary services and these services are used as a input to produce the final services, which are consumed by the human beings.

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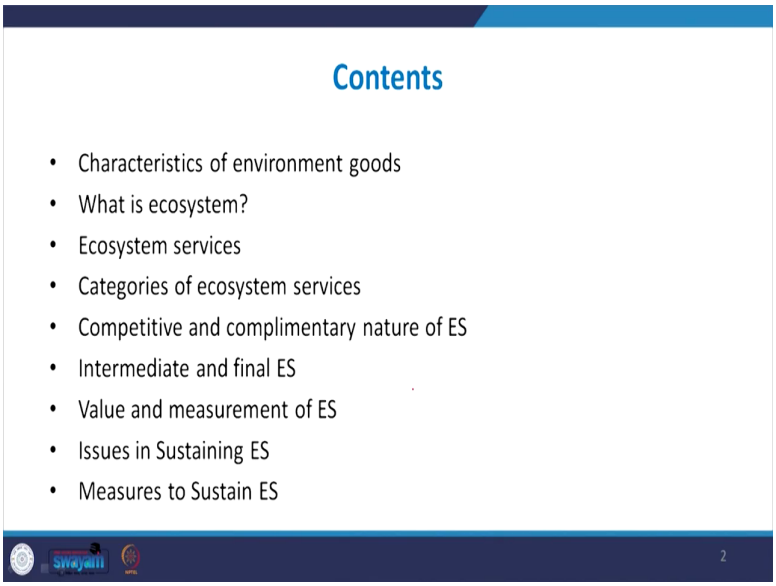

Then you will also study about, environmental values and in brief, you will also know about the different kinds of methods that can be used to estimate the value of environment. Because a detailed discussion will be made in separate modules on how to estimate the economic values, what are the different methods of measuring the economy these environmental values.

Then you will also study about, how to sustain the ecosystem services and finally, I will also discuss what kind of measures we can follow to augment the environmental goods and services.

Let me first explain what is an good or what is an environmental good? Actually in goods had 2 main characteristics, one is excludability and other is the rivalry. Convictional goods which we buy from the market and consumes, they have these 2 characteristics. But most of the environmental goods, they are either non excludable or non rival and therefore, it becomes difficult to allocate them efficiently through the market mechanism.

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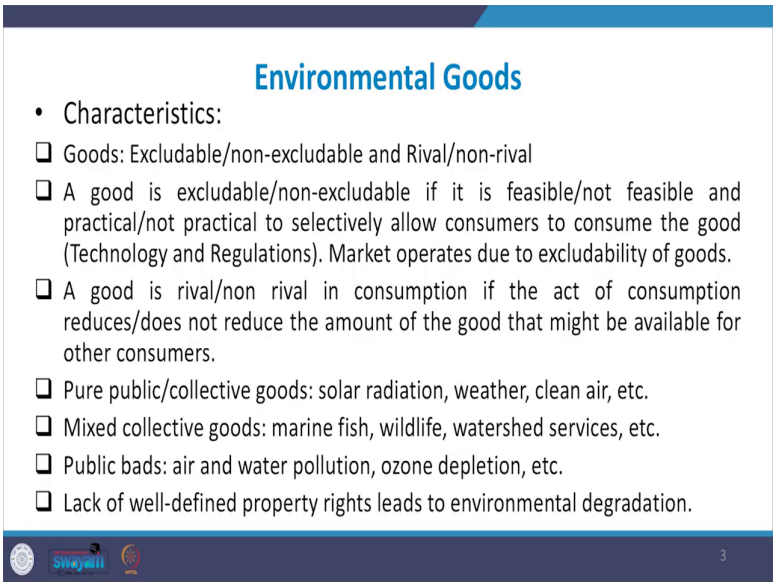

Let me tell you what do we mean by excludability or excludable product and rival product? A good is excludable, if it is feasible and practical to selectively allow consumers to consume a good. So, if you can selectively make it feasible to racial the quantity of a particular product and it is also practical and feasible then product maybe called excludable product.

And most of the convictional goods they are excludable in nature. For example, if you want to consume a particular product, you go to the market to buy a particular product. You will get this product only when the price of the product is given by you.

So, therefore, price system works and market works in case of convictional goods because these goods are excludable. Say some goods may be non excludable. And these goods maybe

non excludable if it is not feasible and not practical to selectively allow consumer to consume the goods. Take the case of clean air.

If you want to start your own business to supply the clean air, how will you distribute the clean air among the consumers? Because the product is non excludable. Once you clean a particular environment, then whether some consumers are willing to pay the price of clean air or some are not willing to pay they equally consume.

So, this kind of product is not possible to exclude or consumers may not be excluded from the consumption of such kind of products. And this nature of the product can be changed through technology and regulation.

So, excludability is a characteristics which can be ensured through technology and regulation for example, you can take dish antenna, cartelized TV. So, if you are not willing to pay the price of a particular channel, then that channel may be blocked by the owner and you will not be able to see that. Similarly, free downloaded; research paper or restricted down load of the particular paper.

So, technology plays an important role, but at the same time we also know that regulations also play an important role, and a product which is considered non excludable it can be converted into excludable through regulation, take the household garbage. If municipality of a city is not making any regulation, no not making any laws, and households may throw garbage on the roadside.

So, dumping of these garbage on the road side is non excludable, but if municipality makes a regulation that those who are throwing garbage on the road side, they may be punished then what will happen market will work. Some waste disposal company will come forward, they will collect your garbage from your household and in this way market will work.

So, excludability is one of the important feature of a product to make the market work. Second characteristic of the product is rivalry. A good is rival in consumption if the act of the consumption reduces the amount of the goods that might be available for other consumers.

For example, if you are consuming a glass of milk; the same glass of milk cannot be consumed by others.

So, the product is rival, but there are certain kind of product. Whose consumption cannot be reduced if some others are consuming, like clean air or this lecture of mine today is a non rival. Anybody can listen my lecture and listening of my lecture by other person is not reducing the listening for others, but at the same time this product that is my lecture is excludable.

Only those who are registered this course can attend my lecture others may not be allowed, but if any political leader is making a public lecture then anybody can listen that lecture and then lecture is non excludable. So, you should know the difference between excludability and rivalry these are the 2 main features of product.

Now, coming to the environmental goods. Look at most of the environmental goods I am not saying all are non excludable, non rivals and therefore, it becomes very difficult to create market for such kind of products, I already given the example of clean air.

So, clean air is a non rival, a non excludable product. But one things you should know is that whether a product is rival or non product is rival or non rival in consumption, it is always rival in production; question is why?

Because the resources involved to create a particular product whether product is clean air or production is a color TV in both these kind of products resources are having competitive uses. So, therefore, all products whether products are rival product or non rival products they are rival in production, but they may be non rival and non rival or rival in consumption depending upon the nature of the product.

So, based on this you can now classify these goods into private goods and public goods. So, most public goods or they are also called collective goods. These are the goods which are mostly non rival in nature. So, anybody can have access to this product and they are non excludable also like a solar radiation whether clean air etcetera.

And there are certain goods which are mixed collective goods like marine fish, why they are mixed? Because to some extent they may be non excludable, non rival, but up to a certain, but if there is a over fishing, then it the product become a rival product.

So, they are mixed of collective goods wildlife water shade services etcetera. Similarly, we may have public beds. So, when we are consuming good products we also release certain kinds of bad products, like pollution. So, pollution is a public bad product like air pollution, water pollution, ozone depletion etcetera.

Now, due to lack of well defined property rights environmental degradation occurs. So, main problem of creation of environmental bad product is the fact that there is no well defined property rights. And a Ronald Coase, wrote a famous theorem which is known as Coase theorem and according to him if property rights are well defined and if there are no ambiguity in the rights and if rights are treated in the market then efficient solution will occur, this topic will be discussed in detail in a separate unit. Now, what is eco system?

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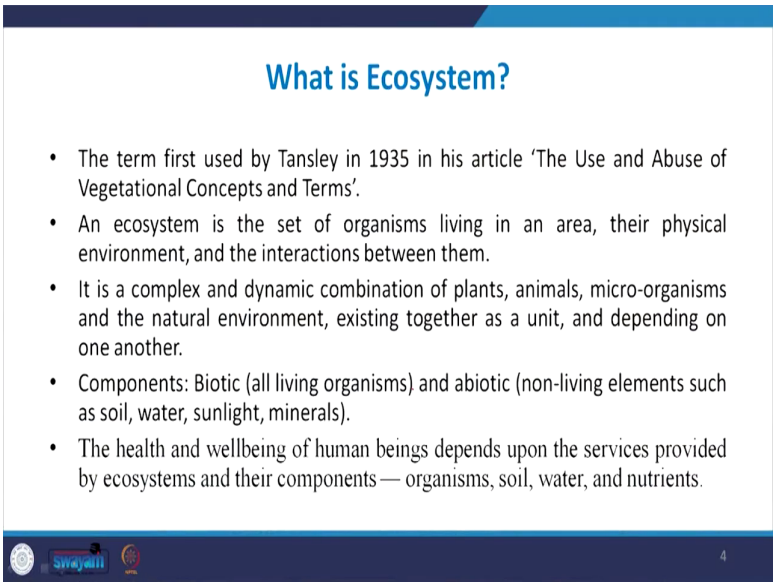

In earlier lecture also I discuss about ecosystem while making a difference between ecological economics and environmental economics. And ecosystem includes ecology as well as environment and this term of ecosystem first time was used by Tansley in 1935 in his article on the use and abuse of vegetational concept and terms.

So, he used this term ecosystem first time. Now, it becomes a buzzword everywhere we use ecosystem even this term is used outside the environment also now we are using it in different manners political ecosystem, social ecosystem and there are different system ecosystems business ecosystem etcetera are being used.

So, now, it becomes a very very popular term, but in context of environment what exactly is ecosystem must be known and an ecosystem is the set of organisms living in an area, their physical environment and interaction between them.

So, in living in a particular area how the different living beings, living organisms interact each other's is studied in ecosystem. So, ecosystem is a complex and dynamic combination of plants, animal, micro organisms and natural environment existing together as a unit and depending on each other.

As earlier also I discussed that environment has 2 components. One is biota biotic component, which includes all living organisms and a biotech, which includes non living elements such as soil, water, sunlight, minerals etcetera.

The health and wellbeing of human beings actually depends on the services provided by the ecosystem and their components which includes like different kinds of living organisms, soil water and nutrients. So, therefore, ecosystem health is very very important for supporting our life.

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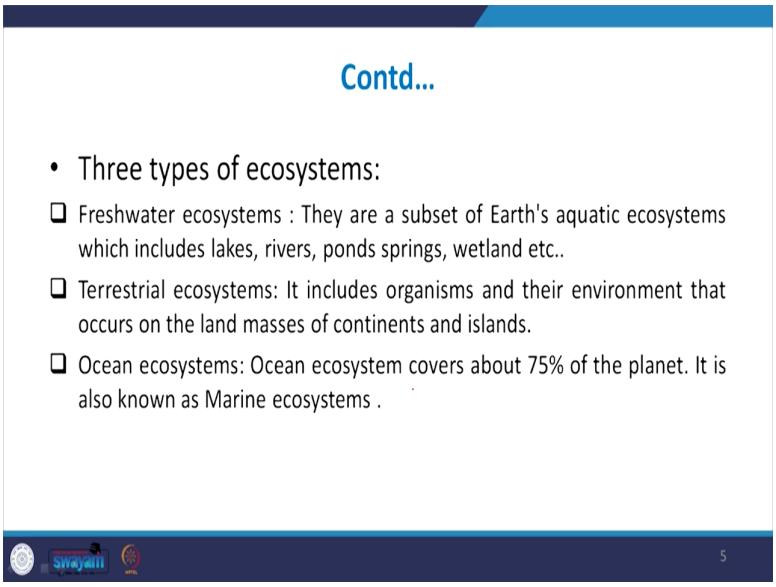

If you try to understand what are the different kinds of ecosystem broadly, although there are number of ecosystems, but broadly we can classify the ecosystems into 3 categories; first is freshwater ecosystem. Freshwater ecosystem comprises, rivers, ponds, lake, wetland etcetera.

So, freshwater ecosystem include all aquatic life, like a river ecosystem that is a part of fresh water. So, river provide us fresh water then another important types of ecosystem is terrestrial ecosystem. Terrestrial means related to land, so it includes organisms and their environment that occurs on land masses of continent and islands like forest ecosystem or mountain ecosystems dessert ecosystem.

So, these are the different kinds of ecosystem, which are on the land surface and how the different kinds of organisms interact and interdependent on each other's that is studied in terrestrial ecosystem. Similarly, we also have ocean ecosystems that is also known as marine

ecosystems where all aquatic life in the sea, how they interact each other's, how they depend on each other? That is considered as ocean ecosystem.

Within these 3 there may be a number of different kinds of ecosystems, like water shade ecosystem, like wetland ecosystems, mangrove ecosystems mountain ecosystems, desert ecosystem. So, there may be number of ecosystem, but broadly they are classified into these 3 category depending upon whether the ecosystem is on land, whether ecosystem is in fresh water bodies or whether ecosystem is in the ocean like marine ecosystem or salted water ecosystem. From this graph you can easily understand how the different living and nonliving organism interact each other's.

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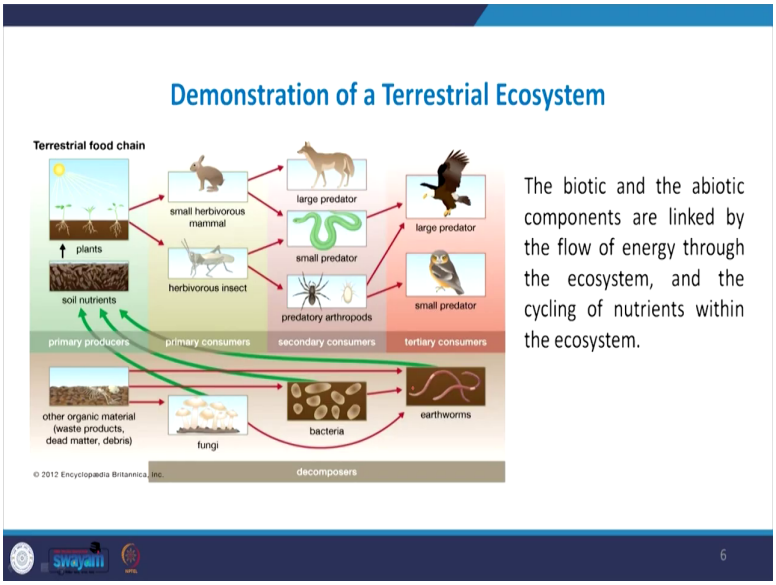

Like we have plants, we have small herbivorous mammals, large predators large predators they also interact each other's depend on each others. So, this graph clearly shows that the

biotech and a biotech components are linked by the flow of energy through the ecosystem and the cycling of nutrients with the within the ecosystem.

You know that say one animal eat the other animals then waste are absorbed by the environments some other animals also eats these waste and generate another kind of things. And similarly earth wound also creates certain nutrients which help to improve the fertility of soil.

So, water, soil, sunlight and different kinds of living organisms they interact each other's in a ecosystem and through these interaction they also generate certain kind of ecosystem services.

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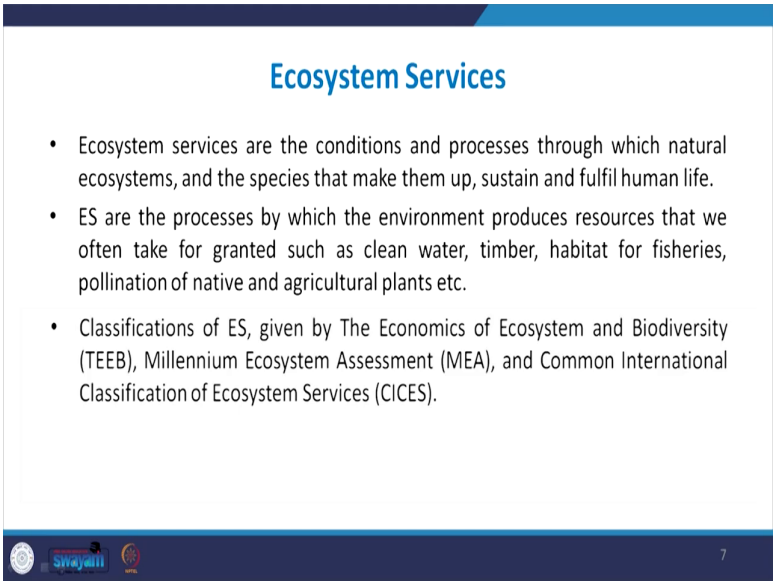

What do we mean by ecosystem services? Obviously, literary meaning is the goods and services, which are provided by our ecosystem, ecosystem maybe a terrestrial ecosystem is term ecosystem maybe river ecosystem or freshwater ecosystem or marine ecosystem.

So, what these ecosystems provide us in the form of goods and services they are actually known as ecosystem goods and services. Ecosystem services are actually the conditions and process through which the natural ecosystems and its species that make them up sustained and fulfill human lives. You can easily defined the ecosystem as the ecosystem services are the processes by which the environment produces resources that we often take for granted such as clean water, timber, habitat for fishery, pollination of natives and agricultural plants etcetera.

So, different kinds of the goods and services which are provided by the environments are known as ecosystem goods and services and a these goods and services maybe of different natures, like a environment provide us timber, water, habitat for fish, pollination of natives, agriculture plants all these are of the kind of services which are provided by the ecosystem. We can classify these ecosystem services into 4 broad categories. First is provisioning services, second is regulating or regulatory services, third is cultural services and forth is supporting services.

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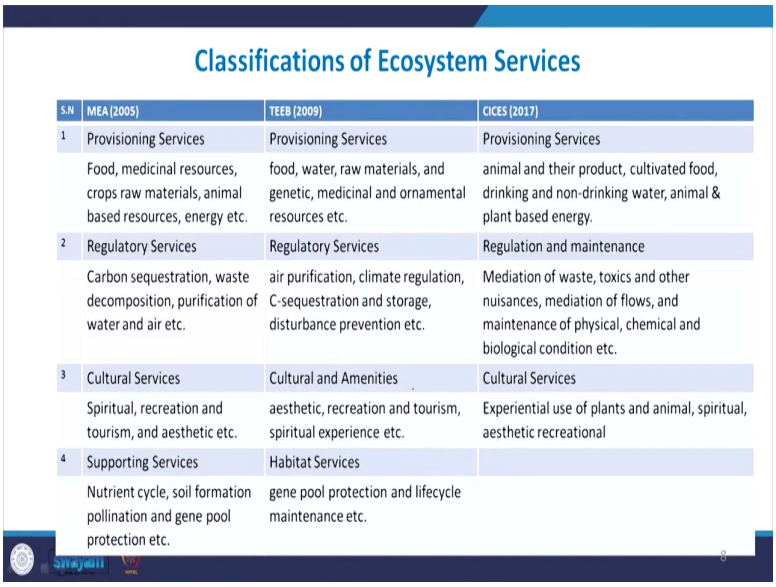

Now, there may be minor variation according to different groups who have coined these different kinds of services for instance one group is the economics of ecosystem and biodiversity teeb another is millennium ecosystem assessment and third is common international classification of ecosystem services.

So, these 3 may have different opinions about the kinds of goods and services which are provided by the environment, but there is a similarities like a MEA, includes 4 kinds of services, provisioning services. Provisioning services includes the kinds of goods as well as services which are directly consumed by us like food.

So, environment provided us food medicinal resources crop raw materials, animals animal based products energies minor forest produce honey all these kind of products which are used for direct human consumptions are provisioning services. Or even there are certain kinds of

services which help to regulate the environment they. So, the second category is regulatory services like carbon sequestration waste decomposition purification of water and air.

So, it is one of the important characteristics of the environment that environment up to a certain extent can clean itself and that is known as assimilative capacity of environment or absorption capacity of the environment. For example, if some waste are release in to the atmosphere say I need water body river. So, if liquid waste is lead into the river system within a few kilometers river can clean itself, but up to a certain extent. And if the pollution load in the river is very high then this assimilative capacity of the environment or sinking function of the environment would be badly affected.

So, this regulating service is not absolute and in fact, that is also constants or depending upon how we are using the other kinds of services. So, there may be some sort of relationship between provisioning services for example, if we are using more or more water for provisioning services under provisioning services less water will be for other services of the environment like environmental flow in our water bodies may be badly affected if we are extracting more water.

So, therefore, regulating services like carbon sequestration, waste decomposition, purification environment they are the important services which are provided by the environment. But they are not absolute they may be depending upon how the other services are being used whether we are using more extracted resources for direct consumption etcetera. Third category is cultural services.

So, environment or ecosystem also provide us various kinds of cultural services is spiritual, recreation, tourist, aesthetic, education, research. So, all these kind of services are provided by the environment many times we look at the beautiful mountains rivers and natural beauties and we get certain kind of insight for our own learning.

So, we learn a lot through our environment and these learning education recreation all these are termed as cultural services then 4^{th} category is supporting services supporting services includes nutrition cycle, soil formation, pollination, gene pool, protection etcetera.

So, pollination service is also very very important and several studies have been conducted on this how the pollination services are creating huge environmental values in terms of money to the societies. Similarly, teeb also have these kind of categories only in place of supporting services it considered habitat services like gene pool protection lifecycle maintenance etcetera and all other things are same.

As far as CICES is concerned here it also include provisioning services animal and like animal and their products cultivated food, drinks, non drink etcetera and regulation and maintenance of different kinds of services like meditation of waste toxic and other nuisance mediation of flows and maintenance of physical and environmental. Then cultural services of course, similar kind of services are termed as cultural services like education recreation etcetera.

If you look at some of the important services which are provided by the environment under different categories they are first is moderation of weather extremes, so environment makes weather extreme moderation seed dispersal.

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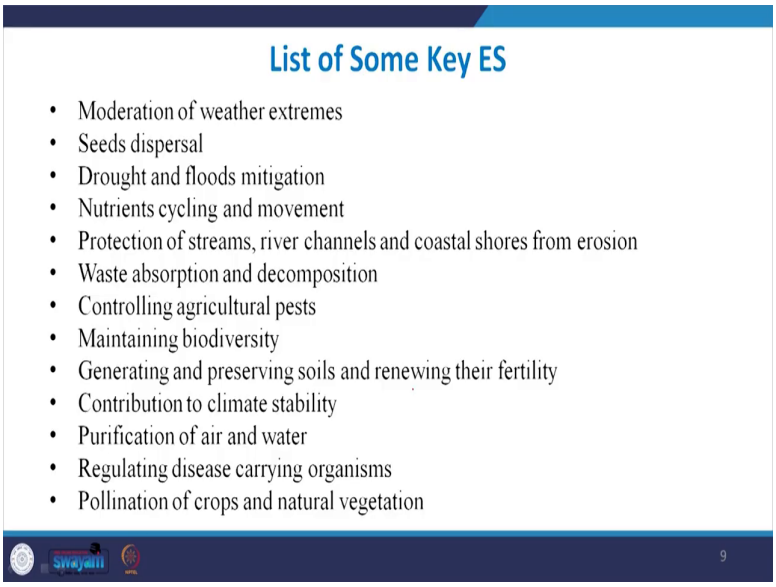

So, in a forest through the various kinds of organisms birds animals they help us to disperse the seeds from one place to other place and help to increase the vegetation in a forest cover. Drought and flood mitigation is also a kind of services provided by our environment. Nutrient recycling and moment of nutrient is also provided, protection of extremes river channels and coastal shores from erosion waste absorption and decomposition is also the important service controlling agriculture pests, its a very interesting that how the one in insect eat the other insect and try to control the different kinds of pest.

And that is why if organic farming is practiced then we can preserve these kind of farmers friendly insect which can help to control the agricultural pest, but when we provide pesticides chemicals in agriculture, then these friendly insects also affected and this kind of services is badly affected. Then maintenance of biodiversity is also one of the key services provided by

the environment. Generation and preservation of soil renewing their fertility that is also a kind of a services.

Controlling to climate stability, purification of air and water, regulating disease carrying organisms and pollination of crop and natural vegetation. So, what I had discussed earlier in case of a 4 categories of ecosystem services like provisioning services, supporting services, cultural services, regulating services. So, more or less these are the important services which are provided by the environment remaining part of this lecture we will be discussed in the next lecture.

Thank you.