Fundamentals of Environmental Pollution and Control
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Lecture No. # 02
Environmental Movement

We continue with the discussion that you know we have, where we have stopped in the last class. And I have also explained you know what are the effects of an environment as such on the earth, what is the position as such you know how this you know the natural resources are getting depleted, we have discussed this. There are three aspects you know which are of, which are of in great importance, I mean in those which are of more important global issues say the global issues in global issues, global issues which you know as such draw a lot of public opinion about this, about environment. One of them is certainly that is you have known as is this you know is say ozone hole, ozone hole. Two is the greenhouse gas, greenhouse gas and global warming, global warming and the third one is the acid rain, acid rain, acid rain.

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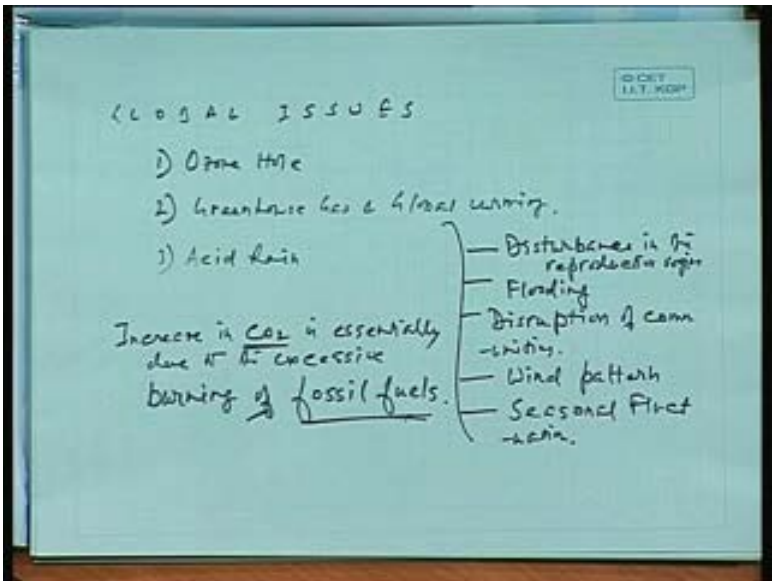

So you see, you know if we just can explain you know this let us we can think about explaining this terms you know let us begin with this ozone hole in the beginning in the first place right. Let us start this you know just if you can think of you know here we can discuss about this ozone hole, you can observe this.

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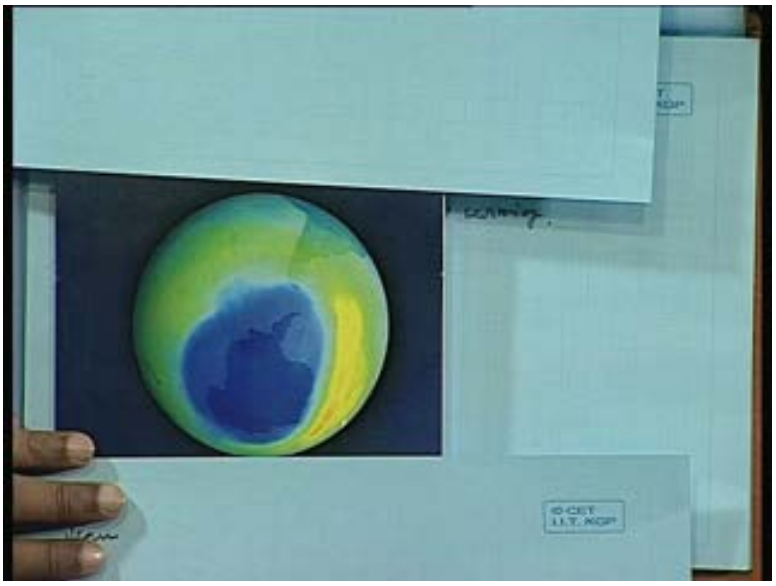

This is our earth you know this is from a satellite picture, it's a real satellite picture I mean the colours that you see is this obviously the artificial colours but where again this particular part, this blue part that you can see here is essentially the ozone hole. You can see this what happens here is mostly what is happening is the particularly the CFC's that are generally related to ozone hole, the CFC's are getting produced due to various aspects of human activity like you know as you can see particularly the release of the refrigerants in the natural atmosphere, natural environment.

Now what happens is this, this CFC's there they have a one important characteristic is they are highly volatile, they are highly volatile and so you know you can see this, we can observe this you know by you know here let me explain you a little bit on this okay. We can begin here this digital in a, you can see like this. See this if you just observe, say if you just observe this stop writing, okay. Here you can see if it is something like this, what happens is essentially if you just see this is, this is the north pole side, this is the south pole, the wind current from various areas you now particularly because of a prevailing wind current in this area you know starting from you know crossing that equator essentially from the troposphere, from the troposphere I mean just above us on the surface of the earth.

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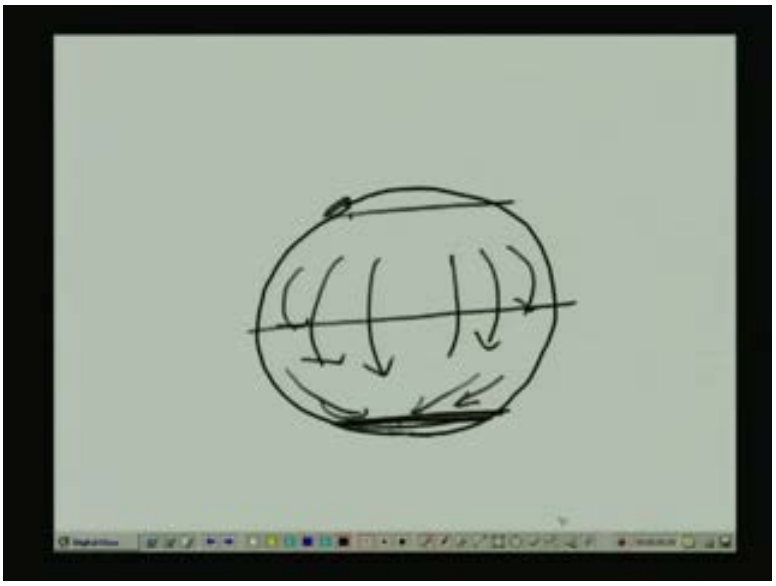

They generally get carried away this, they generally get carried away towards the South Pole. What happens here is there you know this particularly this, all these CFC's essentially all these CFC's they have two important properties. One of them is they are extremely volatile, they are extremely volatile and secondly they are non-reactive, essentially non-reactive under normal I mean atmospheric condition I mean that we see observe in our earth system I mean in the natural system that we observe.

Now what happens is this particularly this wind current they generally travel from difference sources and finally in that South Pole here they get a lift, they get a lift just because they're very volatile from troposphere to stratosphere, okay. There are three atmospheric divisions as I think you know the troposphere, stratosphere and ionosphere, so each of this as you know troposphere is about say from the surface of the earth to about 6 to 8 kilometers, 8 to 18 kilometers, 8 to 12, 8 to about 18 kilometers should be say this stratosphere and then finally on top of that is the ionosphere. So, this particularly as they move say here when they reach the stratosphere that is what is called you know stratospheric ozone layer.

When they reach the stratosphere, they generally under photochemical reaction, under photochemical reaction they begin to displace ozone by breaking the ozone into oxygen and then another oxygen radical. As a result of that the ozone that is which is supposed to observe the radio-active say mostly the alpha radiations from the infra radiations from the, from the sun they would not be in a position to do so as actively as they used to do. That is why you can see here over the large areas you know over the time that ozone has accumulated particularly close to this is you know this towards this southern hemisphere, these as generally generated a particular hole. This hole is very close to the tips of South America. So what I was observed, you know in the initial years you know when this first the ozone hole was established you know the phenomenon of ozone hole was actually observed at about you know 1960's and 1970's.

What was observed that there was a large relative incidence of skin and cancer diseases in the South American regions just because people could, the scientist could find that the infra radiations in those areas has much more than usual, much more than usual. Fortunately for countries like India we are not very much affected by the impact of this ozone hole but if it begins to increase suddenly we will be at risk as well. So, the one important thing is to, the one important thing is to reduce the production of ozone, reduce the production of ozone depleting chemicals like CFC chlorofluorocarbons. This chlorofluorocarbons have been you know this is, this has been there is has been a global warm, global worldwide effort to reduce, to reduce the use of CFC's as refrigerants.

We still use refrigerants, you know in a various aspects like you know as you can see is the most common them will be the moisturizers, the vaporizers that you generally observe. So when you're buying a particularly a very very cheap or very ordinary moisturizer or a foam say there is foam for shaving and all these things, you are most likely to emit a certain kind of CFC's because the CFC's, the just being because of them being very extremely volatile, so they, whenever they are release they come out with lot of force and that is the reason why you find this sprays and the mists forming, okay. Now this is where you know this is the global worldwide afford and as you can see the result of that was the Montreal protocol.

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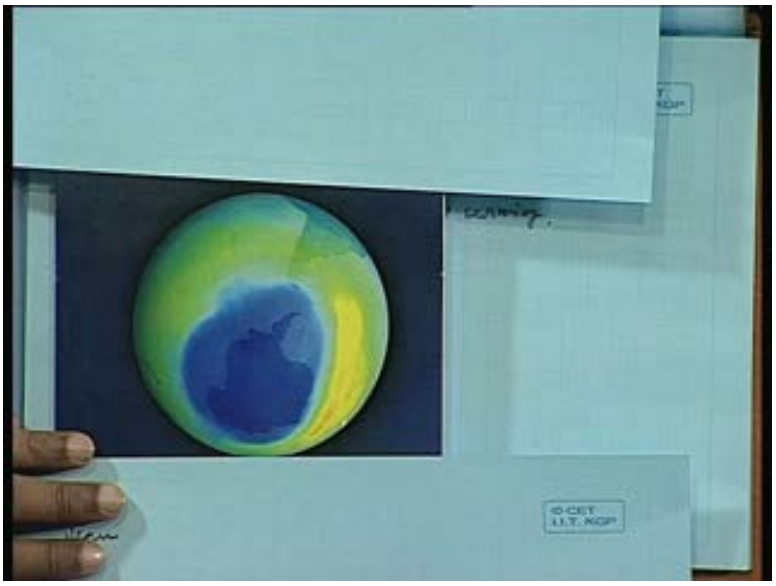

The Montreal protocol has identified that this ozone holes has to be, the ozone hole has to be stabilized or it has to be reduced as much as possible. And this ozone hole even today it is you know it's observed that you know is generally shrinking I mean due to a, there are scientific evidence to suggest and thus this pictures can be regularly daily basis available. You know, you see if this is generally if you just go to the website of national oceanographic administration of America you can write it down national oceanographic administration of America NOAA website they would daily give the shape of the ozone hole, the shape of the ozone hole. You know this know how outside is very famous outside, you go into any search engine just type NOAA USA that would give you this, it would reach you to the site.

And if there you can see this the ozone hole of today as it is today or maybe yesterday like this, so you can see where this, this is where is very important. So the effect is like this, in nutshell the effect is that the CFC's getting produced in the, in the earth, on the surface of the earth. These CFC's being extremely volatile and supported by wind current would finally traveled towards the south, southern pole towards the Antarctic and from the Antarctic from, in the Antarctic from troposphere it will travel to the stratosphere, stratosphere and in the stratosphere, in the stratosphere as by photochemical reaction that means under the, under the impact of sunlight these CFC's would breakdown into the chlorine, free chlorine and you know other free chlorine, ionized chlorine this ionized activated energized chlorine would then react with ozone and to break the ozone into substance like oxygen and some other free radicals.

So as a result of this, so the ozone hole begins to be depleted. So we can see here ozone hole is essentially, ozone hole is essentially distinctively there this is due to a manmade activity, is ozone hole is distinctly created by manmade activity. Till you know about, if you just go about say about 200 years or 100 years before that before these times say about 1900, we will find that there is no such incidence of ozone hole being observed but today it is a fact that the know, we are working, we are having a ozone hole and which is sometime decreasing sometime increasing as well. There are some seasonal variations also you know something like in a particularly as you can see during the summer time the protocol chemical reactions would be more than that of during the winter or during in a particular incidence, particular type of mixture in a particular type of compounds present in that stratosphere would also actually influence, the decay of ozone in the ozone cover surrounding the earth.

So this ozone cover actually helps in observing the infra-red radiation. So in places where this ozone would be, a hole would be created, this ozone hole would allow the sunlight to enter the earth without having any resistance as such. So there would be higher incidence of, as a result of that the higher incidence of skin cancer, there would be higher incidence of skin cancer, there will be higher incidence of you know several skin related diseases, eye related diseases wherever there is an exposure, wherever there is an exposure, whatever we is being exposed to that infra-red radiation would be affected. So this is what is precisely the ozone hole, this is what is the ozone hole is so very important. No, ozone hole is not generally linked to it I mean global warming, we generally do not say global warming is as we have said you know may be but you know that way distinctly all effects can be related to the other but we would not particularly specially attribute global warming with ozone hole. Ozone hole would, the impact of, principle impact of ozone hole is to, the principle or impact of ozone hole is to observe the incidence of infra-red radiation in the earth's surface.

Now having gone from here, you know having gone from here if you can just observe this, right actually you know is about the wind current, I mean you know is tremendous we have an established wind current. You know we generally say you know that is why you can see that you know they particular say rainfall taking place at one time as here hot and windy condition at one time is basically a typical wind pattern. So the observation has for, so far it has been observed that the North Pole is not so much affected. So you cannot, you cannot say you know in today's, in the tomorrows world when there will be a gradual disturbance in the temperature regime around the earth there might be some wind current which might also lead the ozone to the north pole, okay.

This cannot be, this cannot be as such as can be said as, North Pole cannot be said safe but at this present point of time there is not enough significant evidence to suggest that the North Pole is also affected or the areas around North Pole are affected. Greenhouse gas and global warming, I mean this is another aspect you know which is, which has to be understood we can, we can also observe this green, now remember one thing here, say this particularly as I was discussing in the last diagram here say this is, this is from the different wind currents that finally take days and you know go into and finally would travel in the, in the stratosphere to deplete the ozone.

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Now, let us go in to say another picture here, we would work on say you know this to discuss about this global warming. Why it is called green house in the first place? See here if you just observe this here you know we have, we have a certain cover you know is always in a natural, in natural in the above the atmosphere, we have a natural cover of say this, this is a cover of say CH_4, CH_4 and Co_2, okay. This is naturally, naturally available you know from time immemorial we have seen there are greenhouse gases which are being produced. Methane is being produced without human intervention for the time immemorial right, carbon dioxide is being produced without human intervention from time immemorial. Now the problem, the situation is this, this is, this CH_4 and Co_2 when they are in the atmosphere they are forming a layer which essentially reflects you know some of this, the sun's ray, the sun's ray that is coming in the sun's ray that is coming in would also be reflected.

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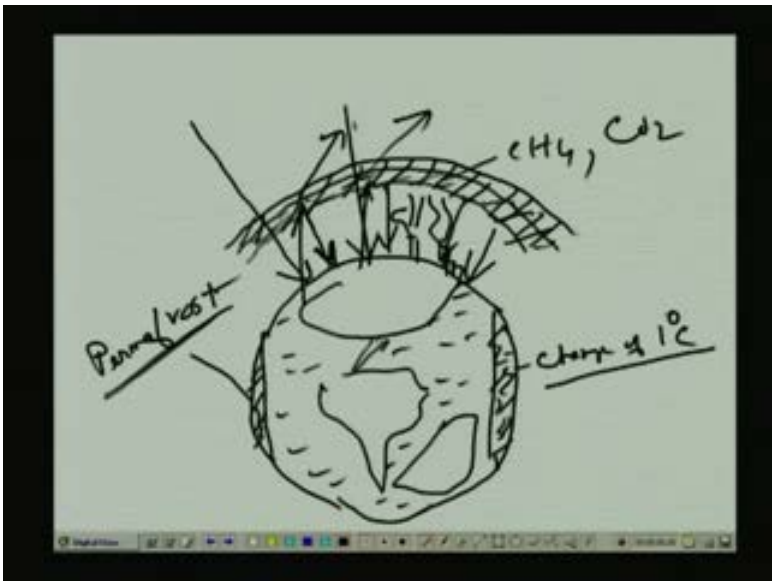

This is would be reflected here, this particularly as you can see there would be a change in the medium, there would be a change in the medium a certain part of that would be also be reflected back, a certain part would be going out into the, into the, out of the atmosphere. So this is you know, this is out of that atmosphere in the planetary system. Now here you know here also you can see these things taking place. Now what has happened this is, this is a natural, in the natural phenomenon that has been taking place for time immemorial. There is nothing new about it, greenhouse gases are not reason, greenhouse gases are not new but what is important in here is that you know here what happens is suddenly like, we know we have built industries, we have built you know factories for our uses and you know we have the fossil fuel burning has increased as a result of which what has happened is that the know the incidence the concentration of this CH_4 and Co_2 has increased.

So we can find a thicker layer now. We can observe a thicker layer of CH_4 and Co_2 now, as a result of which these the thermal radiation, thermal radiation that is being reflected back is now much more, reflected back is now much more. So as a result of which what is happening is this you know the heat that is being produced with remaining within the atmospheric system. So what is, what it is impacting is it is essentially impacting, it is changing the temperature on the surface of the earth. See that why it is important, why it is important is just to suggest this. You see here there are, there are if you just observe you know, if you just observe say you know if you just consider this to be the poles, is to be the, this to be the pole area, if we just consider this to be the pole, here there are many ice cappings you know there are many ice cappings like in the north pole which are known as permafrost, permafrost. This permafrost are they remain frozen, they remain frozen for the whole year I mean say they may be frozen for last several hundred millions years okay they are, they are frozen from, from the, from the time we know. These areas these are the frozen layers, so they are you know essentially as you can see you all, all this you know this you know the continents you know connected like this you know this is the and all this you know if you just say observe this continents together, this water this particularly the water body as soon as this cappings begin to, begin to, begin to change as soon as there is at least you know

a small change of temperature say you know in the, in the atmosphere even if there is a small change of temperature say about change of, change of say change of, change of one degree centigrade, change of one degree centigrade would lead to some of this ice to melt. As a result of which you know the water level, the ice would melt and the water would be released and the water level would begin to increase.

This would have a risk of, this should have a risk of inundating, inundating a several low land areas this is number one and secondly this is not a case you know which would take place hypothetically in the future, it is already happening. Thing is, it is already happening. There are some areas you know is a particularly in Northern America, particularly in all those places though where there is sudden tribe called Inuits, you know in particularly in the green land and Canadian regions, these Inuits there some of their provinces are being so much bar so much submerged now in water, so much submerged in water now that they have to leave their households, they have to go away from their households and they are being termed as the environmental refugees. This is a new term that has generated, has been generated so as to, so as to observe the effect of global warming. This is only about you know a direct impact of global warming taking place is in fact you know in many cases, many attributes you know this something like the impacts of global warming as you can see you know this typical global warming effects is like this.

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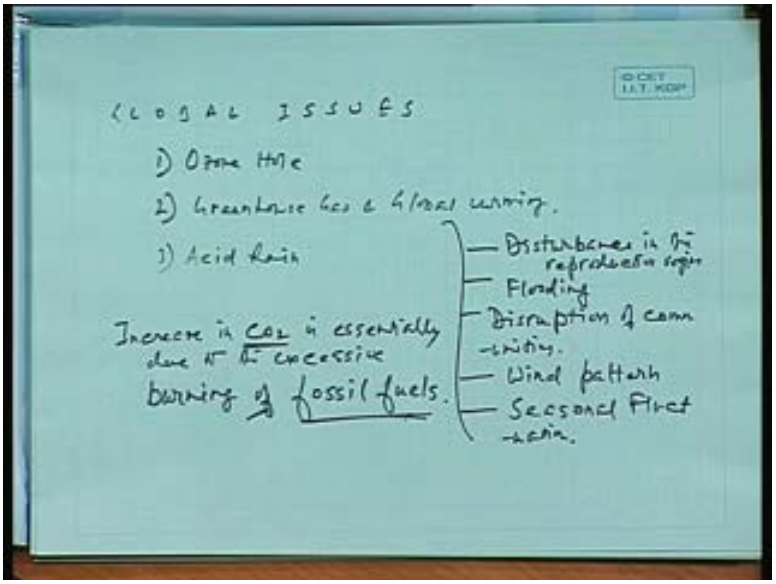

Say the first is you know disturbance in the disturbance, disturbance in the, in the reproductive regime. This is very important reproductive regime, say this, the total say reproduction system of the animals, the birds, all kind of species that it we called as biota all the reproductive regimes are being changed so you know their reproduction time is getting shortened. There you know habitat types are changing, they used to, they used to be resided at one portion of the earth where they are finding, they can no longer remain. They are particularly used to a particular kind of cold temperature which would actually energize, which would actually energize their reproductive system is not being capable to do so. It's not, they are not being able to do so in

effective ways. So this, this particularly disturbance in the reproductive regime and you can see the flooding is another big grieve, flooding is another aspect that we observe, flooding is one aspect disruption of, disruption of communities, then wind, wind pattern change in the wind pattern, wind pattern then seasonal fluctuations increased seasonal fluctuations.

The areas which were supposed to be cold at this point of time is no longer cold. You know this year itself, this year itself it has been said that in a, in a several parts of china, several parts of America they are not as cold as they used to be in the last winter also and though you know the short term changes, short term changes are possible in the, in the atmospheric system. Remember, we have to understand a scientific basis on this. The reason is there are certain things which are locally like to change, you know within the environment or say one year it changes another year it's stabilizes, it remains stabilized for a sometime then again one year it changes, it happens you know is nothing to do with global warming, is not necessary that all places would be similarly cold every year.

Remember this, but when you observe that these changes are consistent that means earlier what we use to see these changes were inconsistent. Today it has changed, tomorrow it has again come back to its original format that it used to have but nowadays what we are finding is the changes are becoming permanent and the changes are becoming consistent. So that is the problem of worry, there was a great debate at one point of time to and it's still continuing I mean you know still continuing. As I was discussing about the environmental politics in the last class that whether global warming actually increases the temperature of the earth or not, there is a tremendous debate on that but today there is a greater convergence among the scientist also that yes global warming does effect the temperature regime, the temperature regime, the regime of you know the atmospheric regime, weather regime all these things are getting changed and this is a fact that is actually taking place, okay.

Now having said this you know this is what is a, this now as such as you can see this particularly the effect of this global warming. There are many sources of CH_4 Co_2 as well but you know this CH_2 Co_2 increase in the Co_2 is essentially increase in Co_2, increase in Co_2 is essentially due to due to is essentially due to, due to the excessive burning, excessive burning of fossil fuels. There is no denying the fact that you know this is particularly the fossil fuels are resulting into the global warming into the heating of the different, different temperature regimes. Now having said this, having coming to this area particularly as we can observe now this is where you know is this is leading to global warming and the effects that as I have a discussed. So there are you must also whenever you are understanding these phenomena as such you must also try to understand that there are still lots of doubt in the minds of the scientists about what actually causes this environmental disruptions.

There is a, there is a still a difference between a different body of scientists as to whether to blame global warming, whether to blame greenhouse gases as a parameter for global warming as a factor for global warming is still questioned. What as I have said at today's world there is a greater convergence, there is a greater convergence among scientists. To suggest that global warming is actually taking place. So we cannot just claim by saying that global warming is not taking place, you cannot just blindly take our face out of this, we have to accept the blame and it is taking place, okay. There is another aspect you know which is generally you know you must

have also found out at different times, you know this is you know about acid rain. Let me explain a little bit on an acid rain, you know how it actually takes place.

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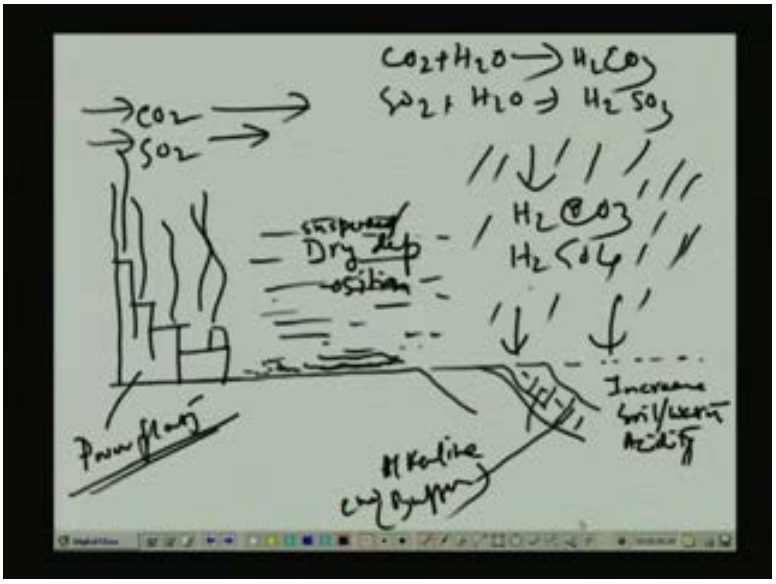

This is you know some of you might be knowing already but let me to give a simple figure as to suggest why this is, this as acid rain is essentially taking place. You can see this you know, if you just make a diagram on this, you see this you know this is where the emission is taking place. Say this is where the emissions is taking place is basically of power plants say you know power plants mostly the power, why power plants I mean all kind of power plants wherever they are that is you know in a cement plant or anywhere wherever you can think of. So this patientially as most of the coal in many cases most of the coal or even otherwise you know many fossil fuels essentially has sulphur.

So you know there would be a greater production of Co_2 and So_2 in the environment. This Co_2 and So_2 is see in a particularly, this particularly Co_2 and So_2 would be essentially carried by the wind current that would actually be flowing like this. There would be, there would be some kind of you know if this Co_2 if it is not essentially if there are, there are called you know dry, dry deposition, dry deposition, dry deposition. The dry deposition is wherever, there is no water vapor it is not coming in contact with water, if this is particularly this dry deposition would take place near the surface of the earth where there is already a heat source.

So you know here you can see a heat source, so this particular area would be generally heated so the carbon dioxide and sulphur dioxide would be in a either in a you know in a suspended condition or there in the suspended, suspended or dry deposited. We generally call it dry deposited that means it would remain on the surface of the earth, on the surface of the earth, this is called the dry deposition. Now as it is moves further I mean as you can see you know that is moving further in the atmosphere is says Co_2 and So_2 if you can just think of Co_2 and finally H_2o would lead to, it lead to finally would Co, H_2 Co_3, H_2 Co_3, So_2 plus H_2o H_2 So_3, this would finally come back as H_2 Co_3 H_2 Co_3 and H_2 So_4 and to finally wet during rain or during any

kind of atmospheric changes which would lead to higher moisture content in the environment, would finally lead to the, would lead make them to come back, will make them to come back to the surface where in some cases, where in some cases wherever there is an alkaline environment wherever they will find an alkaline environment, these alkaline environment if it is an alkaline environment alkaline environment it would be, it would alkaline environment would, would give rise to a buffer it would actually work as a buffer way this $H_2 Co_3$ and $H_2 So_4$ would be somewhat utilized.

Otherwise these $H_2 Co_3$ and this $H_2 So_4$ this acidity, this would increase the acidity, increase soil, increase soil acidity would increase those, increase, would increase soil acidity. So it would bleed to soil and water, will increase the soil and water acidity. This increase in the soil and water acidity, these increase in the soil and water acidity would effect, would effect the, would effect say the water regime, agricultural soil, agricultural soil then human health, human health and also you know is human health, health and say loss of, loss of aesthetic value, loss of aesthetic value then say a higher pitch as they may you know not to be mentioned as which and as we have said higher pitch would require you know separate kind of treatment, all this you know is basically what it is taking place.

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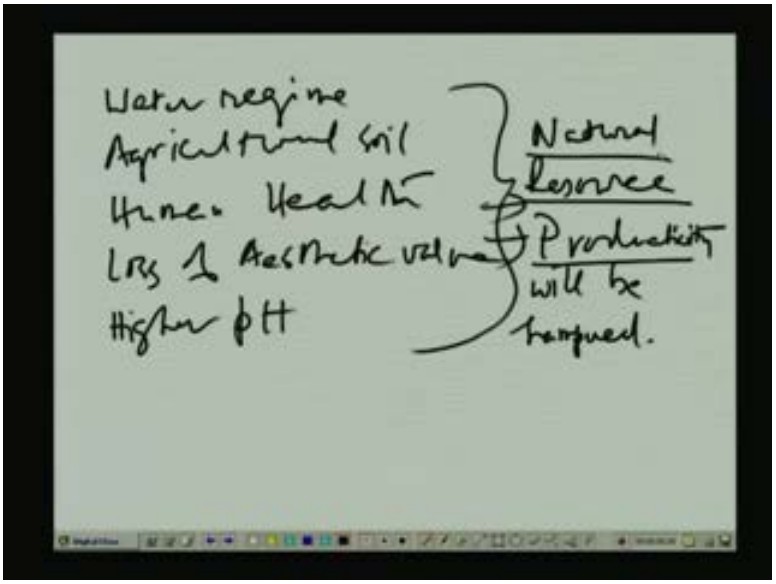

All these would impact is all these as it is changing, as it is changing would essentially reduce productivity natural resource, natural resource productivity, productivity, natural resource productivity will be hampered, natural resource productivity will be hampered. This would lead to this natural resource productivity is likely to be hampered okay. So this is where you know the challenges are. These three, these three kind of global environmental issues I mean the and the causes of general global a pollution or environmental degradation is essentially you know can be linked with various industries and many other many problems can be directly or indirectly linked to this problems. Many other problems which are smaller problems, minor problems in nature can be also included within the impacts of similar nature. So what I, what we want to, what we want to mean say here is one very important thing is the research related to is this, this is natural

resource productivity. Why natural resource productivity is important is our life the human life, our life, our culture, our sustenance in the world, our usual habits, practices are all dependent on natural resource productivity.

If fish production goes down, if the agricultural production goes down, if the say you know if our say the generation of adequate power for all goes down, the lightly impact would be on our day today life style. And similarly at the same time most of this natural resource is essentially of non-renewable in nature. So, there is a need for protection of these things, production of this natural resources which are related to the all these aspects of environmental degradations, okay. Now this is to suggest you know what are the main issues that we have dealt with. Now I would go back, I will go start a new topic today.

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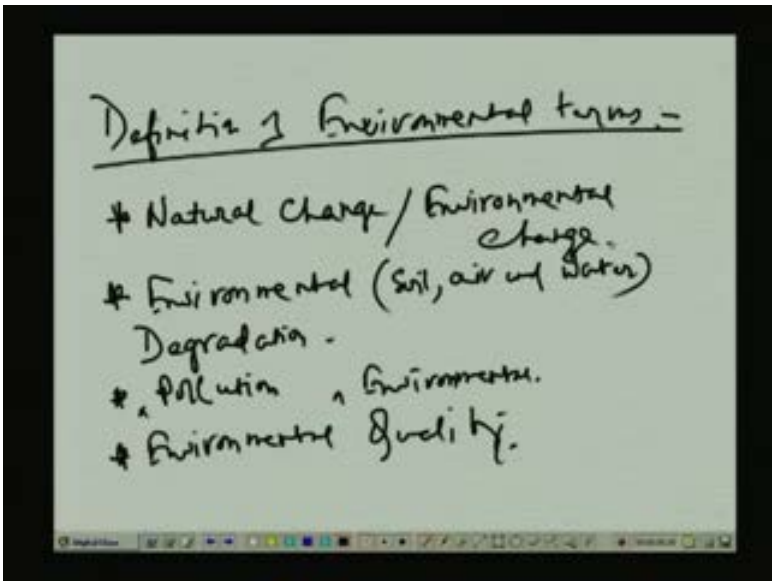

Now here it is start is you know definition of I think you know I generally definitions, definition of environmental terms, definition of environmental terms, definition of environmental terms. There are few things that we know we will try to explain, we will try to observe one is, one is this you know these are very important aspects you know as you will have further understanding in the environmental science and engineering, understanding the basic definition has a tremendous importance, has a tremendous importance say this is, this a natural change or environmental change, natural change or environmental change, environmental under environmental we'll generally explain soil, air and water. Degradation, this another important term that we will degradation.

We would also discuss another very important term which is generally discussed is this pollution, pollution, environmental pollution you can write in environmental pollution also, here we can say environmental pollution. Environmental pollution and there is the fourth is this environmental pollution, we would also talk about environmental quality, environmental quality, environmental quality. So you can see here all these terms are of importance. You know why it is important let me explain you some of this. So as I began the class, you know if you remember

when I started the class I said you know don't confuse tsunami with an environmental degradation. I say these are natural changes, so you know pertaining to that you know explain this natural, natural change and you know the environmental change. The first is to understand the term naturally, you just take down a line on this what is natural. We will explain, will explain natural, will explain natural as something will explain natural as something or some entity or some entity or some entity which has evolved, which has evolved or will evolve without, without a, without a discernible, without a discernible, without a discernible influence, without a discernible influence of any living being for example that of humans, for example that of humans, for example that of humans to alter a, just one minute… Can you start the sentence again, now what I have written? (Student Conversation: Refer Slide Time: 43:20) without a discernible. For example human for its sustenance, for its sustenance you write for its sustenance. In simple term, in simple terms, in simple terms it would mean that the substance or the entity that the substance or the entity is not directly influenced, is not directly influenced by human activity, by human activity, by human activity, by human activity.

For example, for example, for example volcanic eruptions, volcanic eruptions, earthquakes, earthquakes, huge surge of water, huge surge of water, huge surge of sea water, huge surge of sea water are called natural, are called natural, are called natural and the change they impart, and the change they impart and the change they impart will be called natural change, will be called natural change, will be called natural change, is the change they impart will be called natural change. So if a volcanic eruption is continued, so if a volcanic eruption, if a volcanic eruption feels the atmosphere, feels the immediate atmosphere, feels the immediate atmosphere with burned ashes it will neither be called degradation nor pollution but only a natural change, but only a natural change, but only a natural change.

Environmental change is also sometimes used, sometimes used synonymously with, synonymously with natural change, synonymously with natural change, synonymously with natural change, natural change, environmental degradation, environmental degradation. The word degradation in the natural environment, the word degradation in the natural environment refers to the impacts by human activities or other anthropogenic causes or other anthropogenic causes. So degradation, so degradation is basically human culture induced change, human culture induced change that has evolved due to human culture that we know of, human culture that we know of. In the same context, in the same context, in the same context in the same context, in the same context, soil degradation would mean, soil degradation would mean the deleterious changes, the deleterious changes in the soil characteristics that are completely separate, that are completely separate from the natural changes, from the natural changes, from the natural changes, from the natural changes, from the natural changes.

Deleterious changes means harmful effects I mean harmful changes like you know suppose a say you have, you have by pollution or by any human activity you have increased the concentration of cyanide in soil. It's a basically deleterious change but see you know soil would undergo a natural change, always you know soil is not a fixed strainers, a typical entity which would remain as it is you know it will, its own characteristic should also change over time, I mean within a, in a seasonally, yearly you know basis diurnal base, not diurnal seasonal basis it would also change. The soil would be sometime more with water sometime less with water, these are natural changes but whenever changing the characteristic of the change is, characteristic, you are

changing the characteristic by means of an human intervention which will have a deleterious effect that is to reduce the productivity of the soil, productivity of the soil in such cases we would call it as soil degradation, degradation. Remember this distinction is extremely important because you know sometimes we would see that you know we would also see this. As a result of which you know this, this basically attacks the basic concept of our understanding in the sense like this. Say you know we would say a garden as a environmental degradation but we will call jungle a natural change okay.

So you know to idealize this is not easy I mean in the sense for most of the planers, the jungle is a, you know is a particular entity which doesn't have a value but it essentially has more value than a garden. So the gardener you know our department, you know the person who keeps the garden would be angry if we say him that you know you are actually doing a certain kind of an environmental degradation because you are not allowing the natural changes to takes place. In the same light you know a much of our human culture can be blamed for what has happen to the natural environment. In the same light we can say you know Tajmahal is an environmental degradation, in the same light we can say many other construction, many other affects that we have carried on as human as environmental degradation. That is what the distinction it makes, say it's a natural change and environmental degradation.

So any kind of human activity essentially disturbs the natural, natural activity ,natural cycle. So whenever it is changing that essentially discerningly changing and it is changing in a manner where it is which cannot be recovered back again would be called as degradation, it will be called as degradation, in the same light you can understand about air and water also okay the similar type of degradation we would allow. The anthropogenic causes is, anthrop means is human, anthropogenic human related or human caused effects is a basically the term I will use continuously. So you know I am just trying to acclimatized you to this terms, particularly the anthropogenic causes and things like that, who will come back to pollution in the next class just for a 5 minutes break okay will again assemble after 5 minutes okay, fine.

Preview of Next Lecture:

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So, having said all these you know we that we are beginning to discuss about this environmental pollution, some of you asked you know how pollution is different. Air pollution and degradation are different I mean this is one distinction that we would like to make here. Degradation you just write down degradation is, degradation is, degradation is about says in the life and life pattern of all living beings, of all living beings we generally call them as biota that we know of biota.

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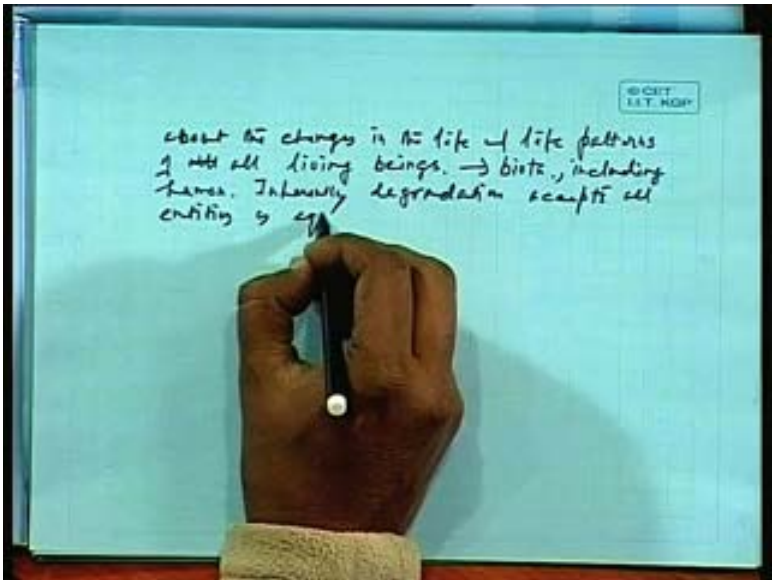

Degradation is you know it's a particular aspect where it is biotized you know it is, it includes human, including human inherently, inherently, degradation accepts all entities as equal. You also suppose for India say you know if we have to employ all our people we have to, we have to exhaust, we have to use our natural resources and only then we can provide them some kind of income, some kind of sustenance. So here the deep ecology was exactly countering that in the sense that you know it was completely opposing the philosophies of frontier economics. So here in case of cases like this, we can see that you know we just generally a combine response of this frontier economics and deep ecology you can see.

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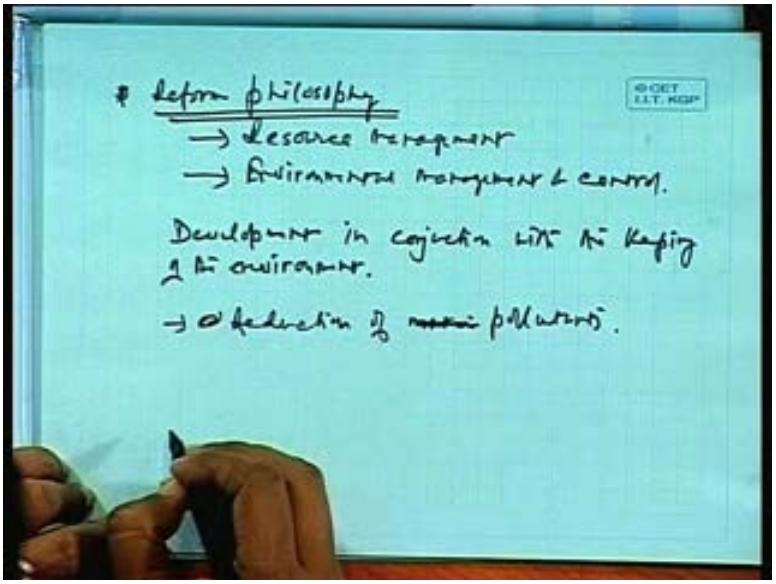

We can find out a reform philosophy, reform philosophy which is you know we generally find it in the manifestations like resource management, resource management and environmental management and control reform, reform philosophy, under this reform philosophy what we have done is so the idea is here we will also develop a development, development in conjunction with the keeping of the environment. So this is basically a compromise between frontier economics and deep ecology, this is basically a compromise between frontier economics and deep ecology where you have made a compromise but here also again a one thing the resource management what it said is challenging, reduction of pollution, the basically how it was met, how it was carried out reduction of, reduction of material, reduction of pollutants. So when the industries were called, were asked to reduce pollution what they did is they only reduced pollution.