Ethics in Engineering Practice
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Lecture – 21
Responsibility to Environment

Welcome to the session of Ethics in Engineering Practice. Today, we will learn about the responsibility of the engineers towards the environment. So, it may appear to us like why we should be responsible to the environment, and what does it happens if you are not responsible like are we taking something from the environment, should we be doing it harm or if you are not like extracting from the environment, then how do we produce new things.

And they to what extent it should be done, after that like it may not be done and how do we take become responsible towards the environment and try to provide less harm to the environment. These are now important questions, which are there in the mind of engineers, because in environment is an where important stakeholder in the whole process of development. And, because it is our silent stakeholder, which may be cannot protest as in terms of giving demonstrations.

In other things, which other stakeholders like if you are providing any harm, any damage to a human being are by like while doing a dam and other things, they may form a group and come and protest, but environment is a silent stakeholder who cannot speak for itself to tell like please take care of us. So, in that case, what happens and what are the responsibilities of engineers to this silent, but very important stakeholder for a balanced coexistence of the human like civilization. So, we will learn about this in this present session. So, let us focus into what is the what will be discussed a under the section, when we are talking of an responsibility towards the engineers towards the environment by the engineers.

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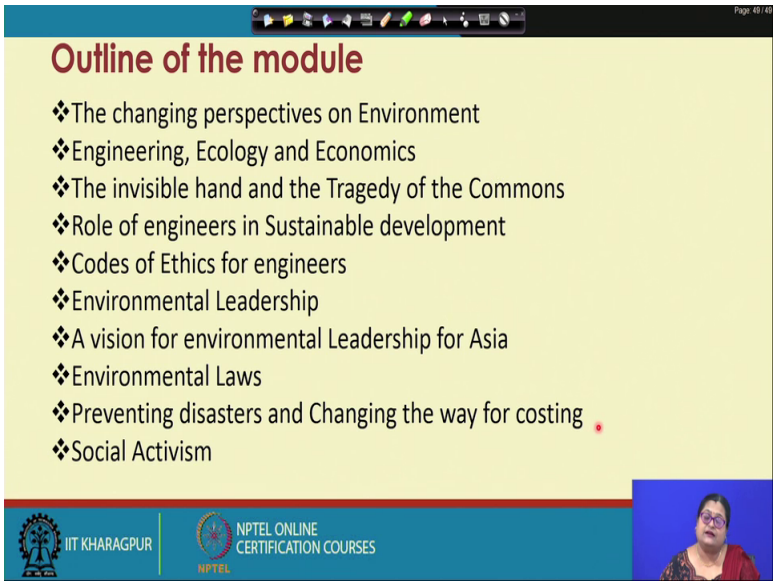

The outline of today's discussion will be like, the changing perspectives on environment, engineering, ecology and economics, the invisible hand and the tragedy of commons, codes of ethics for engineers, environmental leadership, a vision for environmental leadership for Asia, environmental laws, preventing disasters and changing the way for costing, and social activism. We will discuss all these points one by one along with examples. And the case may be possible; at the end to see like, how all these factors are appearing to be important in real life situations.

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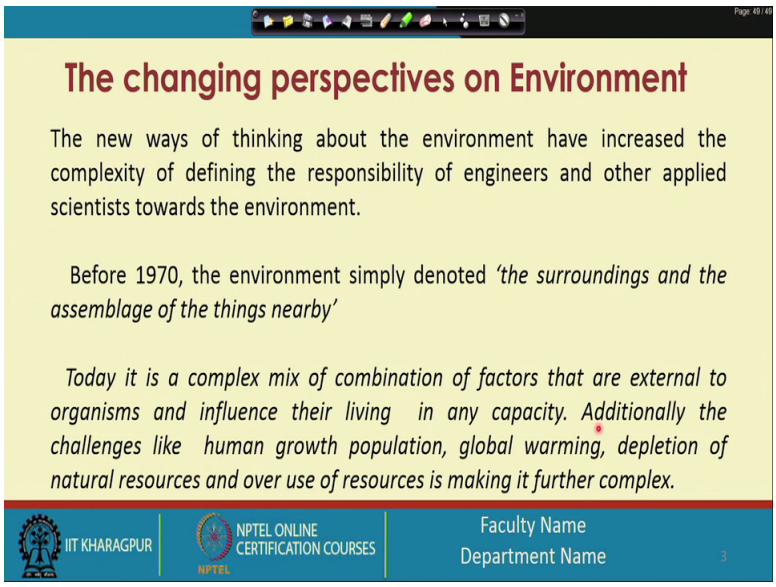

So, we will start with the changing perspectives on environment. So, the new way of thinking about environment have increased like with the complexity of the defining the responsibility of the engineers and other applied scientist towards the environment. So, why because there have been shift in understanding, what environment actually is and how we are related to the environment. So, with that shift in thinking there is a change in responsibility also, and our accountability for our actions.

So, before 1970, the environment simply denoted the surroundings and the assemblage of things and nearby. But, now today it is a complex combination and mix of factors that are external to the organism and influence their living in any capacity. Additionally the challenges like human growth population, global warming, depletion of natural resources and over use of resources is making it further complex. So, if you see like from 1970 to present day, there is like massive shift in the definition so, why? In 1970, it was just looking into the maybe the physical surroundings and the assemblage of things, which are nearby.

But, now it has got a it is not only the physical environment, but it is a complex combination of factors, which are outside the organism external to it and influence their living in any capacity. So, it could be like natural things like global warming, and depletion of natural resources, overuse of resources or like the with the challenges of human growth and in the population also.

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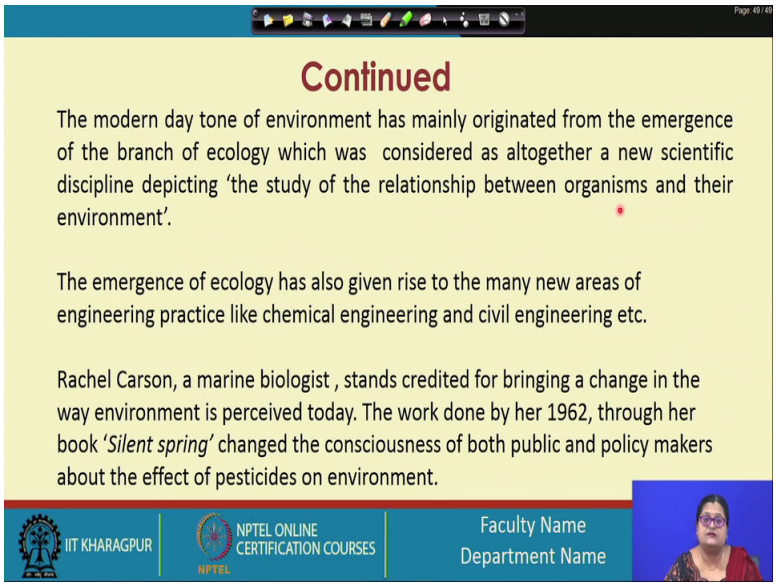

So, the present definition of environment has originated from the branch of ecology, which has considered as altogether a new scientific discipline, which is depicting the environment the study it is the field, which studies the relationship between the organism and their environment. The word relationship is important over here. So, there is an organism and there is an and it has an environment, but the ecology states, it is the relationship between this organism and environment, which is very important, and which needs to be defined properly, because it leads to mutual coexistence, and a synergy.

The emergence of ecology has given rise to the many new areas in engineering practice like chemical engineering civil engineering etcetera. Rachel Carson, a marine biologist, stands credited for bringing change in the way environment is perceive today. In 1962, she did a through her book like the 'Silent spring' change the consciousness of both public and policy makers about the effect of pesticides on environment.

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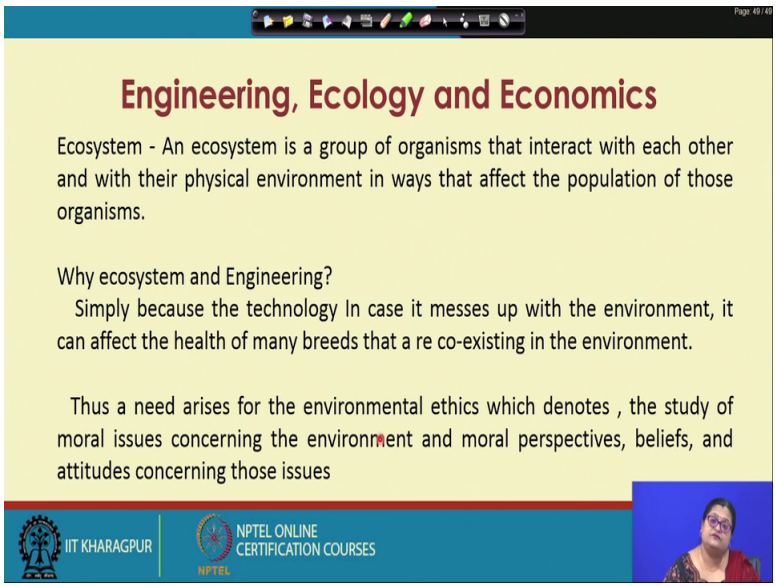

So, there we come to the relationship between engineering, ecology and economics. And we define ecosystem, as a group of organisms that interact with each other and with their physical environment in ways that affect the population of those organisms. So, we talk of an ecosystem, where there is a group of organism, which interact with each other. So, group of organisms, which are interacting with each other and also with their physical environment in such a way that it affects the population of these organisms.

So, when you are defining this as a ecosystem, then how ecosystem is related to engineering. And why it is related, because the technology in case it messes up with the environment, it can affect the health of many breeds that their co-existing in the environment. So, why this we need to study in this relationship, because the engineering, which brings in the technology if he tries to like disturb the environment or has an adverse effect of the environment, it can affect the health of many breeds and are that are co-existing with each other.

So, here from the utilative and perspective also we can see like the game that we have from the technology. We said we the cost that is that we have to take up that is the cost involved is much more. If it tries to mess up with the environment, because that technology can affect the health of many breeds of organism that is co-existing in the environment, that is why, we need to be like cautious about the use of technology.

Thus a need arises in environmental ethics, which denotes the study of moral issues concerning the environment and model perspectives, beliefs, and attitudes concerning those issues, because this affect could be like there could be a chance of producing harm to the organisms related in the ecosystem by the technology, which tries to maybe bringing changes to the environment of the in during the organism that is why, there is a need for environment ethics, which studies the moral issues concerning this.

And conserving the environment, and the moral perspectives, the believes, which are guiding us and attitudes that engineers have towards the environment. If they have a exploitative attitude or they have a caring attitude towards the environment, it will definitely affect their ways that they are trying to like interact with the environment through their technology, and to give their deliverables.

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So, we will look now into the very two important discussions. One is which is the invisible hand and the other is the tragedy of commons, which is very important, when we are discussing about environmental ethics. Let us see what is two concepts are and how it is like related to when we are discussing about environment and ethics. These two metaphors have majorly dominated the thinking about the environment, as we told in the invisible hand and the tragedy of commons. Both these why, because both these metaphors have highlighted the unintended influence of the marketplace on the environment, but one is optimistic and the other is cautionary about those impacts.

So, the world unintended influence of the marketplace on the environment, because sometimes what happens, like the harm may not be intentional. The but in the process of answering to the needs of one stakeholder, it may so happen. The needs of the environment are the right of the environment for protecting itself in at the form, it is originally there is sometimes overlooked, and that is called so though not intentionally done. But, in the way of answering to the needs of the human stakeholders, it may so happen. We are sometimes overlooking the rights of the environment for existing in the form, which is it originally exist. And there lies the conflict of interest, and there is where it comes the invisible hand and the tragedy of commons.

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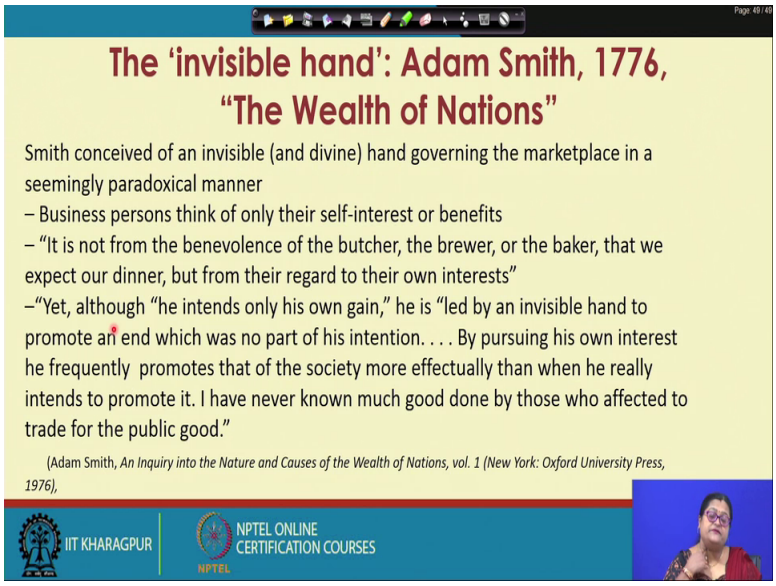

So, now we will discuss about the invisible hand Adam Smith in nine 1776 in the discussed about the wealth of nations. So, now what we see, what is the concept given. Smith conceived of an invisible and divine hand governing the marketplace in a seemingly paradoxical manner. Business persons think of only their self-interest or benefits. It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interests.

Yet, although he intends his own gain only his own gain, he is led by an invisible hand to promote an end, which was no part of his intention. By pursuing his own interest he frequently promotes that of the society more effectively than when he really intends to promote it. I have never known much good done by those who affected to trade for public good. So, what it talks of like everybody maybe he is moving towards their own gain, but in doing that, they also contribute towards like the benefit of the society at large.

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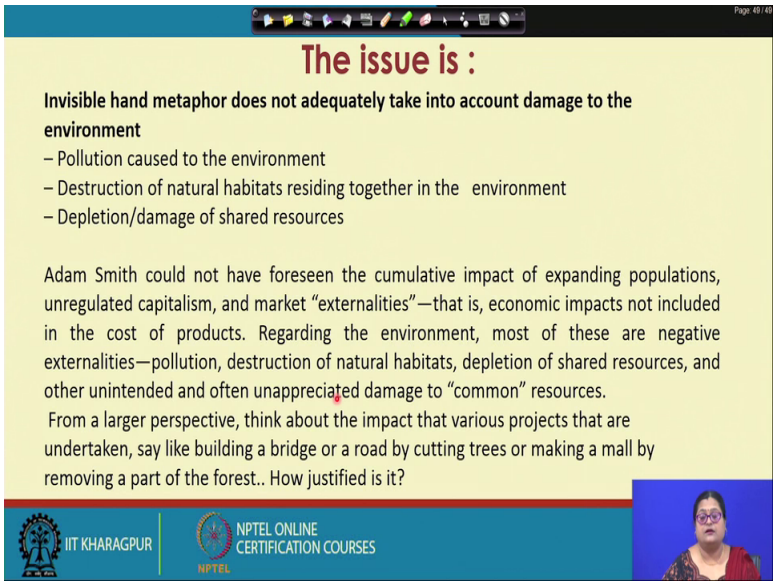

But, what is important over here. In the way part of promoting, the benefit of the society at large what gets may be neglect it or the rights of the environment may get over looped. So, what we understand over here. The invisible hand metaphor does not adequately take into account damage to the environment. In the process of like promoting their self-interest of the own human, self-interest or in an in the way of doing that promoting the interest of the society at large; sometimes may happen like there is a pollution caused to the environment, destruction of natural habitats residing together in the environment, and depletion and damage of shared resources.

Adam smith could not have foreseen the cumulative impact of expanding populations, unregulated capitalism, and market externalities that is economic impacts not included in the cost of products. Regarding the environment, most of these are negative externalities. So, in the order of promoting the positives for the human species population; sometimes knowingly or unknowingly, we promote negative externalities for the environment in terms of pollution, destruction of natural habitats, depletions of shared resources, and other unintended and often unappreciated damage to common resources.

So, from larger perspective; so, if you think, environment also has a stakeholder. And then, if you take a larger perspective, we need to think of this questions like what are the various projects that you are under taking. And what the impact of those projects, like building making a building making a building a bridge or a road by cutting trees or

making a mall by removing a part of the forest. So, how far it is justified? We may be promoting the benefit of one stakeholder, but at the major cost paid by the other stakeholder. And maybe in the long run, when you are talking of the synergy of the co-existence of the both the stakeholders. It is not beneficial to this mutual co-existence.

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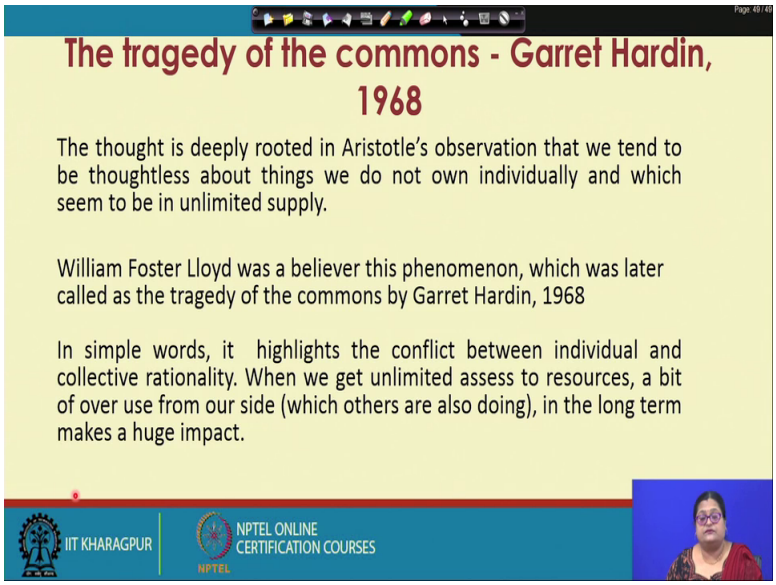

Next, we will discuss about the tragedy of commons and this was given by Garret Hardin in 1968. The thought is deeply rooted in Aristotle's observation that we tend to be thoughtless about things we do not own individually and which seem to be in unlimited supply. So, here this talks of fewer less careful, we do not think much about things, which do not belong to us and, which we think are there in plenty of supply.

William Foster Lloyd was a believer in this phenomenon, which was later called the tragedy of commons by Garret Hardin in 1968. In simple words, it highlights the conflict between individual and collective rationality. When we get unlimited access to resources, a bit of overuse from our side, which others are also doing, in the long term makes a huge impact.

So, here maybe he talks when you are talking of this from the moral perspective. What generally everyone thinks of like, if something is available in plenty, and if I am using something a bit more, it may not provide that much harm to the whole system. But, if everybody starts thinking in that way, then it may have a major impact negative impact adverse impact on the environment in the long run.

Here comes the question of virtue of self restriction, to take use the resources to the extent only to what it is required, reduce the wastages. Try to replace back for the harm created. And try to protect the left portions, and take care of those. So, this again talks of a virtues character, which like takes tries to take care of the environment, and which imposes self restriction on which restricting from the overuse of resources.

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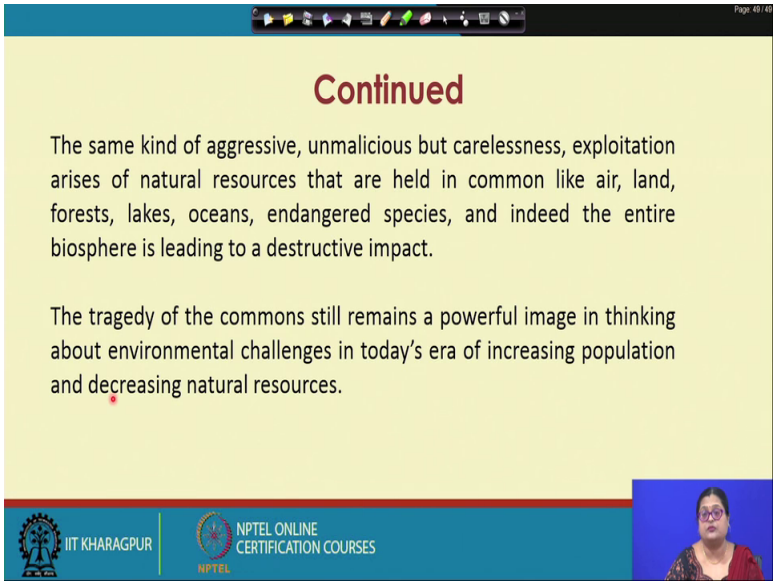

The same kind of aggressive, unmalicious but carelessness, exploitation arises of natural resources that are held in common like air, land, forest, lakes, oceans, endangered species, and indeed the entire biosphere is leading to destructive impact. So, it tragedy of commons still remains a very powerful image in thinking about the environmental challenges in today's era of increasing population today's era of increasing population and decreasing natural resources.

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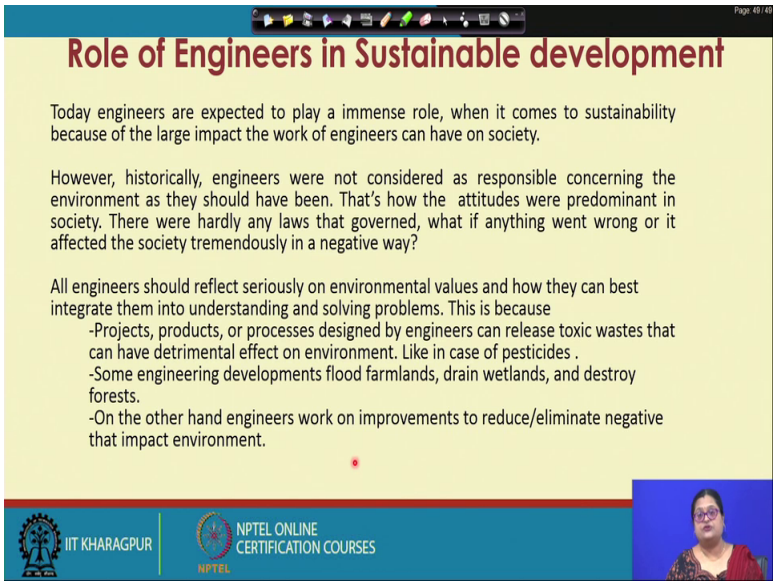

So, where we are talking of this in terms of like, we have discussed about the ecosystem. We have discussed about the invisible hand, we have also discussed about the tragedy of commons. And then, we understand the balanced co-existence the of all the stakeholders together. Where we are not only focused on the benefit of the human population,, but we have to be equally responsible for the environment, and the rights of the environment. And we need to be dutiful to protect the rights of the environment, so that a synergy develops between these different stakeholders which is beneficial for the mutual co-existence and for a sustainable development.

Next, we will discuss about the role of engineers in a sustainable development, which where we are talking of like protecting the rights of the all the stakeholders, going for a mutual co-existence for the present generation and also for the future generation. And we are thinking not only of the people, we are not only thinking of the profit, and but we are also thinking of the planet.

So, in this context, we will discuss the role of engineers in sustainable development. And for that, we need to understand: what is sustainable development. Whenever we are talking of sustainable development, we are talking of the balanced approach of people profit and planet. And it is not only the eco like focus on the profit, and the people, but it also on the planet. And takes care of the means of the present generation, but also

preserve for the future generation, so that they can also enjoy the benefits, which the present generation is enjoy.

So, let us see: what are the roles of engineers in this sustainable development. Today engineers are expected to play a immense role, when it comes to the discussion of sustainability because of the immense impact of the work of the engineers that can have on the society. However, historically, engineers were not considered as responsible concerning the environment as they should have been. That is how the attitudes are predominant in the society. They were hardly any laws which govern, like what if it went wrong or affected the society tremendously in a negative way?

All engineers all engineers should reflect seriously on environmental values and how they can best integrate them into understanding and solving problems. This is because projects, products, and processes designed by engineers can release toxic waste that can have detrimental effect on the environment. Like in case of pesticides some engineering developments flood farmlands, drain wetlands, and destroy forest. On the other hand engineers work on improvements to reduce or eliminate negative that impact the environment. So, what are the why environment should be a primary concern for engineers are like projects or products can release toxic wastes, which have detrimental effect on the environment.

Sometimes, it lead to direct destruction of the forest and like have a which has a greater impact on the natural ecosystem. And sometimes the engineers need to focus on like how to improve their works to reduce or eliminate negative impact on the environment.

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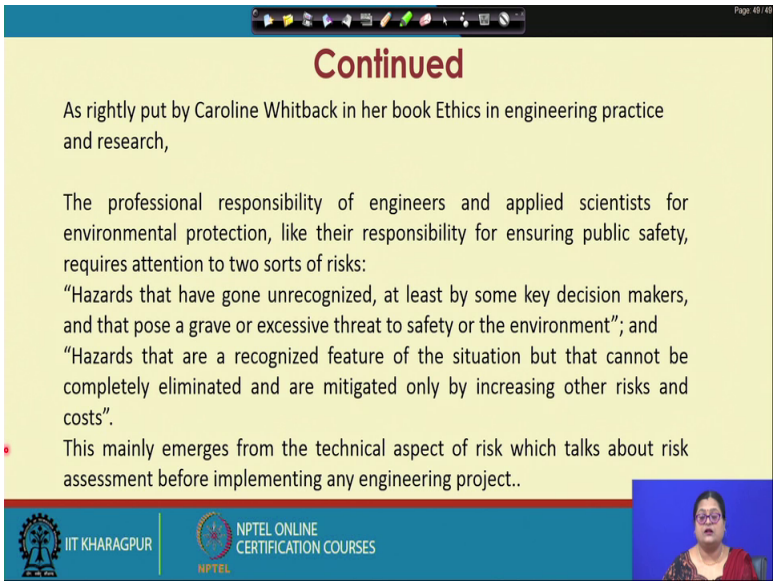

So, what we can say, as rightly pointed out by Caroline Whitback in her book Ethics in engineering practice and research, the professional responsibility of engineers and applied scientists for environmental protection, like their responsibility for ensuring public safety, requires attention to two sorts of risks. Now, what are those risk one is hazard, like hazard that have gone unrecognised, at least by some key decision makers, and that pose a grave or excessive threat to the safety of the environment. And hazards that are recognized feature of the situation but that cannot be completely eliminated and can be mitigated only by increasing other risks and cost.

So, it is a like a dilemma type of decision like should we go for this or not to go for this. Because, if you want to reduce one hazard, then it is maybe the possibilities there we are increasing other risk. And we are enquiring more cost. So, what do we do. So, this mainly emerges from the aspect of risk which talks of the risk assessment before implementing any engineering project. So, what we see, like in out of these two type of hazards. So, here the hazard has gone unrecognised, and it is you know like it is an excessive threat.

But, here what happens, there could be an approach of a dis conflict like whether to go for the reduction and mitigation or not because in order to do that you are becoming like opening yourself to the risk factors, which are like maybe from other aspects and then also the cost involvement. But, this is very important like in order to reduce something.

If we increase the probability of risk for other things, then should we go for it or not to go for it this kind of decision is involved in this part of the discussion.

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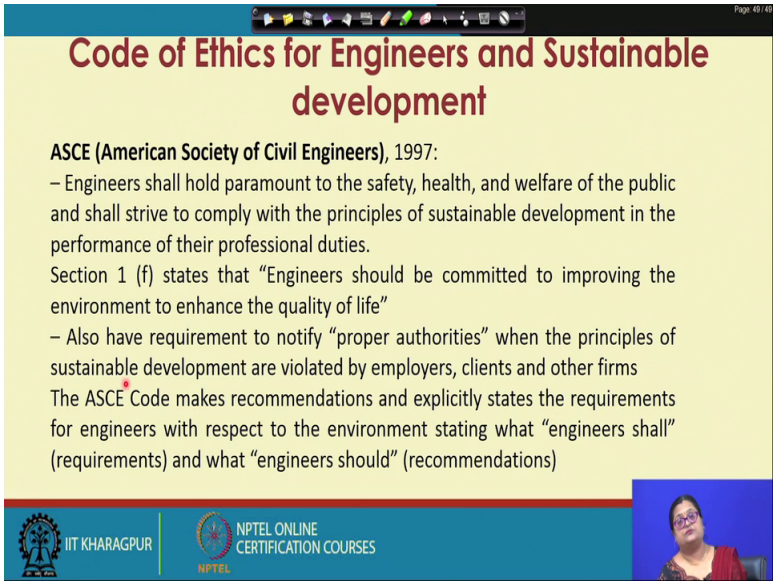

So, now we will look into some of the codes of ethics for engineers for sustainable development. And we will look into the codes of ethics for given by the American Society of Civil Engineers in 1997, which states that engineer shall hold paramount to the safety, health, and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties.

So, and it has got section, which is section 1 f it states that engineer should be committed to improving the environment to enhance the quality of life. Also have been requirement to notify proper authorities, when the principles of sustainable development are violated by employers, clients and other firms. The American Society of Civil Engineers code make recommendations, and explicitly states the requirements for engineers with respect to the environment stating what engineers shall like what are the requirements and what engineers should means the recommendations.

So, what we find like in section 1 f, this statement is very important engineer should be committing to improving the environment to enhance the quality of life. So, within the responsibility and the duty of the engineers, we have broadening the definition, which previously included like it is a safety, health, and wealth protection of safety health, and

wealth of the public at large. Here we also add on to it to the committed to improving the environment to enhance the quality of life.

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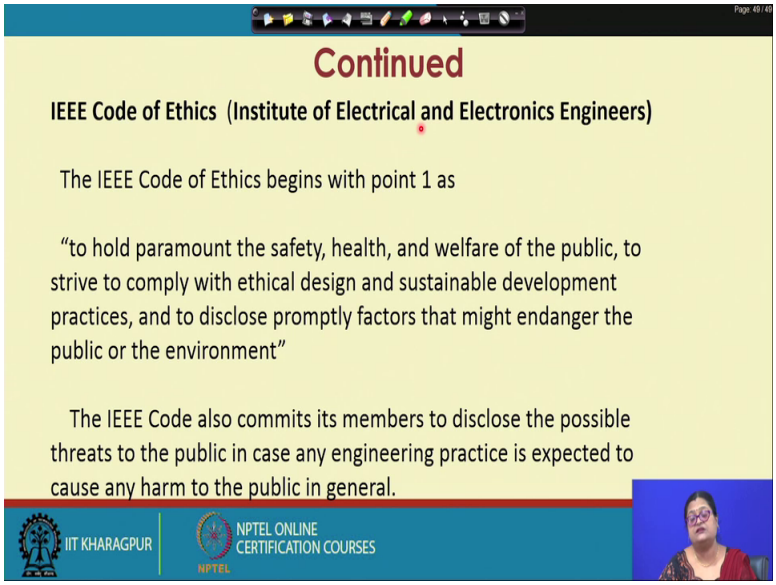

We go to the Institute of Electrical and Electronics Engineers code of ethics. The IEEE code of ethics begins with point 1 as to hold paramount the safety, health, and welfare of the public, to strive to comply with ethical design and sustainable development practices, and to disclose promptly factors that might endanger the public or the environment. So, what we see in the safety, health and welfare of the public is one major concern. To comply with the ethical design, and sustainable development practices, which takes care of the people, planet, and profit the needs of the present generation, and the needs of the future generation, and to disclose promptly about factors that might engender the endanger the public or the environment.

So, when you are talking that may endanger the public or the environment, here we are given high importance to the environment as one of the very important stakeholders. The IEEE code also commits its members to disclose possible threats to the public in case any engineering practice is expected to cause any harm to the public in general. So, this is an awareness generation like if the IEEE code guides like the if the members come to know about any potential hazard and possible threat, then it is the part of the responsibility to disclose that to the public. In case, any engineering practice is expected to cause any harm to the public get large.

So, if I were generating awareness about the possible threats, which may be like coming from an engineering practice should also it is a part of the responsibility to make the public aware of it. So, they can take precautionary measures.

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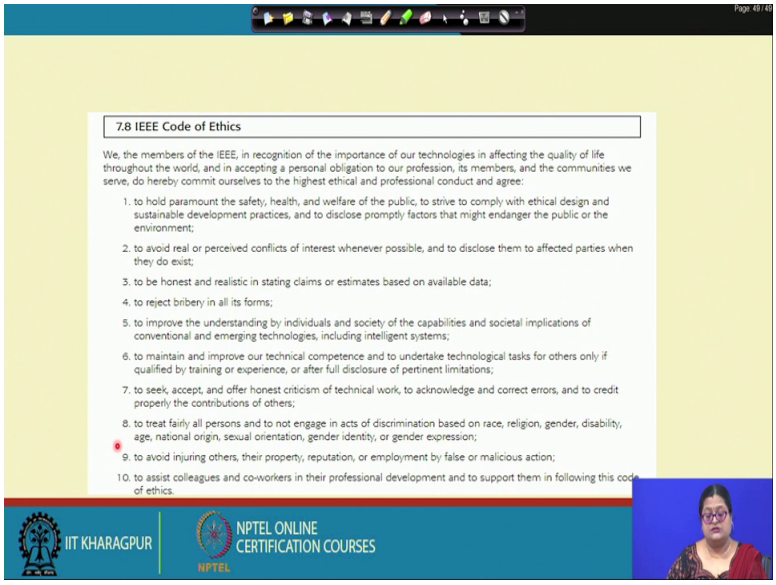

So, we will look into the IEEE code of ethics. We the members of IEEE in recognition of the importance of a technologies in affecting the quality of life throughout the world and in accepting a personal obligation towards a profession. This our personal obligation towards a profession is important. The word duty is very important its members and communities we serve to hereby commit ourselves with the highest ethical and professional codes of conduct, and agree; to hold paramount the safety, health and welfare of the public to strive to comply with ethical design and sustainable development practices, and to disclose promptly factors that might endanger the public or the environment.

Two to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist; to be honest and realistic in stating claims or estimates based on available data; to reject bribery in all forms; to improve the understanding by individuals, and society of the capabilities and societal implications of the conventional and emerging technologies including intelligent systems.

To maintain and improve our technical competence, and to undertake technological tasks for others only if qualified by training and experience, or after full disclosure of pertinent

limitations; to seek accept, and offer honest criticism of technical work to acknowledge, and correct, errors and to credit properly the contribution of others. To treat fairly all persons to not engage in acts discrimination based on race, religion, gender, disability, age, national, origin, sexual orientation, gender identity or gender expression; to avoid injuries others; injuries to others their property reputation and employment by false or malicious actions; to assist colleagues, and co-workers in their professional development and to support them in following this codes of ethics.

So, what we find over there, there are certain parts, which are focusing of the duty of the engineers, and some it focuses on the virtuous characters of the engineers also, so, that in the process of respecting this code of ethics. So, we are taking care of the environment at large, the externality at large, which is externality, which is it is outside the individual organism.

And it is these environment consist of other related stakeholders. The interaction of the organism with these stakeholders interaction of the stakeholders among themselves, and the interaction of the stakeholders with the physical environment at large, which leads to a complex dynamics, and synergy. And it is important to have a balanced approach towards the behave like towards how to interact with all these stakeholders.

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The American Society for Mechanical Engineers could of ethics also are stating. The fundamental principles engineers uphold and advanced the integrity, honour, and dignity

of the engineering profession by; using their knowledge and skill for enhancement of human welfare; being honest and impartial, and serving with fidelity the public, their employers and clients; and striving to increase the competence and prestige of the engineering profession.

So, here it focuses mainly on the virtuous nature of the people, and to advance the integrity honour and dignity of the engineering profession. So, using of one's knowledge and skill for the enhancement of human welfare being honest and impartial and serving with fidelity the public, and their employers and clients; and to increase the competence and prestige of the engineering profession. So, it focuses more on the virtue of the person.

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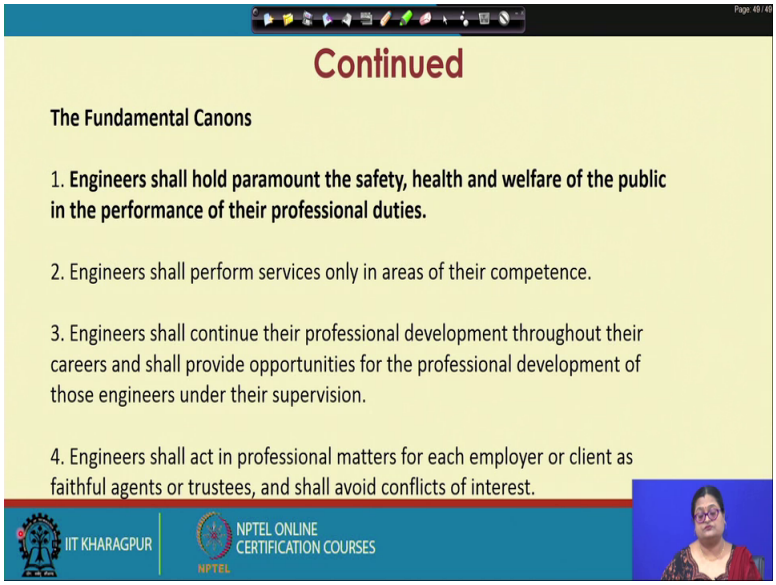

So, the fundamental things that we arrive at engineer should hold paramount the health safety health and welfare of the public in the performance of their professional duties. Engineer should perform services only in their areas of their competence. Engineer shall continue their professional development through their careers. And should provide opportunities for the profession, and development of those engineers under their supervision that is where, we talking of taking care of the present generations needs,. And also taking care of the future generations needs and therefore existence.

Engineer shall act in professional matters of for each employer or client as faithful agents or trustees, and shall avoid the conflict of interest. So, it should be such like

engineers should act for the each they should be acting as agents of the principal, which is the mean employer of the client. And that the conflict of interest should be avoided in this matter.

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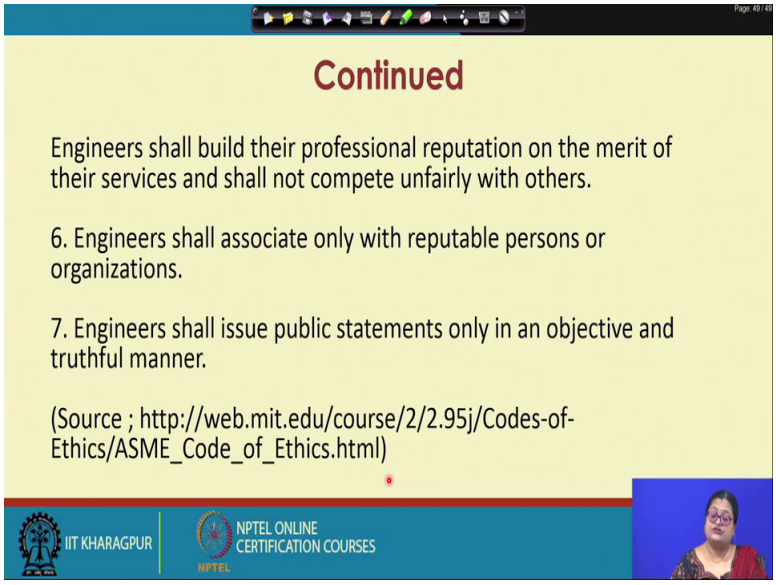

The engineer shall build their professional reputation on the merit of their services and shall not compete unfairly with each other. Engineers shall associate only with reputable persons or organisations. And engineers shall issue public statements only in an objective, and truthful manner.

So, these are the codes of ethics, which gives the guiding principles for the actions engineer should be doing, so that they are like maintaining a again a balance in the when they are talking of balancing with your competitors, balancing with your like networks that you have in terms of the your suppliers and your clients. So, this talks of like how you are doing it to maintain a balance in the outside environment at large.

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So, where we talking of sustainable development and engineers, so United Nations World Commission and Environment and Development defines sustainable development as the development that meets the need of the present without compromising the ability of the future generations to meet their own needs. American Society of Civil Engineers define sustainable development as a process of change in which the direction of investment, the orientation of technology, the allocation of resources, and the development and functioning of institutions is directed to meet present needs and aspiration without endangering the capability capacity of the natural systems to absorb the effects of human activities, and without compromising the ability of future generations to meet their own needs and aspirations.

So, if you see, it is a sustainable development is a process of change, which the direction of environment and the orientation technology, the allocation of resources and the development of functioning of the institutions are focused not only towards the present needs and aspirations of the present generation, but it should be focusing towards the needs and aspirations the present generation. In such a way that it is not compromising on it is not endangering the capacity of the natural system, and to absorb the effects of this human activities and which makes it depletes from its original form. And without compromising the ability of future generation to meet their own needs and aspirations; so, the future generation should not become so weak that their existence is at stay. And

they cannot take care for their own growth and development needs, and by looking into the needs and aspirations.

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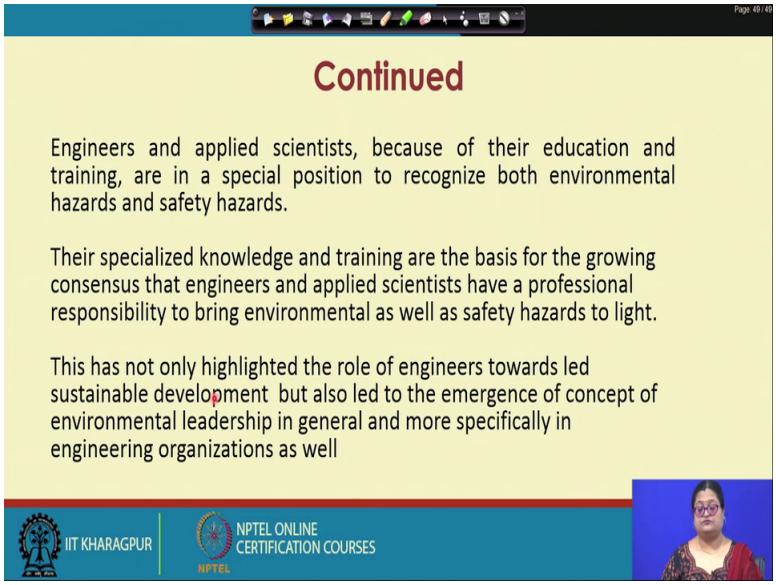

So, how engineering profession becomes important over here, is engineers and applied scientists, because of their education and training, are in a special position to recognise both environmental hazards and safety hazards. Their specialised knowledge and training at the basis for growing consensus that engineers and applied scientists have a professional responsibility to bring environmental as well as safety hazards to light, because they have a knowledge base, because they are trained for it to recognize with the environmental hazards, and safety hazards. So, it is a part of responsibility of the engineers to bring to focus any sort of like discrepancy in the how the what is happening, and what is expected to happen, how things are like being processed, and how it is expected to be processed, which will lead to some hazards.

So, if there is any environmental issues or safety hazards it is the responsibility of the professional responsibility of the engineer to bring those things into the focus. This is not only highlighted the role of engineers towards like sustainable development, but has also led the emergence of the concept of environmental leadership in general, and more specific in engineering organisations as well. So, how we are utilising our knowledge, how we are utilizing our world view, the perspective in dealing with the decision, and dilemmas, how we are solving the problems to arrive at a solution, so that it has a long

term focus on the mutual coexistence of all the stakeholders, and stakeholders in the environment.

It focuses towards the at like environmental leadership qualities present in an individual and an engineer or the organisation as such. And it more specifically towards the engineering organisations because it is a way of looking at the whole perspective bringing in like thought processes innovative thought processes which gives rise to a totally new way of thinking and doing with respect to the environment. In our next session, we will continue with the discussion of environmental, leadership and we will discuss cases about it also.

Thank you.