

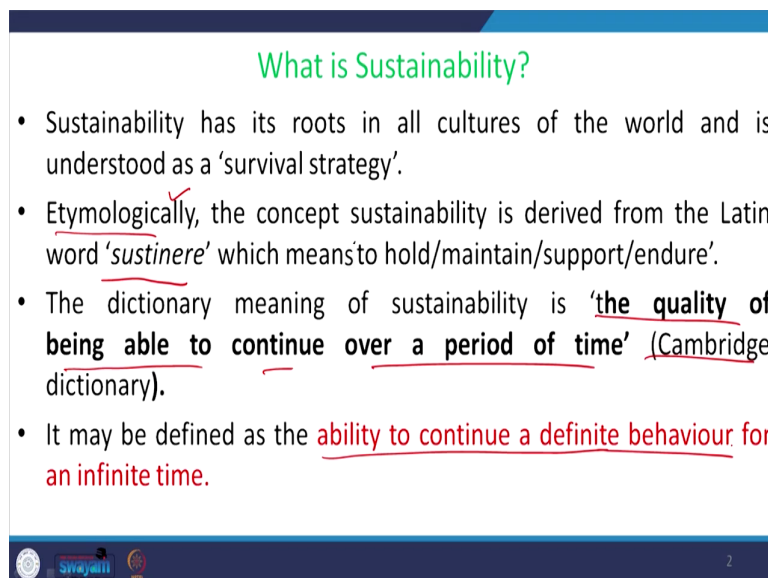
Introduction to Environmental Economics
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Lecture - 21
Environmental Sustainability- I

In the last lecture, we discussed about the problems of commons and the collective goods. So, what is the basic problem we found? We the basic problem that we are found is how to sustain the common itself given the collective actions. So, in this respect, we need to understand what is the sustainability in the commons or how the collective actions can be sustained for to be called a successful collective actions.

So, in this context, we need to understand what is sustainability and here in this module we will be discussing environmental sustainability and some of the indices that is helpful in capturing this environmental sustainability.

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What is Sustainability?

- Sustainability has its roots in all cultures of the world and is understood as a 'survival strategy'.
- Etymologically, the concept sustainability is derived from the Latin word '*sustinere*' which means to hold/maintain/support/endure'.
- The dictionary meaning of sustainability is 'the quality of being able to continue over a period of time' (Cambridge dictionary).
- It may be defined as the ability to continue a definite behaviour for an infinite time.

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So, what exactly is the meaning is the meaning of this sustainability?

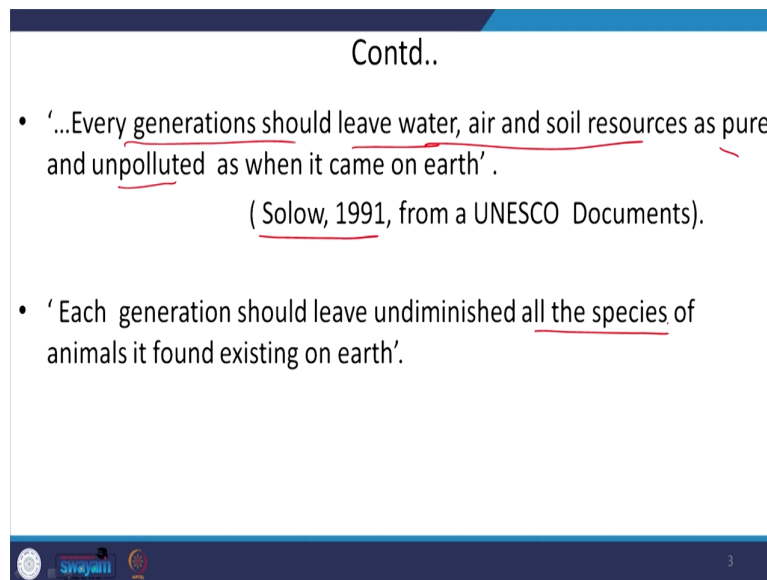
So, we can say sustainability is the word, which may mean to hold to maintain or to support. So, this is what if you see a want to find, the origin of the concept on sustainability, then we can find this, this what is derived from the Latin word called Sustinere. And, its meaning is to sustain to support or to maintain.

And, if you want to find out the dictionary meaning of the sustainability, then we can find the definition given in the Cambridge dictionary. And, sustainability means the quality of being able to continue forever or for a long period of time. So, that means, here we want to say that sustainability means to sustain or to maintain the quality of a thing of a system which can continue for a longer period of time or forever.

So, that is what the meaning of a sustainability from the very word we can know. And, in this respect by taking into account the etymological meaning, that is the derivation of the word itself and the dictionary meaning of the sustainability, we can say that. Now sustainability formally can be defined as the ability to continue a definite behaviour for in infinite time.

So, if a particular behaviour particular pattern of the behaviour of a system can be found for infinite time for a longer period of time, then you can say that this is sustainability or that particular characteristics the particular quality can be sustained.

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- ‘...Every generations should leave water, air and soil resources as pure and unpolluted as when it came on earth’ .
(Solow, 1991, from a UNESCO Documents).
- ‘ Each generation should leave undiminished all the species of animals it found existing on earth’.

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So, in this respect we can actually take the very meaning of sustainability from Solow’s work. So, in 1991 he tried to find out, he tried to understand the meaning of the sustainability itself through examples. That, he had taken these examples that every generation should leave water, air or soil resources as pure and unpolluted as when it came on earth. So, perhaps this

is the meaning of sustainability, but it is not the definition. This is the example of sustainability and we need to understand it, what is the meaning behind it and how to define sustainability.


So; that means, here if you see the a the original meaning of sustainability the concept of sustainability or the dictionary meaning of the sustainability, we are finding the same thing that every generation should leave the water these resources as pure and unpolluted, when they came on the earth. That means, the particular characteristics of water, air, soil resources or other resources or other systems; they need to continue the same quality. And if it is then these characteristics, these qualities of water, air, soil resources or other resources or other systems can be called as a sustainability.

So, in an another example we talked about that each generation should leave undiminished all of the species animals it found existing on earth. So, another example can be that if all the species and their quantity and their spread above their populations are undiminished in the on the earth itself, then we can say this is the example of sustainability.

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- Definition by Daly (1990)
 1. Renewable resources shall not be used faster than they can regenerate. (sustainable yield)
 2. Pollution and wastes shall not be put into the environment faster than the environment can recycle them or render them harmless.
 3. Nonrenewable resources shall not be used faster than renewable substitutes (used sustainably) can be developed.
- However, this definition is said to be incomplete because it does not talk about 'level of quality of life'.



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So, this is what we are saying we can find the examples that are given by Solow Robert Solow in 1991. Then, we can also talk about the sustainability or the definition of the sustainability. And, for Daly Herman Daly sustainability means, if the renewable resources are not used faster than they get generated, then it may mean this is the sustainability in terms of the sustainable yield of renewable resources.

So, what is the definition then? The definition is that this renewable resources, if you need to say that what is sustainability in renewable resources. Then, we can say that renewable resources can be sustainable, if their use is lesser than their regeneration. If their use or if their extraction is faster than the rate at which the renewable resources can get regenerate, then it is not sustainable resources. So, the second again second examples can be or the second parameters of sustainability can be understood in terms of pollutions and wastes.

And, he also talked that the pollutions and wastes shall not be put into the environment faster than the environment can recycle them or render them harmless; that means, here he talked about two qualities. The first one is the quality of the environment in terms of what is the amount of pollution or waste that is generated because of the economic activities and the second is the assimilative capacity of the environment itself.

So, as you understand that environment is having it is assimilative capacity; that means, it is having a natural capacity to recycle all the pollutions recycle pollutions and wastes, not all the pollution and all the waste. And, if the pollutions the amount of pollutions and amount of waste is less than the assimilative capacity of the earth. And, so, that earth can automatically or naturally recycle them, then this is called the sustainability of economic activity.

And, here we need to understand that when we undertake any economic activity, the bio products are the pollutions or waste. And, if the economic activities or the productions are treated to be are to be treated sustainable, we need to think about the amount of pollutions and the assimilative capacity of the earth itself.

And, the third one he gave this example, another criteria we can say for the sustainability to understand the sustainability. It is in terms of non-renewable resources and the substitutes of these non-renewable resources. So, what is the meaning of this? So, he talked about that this non-renewable resources shall not be used faster than the renewable substitutes.

So, again what is this meaning that non-renewable resources, it should not be extracted; it should not be exploited, faster than the substitutes faster than it is substitutes in terms of a renewable resources.

If, it is so, then we can say that we are using this non-renewable resources sustainably. So, in this respect we can take this example, we can have this example. Suppose say we are taking coal as non-renewable resources. And, if the coal is extracted used faster than its substitutes in terms of renewable resources; that means, the work what these non-renewable resource like coal is doing. If, some kind of other good or other service or other element is developed which

can be substitute to the coal and which can produce similar work. So, that is we are saying they are substitutes of this non-renewable resources.

So, here when the non-renewable resources are not used faster than the renewable substitutes, then we are saying that this non-renewable resources like coal is sustainably used. But, however, if we analyze this definition, then we are we can find that this definition is not giving a complete picture of sustainability, because this definition is not talking about the level of quality of life which is also necessary for understanding the sustainability as well.

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- The earliest instance of sustainability can be found in 'Limits to Growth' by Meadows, Meadows, Randers and Behrens III(1972).
 - This book talked about the limits of 'earth's carrying capacity' in relation to long term global trends in population, economics and the environment.
- 'It is possible to alter these growth trends and to establish a condition of ecological and economic stability that is sustainable far into the future. The state of global equilibrium could be designed so that the basic material needs of each person on earth are satisfied and each person has an equal opportunity to realize his individual human potential.' (Meadows et al., 1972, p.24)

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And, if you want to find out what is the original instance of sustainability in academy perhaps then, we can go back to this book 'Limits to Growth' by Meadows and their co-authors in 1972. And, what is the novelty of this book or what is the importance of this book? For the

first time this book talked about the limits; the limits of earth system that is the earth's carrying capacity in relation to the anthropogenic activities and anthropocene.

So; that means, here this book talked about for the first time earth's carrying capacity with respect to some global variables like population, economic activities and the status of the environment itself. And, in this book, the authors they very much used this word sustainable. Also, they are they have not defined the word or they have not propounded any definition of this word sustainability. But, frequently they have used this word sustainable.

So, that is why it will be wiser to quote some portion of this book, in order to understand the sustainable or sustainability. So, to see this to get this some portion of this book, it has been stated, it is possible to alter the growth trends and to establish a condition of ecological and economic stability that is sustainable far into the future.


So, here we are using the word sustainable although we have not defined here. The authors have not defined the concept sustainable or the meaning of the concept sustainable, but they have used the context. And, the second one is the state of global equilibrium could be designed, so that the basic material needs of the person on the earth will be satisfied. And, each person they will be getting equal opportunity to realize their individual potential. So, from these we can actually understand the very applications of or very understanding of the concept sustainability in 1972 concept of or 1972 book, that is limits to growth.

So, here the authors they wanted to highlight that the system can be sustainable, that is the condition of ecological and economic sustainability can happen. If, we are going to change the growth trends the why we are running after the growth in terms of the macro parameter like GDP.

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- However, the concept of 'sustainability'/sustainable development was first promulgated in the framework of World Strategy of the International Union for Conservation of Nature and Natural Resources (IUCN) in 1980.
- Further, it was elaborated and defined at World Commission on Environment and Development (WCED) by the Norwegian PM Gro Harlem Brundtland in 'Our Common Future' Report in 1987.
- Sustainable Development is defined as which 'meets the needs of the present generation without compromising the ability of the future generations to meet their own needs' (WCED, 1987).



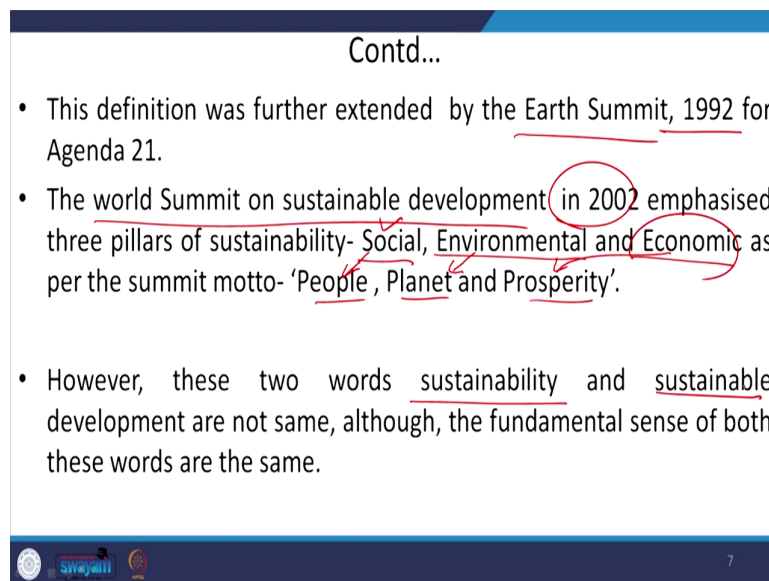
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But; however, if you want to see the very concept used as a framework, then we can go back to the IUCN World Strategies of the International Union for Conservation of Nature and Natural Resources in 1980. World Strategies for sustainable development or how to conserve the resources for sustainability. And, however, popularly this word was used in the report that is known as the 'Our Common Future' report which is popularly known as again the Brundtlands Report.

So, in Brundtland's Report, the very concept of sustainability got its definitions and it was elaborated over there. And, as you understand that this Brundtland report is named after this Norwegian Prime Minister Gro Harlem Brundtland, where the sustainable development and or sustainability concept was popularized and emphasized to be reflected in the public policies of the countries throughout the world, in order to sustain the resources.

In order to sustain the resources for not only meeting the present generation needs, but also for the needs of the future generations. So, that is why in this report, Our Common Futures Report in 1987, sustainable development is got its formal definition which is defined as the development which 'meets the needs of the present generation without compromising the ability of the future generations to meet their own needs'.

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- This definition was further extended by the Earth Summit, 1992 for Agenda 21.
- The world Summit on sustainable development (in 2002) emphasised three pillars of sustainability- Social, Environmental and Economic as per the summit motto- 'People, Planet and Prosperity'.
- However, these two words sustainability and sustainable development are not same, although, the fundamental sense of both these words are the same.

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And, again this definition of sustainability in 1987 was further extended by the Earth Summit in 1992 in form of Agenda 21. So, what is agenda 21? That is agenda for the 21st century for achieving the sustainable development.

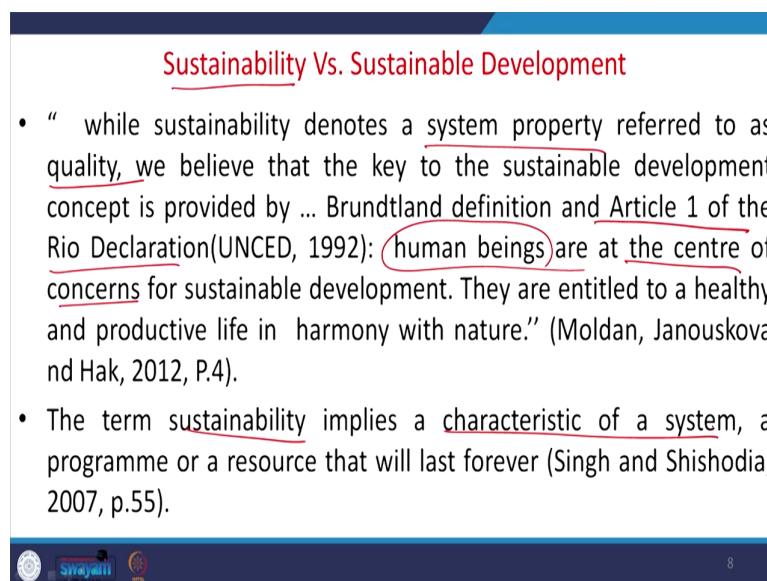
So, again the world Summit on sustainable development in 2002 emphasised three different parameters which are called three pillars of sustainability take into account the social sustainability, environmental sustainability and economic sustainability based on this motto of

the summit that is people, planet and prosperity. So, this social sustainability means it should be satisfying the people's societal aspects.

And, when you are saying this environmental sustainability, it is related to the planet itself. And when you are saying it is economic, it is related to the prosperity of the human being. So, this is how the very concept sustainability has got extended in by the Earth Summit in 1992 as well as world Summit on the sustainable development in 2002.

However, these two words sustainability and sustainable development, they are not the same although the very fundamental sense or fundamental backbone of these two words are same here.

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Sustainability Vs. Sustainable Development

- “ while sustainability denotes a system property referred to as quality, we believe that the key to the sustainable development concept is provided by ... Brundtland definition and Article 1 of the Rio Declaration(UNCED, 1992): human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.” (Moldan, Janouskova and Hak, 2012, P.4).
- The term sustainability implies a characteristic of a system, a programme or a resource that will last forever (Singh and Shishodia, 2007, p.55).

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Then, what is the difference? The difference is that, when you are saying the sustainability it refers to a systems property, the characteristics of a system that is the quality of a system itself; a system property or the quality itself. But what is sustainable development? In order to understand the sustainable development, we can actually refer to the Article 1 of the Rio Declaration 1992 United Nations Conference on Environment and Development.

So, there sustainable development is understood as the centre of the concerns. Who are these centres of the concerns for the sustainable development? They are the human beings. For sustainable development, human beings are the apex; are the centre for all these concerns. So; that means, the human beings need to be healthy and productive and they need to have a harmony with the nature itself. That is what the meaning of sustainable development as is understood from the Article 1 of the Rio Declarations.

So, what is the difference then? Sustainability is nothing, but the quality of a system the very property or characteristics; a system is displaying that is sustainability. Whereas sustainable development is concerned to the human beings development in terms of a getting healthy and productive life in terms of getting a harmony with the nature itself.

So, in this context we can say that this term sustainability implies, the very characteristic of a system or a program or a resources that can last forever. Whereas sustainable development means, we are focusing the human beings development and how their needs can get satisfied along with the present generation and future generations.

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What needs to be sustained?

- Schools of thought:
- **Economists view:** maintaining and improving human welfare through long-term stability in economic output, income or consumption.
- In this perspective, Robert Solow (1991) defined sustainability as making sure the next generation is as well off as the current generation and ensuring that this continues for all time (Kolstad, 2011, P. 46).
- **Ecologists view:** focus is on sustaining the ecosystems. That is, long-term preservation of biosphere.
- **Anthropologists view:** they focus on protecting and preserving the cultures and languages.

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So, after understanding the very meaning the concept of sustainable development, now, we need to think about, what needs to be sustained, by taking into account different schools of thought. So, what are these schools of thought? What needs to be sustained from different disciplinary boundaries or as is understood by different disciplines.

So, let us start from the economics itself. How the economists; they are perceiving the sustainability or sustained? So, for economists this sustainability means maintaining or improving the human welfare. The centre is the human welfare. Through difference long term stability in terms of economic output, income, profit, consumptions, cells and other economic parameters.

So, for economists, how we are defining this sustainability or how the economy can be sustained? If, the human welfare can be improved or maintained by taking in to account, the

economic output, income and consumption. If it is so, then you can say that we do have a sustainable economy.

So, in understanding this economist's view of sustainability, we can actually take the example or explanation by Robert Solow again. So, in 1991 Robert Solow defined sustainability as making sure, the next generation is as well off as the current generation and ensuring that this continues for all the time to come forever for infinite period of time.

So, here economic sustainability is that we need to see the wellbeing of the present generation as well as the future generations. And, this level of welfare should be continued for ever. So, this is what the economists they are perceiving the very meaning of sustainability. Now, let us talk about the ecologists view point on the sustainability itself.

So, for a ecologist sustainability means, how to sustain the ecosystems, how to sustain, how to preserve, how to maintain the very biosphere for long period of time or for infinite time. And, another schools of thought that talks about the sustainability as perceived by the anthropologist. So, for anthropologist this sustainability means, focusing, or protecting, and preserving the very cultures, and very languages of the society.

When you are maintaining, you are protecting, you are preserving, the languages the culture of the society, then we can say that this is sustainability in terms of in terms of societal sustainable.

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Environmental Sustainability

- Originally, 'environmentally responsible development' was used by World Bank in 1992.
- Then 'environmentally sustainable development' was employed (Serageldin and Streeter, 1993) ;
- and the concept of 'environmental sustainable development' was developed (Goodland, 1995).



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And, another aspect of sustainability is Environmental Sustainability. So, what is environmental sustainability or we can say sustainable environment? So, originally this environmental sustainability was used in terms of 'environmentally responsible development'. And, this was for the very first time it was used by World Bank in 1992 for meaning, what is the environmental sustainability.

And, again with due course of time this 'environmentally responsible development'; it was named as, it was known as, environmentally sustainable development. And, finally, if you see the literature in 1995, then this concept got evolved and we found this concept environmental sustainable development. And, perhaps this these are this these concepts are the reflections of environmental sustainability.

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- **Environment sustainability:** It may refer to – the rates of renewable resource harvest, pollution creation, and nonrenewable resource depletion that can be continued indefinitely.
- It is synonym with sustainable development.
- It implies responsible utilization of the natural resources such that the present generation's needs are fulfilled without jeopardizing the needs of the future generation.
- It can be defined in terms of the carrying capacity of the natural systems.
- Carrying capacity: The maximum population size of species that a natural system can sustain indefinitely or for a defined period for a given standard of living.

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So, what exactly is the meaning of this environmental sustainability or environment sustainability? It can refer to the rates of a renewable resource harvest, the rates of pollution creation, the rates of non-renewable resource depletion that can be continued forever.

If it is allowed if the renewable resources are harvested continuously at the same rate; if the pollution creation is there and if without any other repercussions and if the non-renewable resources their depletions occur at the same rate for quite a long period of time or for indefinite time, then this kind of state is known as the environmental sustainability.

So; that means, we need to say that this environmental sustainability can be interpreted as the same thing as the sustainable development. So, what is sustainable development that, we have already talked about by taking the definition of Brundtland Commission our common future in

1987. So, this sustainability implies the utilization of natural resources in such a way that the present generation's needs are fulfilled without sacrificing the needs of the future generations.

So, if both the generation's needs are fulfilled without any kind of sacrifice, without any kind of trade out, then this growth, this development is known as the sustainable development. And, here in defining the sustainable development, we can also or this can be also explained in terms of carrying capacity of the system.

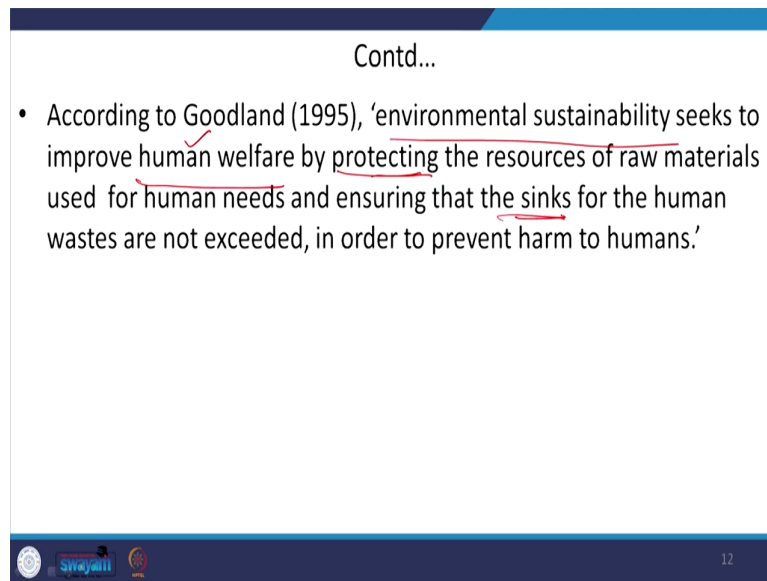
So, sustainable development can be understood in terms of the carrying capacity of the system itself. So, what is the carrying capacity of this system? So, the carrying capacity of the system is expressed in terms of the maximum population species, that a particular nature or natural system can sustain for a quite long period of time given the standard of living.

So, that is why the first definition that is taking the needs of the present generation and the future generation as well, this is the same thing as we are defining the current carrying capacity. So, environmental sustainability can also be interpreted or can also be expressed in terms of this concept carrying capacity of the system itself.

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- According to Goodland (1995), 'environmental sustainability seeks to improve human welfare by protecting the resources of raw materials used for human needs and ensuring that the sinks for the human wastes are not exceeded, in order to prevent harm to humans.'



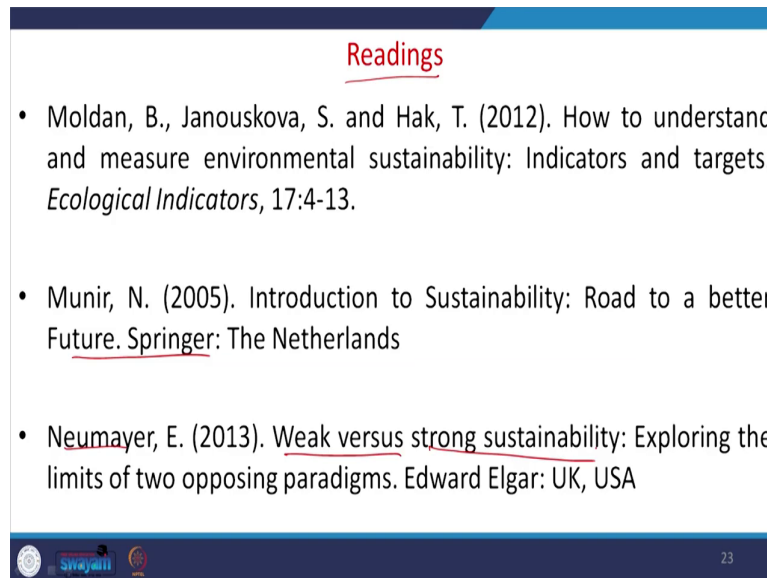
So, systematically now we can define, the sustain environmental sustainability that is 'environmental sustainability seeks to improve human welfare by protecting the resources of raw materials used for the human needs and ensuring that the sink for the human wastes are not exceeded, in order to prevent the harm to humans'.

So, what you are highlighting in explaining this environmental in defining this environmental sustainability. That means, we need to seek the how to improve the human welfare. But, side by side we need to see that, how resources or the raw material raw materials they need to be protected?.

And, we need to sure need to ensure that the human wastes in terms of the sinks should not be exceeded the carrying capacity or sorry should not be exceeded the assimilative capacity of the

nature itself. So, that the resources for the raw materials or the raw material resources that can be they can be protected and the environmental sustainability can happen.

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Readings

- Moldan, B., Janouskova, S. and Hak, T. (2012). How to understand and measure environmental sustainability: Indicators and targets. *Ecological Indicators*, 17:4-13.
- Munir, N. (2005). Introduction to Sustainability: Road to a better Future. Springer: The Netherlands
- Neumayer, E. (2013). Weak versus strong sustainability: Exploring the limits of two opposing paradigms. Edward Elgar: UK, USA

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So, after understanding this environmental sustainability and its definition, let us summarize what we have discussed today. So, when we started with the definition that is Layman's definitions and understanding of sustainability, then we moved to the understanding of origin and history of sustainability and also the sustainable development. We discussed what are the pillars of sustainability that take into account the social, economic and environmental sustainability.

Then, we have made a differentiation between the sustainability and sustainable development. And, we also discussed what needs to be sustained taking into account different perspectives from the economist view point, from anthropologist view point and from ecologist view point.

And, we also discussed about environmental sustainability and environmental sustainable development.

So, having discussed all these now in the next class, we will be discussing the rest of the a rest portion of this environmental sustainability. So, we will be discussing the economic sustainability, social sustainability and what is the difference between weak sustainability and strong sustainability. And, what can be the criteria for measuring the environmental sustainability, is there any indicator or some existing indices are there that way we will be exploring in next class.

Thank you very much.