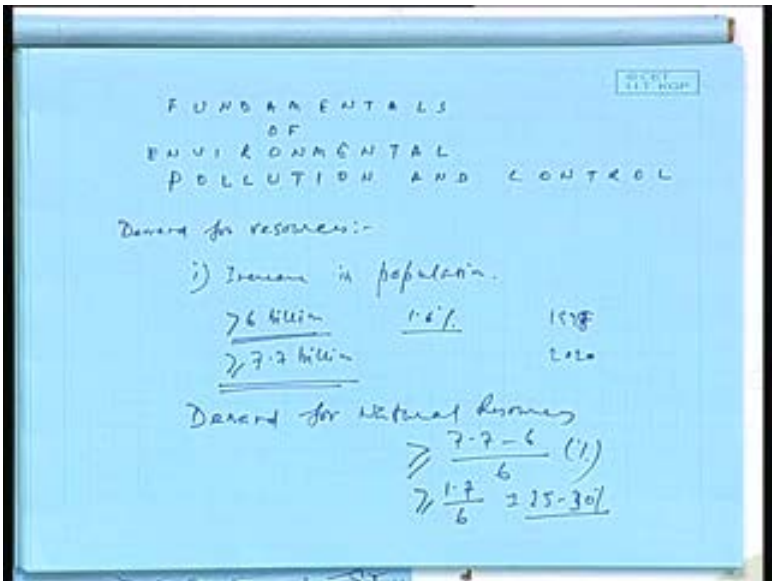
Fundamentals of Environmental Pollution and Control
Prof. Jayanta Bhattacharya
Department of Mining Engineering
Indian Institute of Technology, Kharagpur
Lecture No. # 01
State of the Environment

So, today's class you know we'll deal with the subject this, fundamentals of environmental pollution and control.

(Refer Slide Time: 00:01:02 min)



This subject you know before we begin to take up, you know there let me discuss the issues related to environment. We'll go in great detail about the definition of the terms, it has a very important significance because in many cases there are misinterpretation of environmental terms but will let us go back to some basic statistics about how environment has been damaged over the years over say, over the period of human civilization and the state of the earth today. You see you know many of you, you know who are reading newspapers regularly or watching TV's you would appreciate that there is many, many cases like you know many situations are being discussed with environmental issues in mind like you know in very recent time, if you see that you know this winter we find that you know the environment around us is somewhat not as chilly as it used to be or as cold as it used to be. It says that you know instead of the reason being put behind is that the wind current, actually the wind current that brings in cold environment in a particular area has been restricted by the generation of excessive heat waves in some part of the, some part of the country and some part of the, some part of the earth as well. As a result of which the hot condition I mean if you can say this as hot because you know in many cases it makes a tremendous difference if a temperature which is supposed to be say at minus 25 at one place is suddenly minus 10 or minus 15 degree centigrade or here in case something like you know where it should be say about 20 degree centigrade it should be, it is being found as 25 degree centigrade.

This makes a tremendous significance. The reason being is there be many things which should be associated with that, that is something like you know the few examples like you know farming would be greatly affected. One of the reason being is farming would be greatly affected. Similarly affected would be you know this life of various organisms which are you know generally at the lower level of the food chain, at the lower level of the food chain. Say you know whose support you know this the upper level of the food chain we are at the top of the food chain but you know below that you know there would be very small organism's, microorganisms which are actually feed to finally form, feed up to the ladder to form to go into the food chain. So this has a tremendous significance in the sense like this.

So there are many issues like you know as you can say now global warming is an issue where you say that you know is being said that throughout the world, this for every decade there is an increase of say about, about now there is an increase in the global temperature by about 2 to 3 degree centigrade or about say now 4 to 5 degree Fahrenheit. This has tremendous significance in the sense that you know there are certain areas like you know particularly near the poles where there are ice capping's which are, which generally do not even melt during our summer, they are beginning to melt. There would be some ice cap's you know in the mountains of Himalaya which will begin to melt during the summer which usually in say you know 20 years, 30 years back or even 50 years back wouldn't have melted during summer also.

Now it would result in, it would result in you know water being flooding the area, excessive flooding would take place. It would change the climate pattern, say one part would show would find more water being, water, water being flown in and in another area it would remain as dry for a longer longer time. There are many areas you know in India such there are many areas where drought, time for drought has increased. You know if you go to some part of southern India or even in western India there are many areas which have not witnessed rainfall for last 4 to 5 years, no drop of rain. And essentially this makes you know what, not with certainty we can attribute, the reason to any environmental factor but there is a sudden kind of correlation now being developed you know now scientists are finding that it has a, it has a reason I mean if that the warming or any other reasons can directly contribute to the less and less rainfall in a particular area.

There are many scientific debates because you know in many cases, you will find that in one case the scientists say one thing, another scientist dispute that. There is a possibility that you know this kind of things beginning to take place. Let me tell you if this is one of the major hindrance for a larger global action towards environmental pollution and control, the reason being is something like that Europeans, Europeans or even in the, particularly the research groups in Europe and predominately Europe and also you know several other countries like Japan or even some more developed, more developed countries like South Korea scientist begin to believe that you know the global warming is a cause for various kind of environmental disasters taking place but don't confuse with tsunami. Tsunami is not I mean tsunami is not an environmental disaster we'll discuss about this. It's a natural disaster don't confuse tsunami with that. So here what we see is you know ultimate impact of such an effect like you know global warming or acid rain or say ozone hole depletion or any cases like this.

We'll have a direct impact as this can be as I was telling that you know the scientist from you know different part of the world dispute with the scientists of another block of the world. Say well only yesterday you know I was reading a newspaper item where it said that you know one adviser to the State of United State, I mean to the cabinet of United States disputing the European theory that global warming is actually a cause of various climatic disturbances throughout the world.

Now it is a very, it is a very complex situation. The situation is there you know development and development of a particular country, development of a particular place is directly integrated with an impact on the environment. There cannot be any development without any impact on the environment. This kind of qualitative development has not been possible as yet, it is possible in a sense you know it's maybe someday it is possible when we'll have in the world a larger, a better distribution system. Distribution system what I mean is suppose you know there are in a society say if some wealth is created, if this wealth can be equally distributed among the people, it is generally observed that you know environmental performance increases.

If a sudden commodity is equally shared by us we become more responsible, it is generally observed but on the other hand if the resource is inequitably distributed like you know only few of the people get and the rest of the people get deprived in such a situation, we generally say the environmental related tensions increase. So this is, this environmental impact is not necessarily a matter of concern for the scientist or people in general. It is also a matter of great concern to politics. A large number of a state and central policies, politics related to that are basically connected to environment. So people take different postures, say people generally say you know in many cases people would say that development without harming the environment. It is not all, it is not possible, in today's world it is not just possible.

If you are going for a material development, if you are going for an, if you are going for a larger buildings, if you are going for a big flyovers say big dams, big you know infrastructural projects and things like that environment is suddenly going to be affected. There is no denying the fact and you know it has been observed that you know with whatever remedial measures that we have been doing at this present point of time is not adequate enough to control the damage or control to reduce the damage, the damage is none the less taking place. So even in such a cases let me give you a simple example. You know this, the government of India estimates that you know in about 8 to 10 years' time in about say you know from afar about 10 years' time from now say till about say 2020, India is going to grow by say about 7 to 8%.

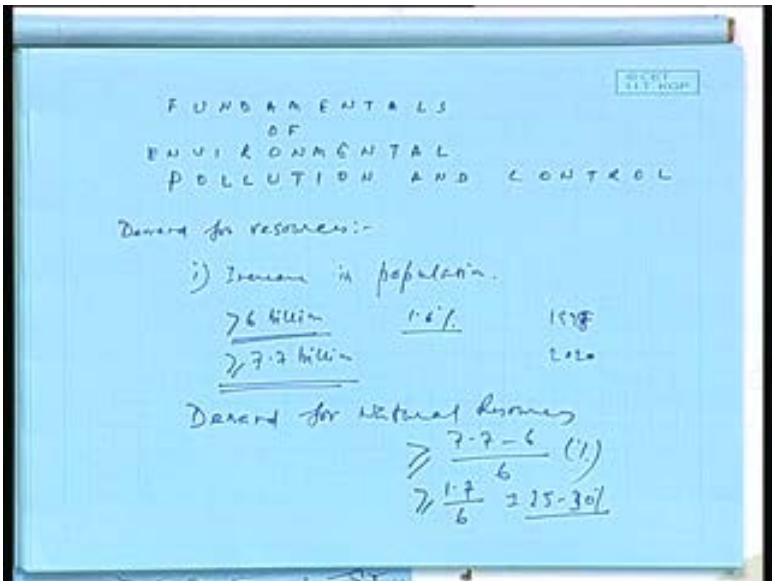
What it means? It basically means that you know the material used that you would be making general would be increasing 7 to 8% every year like if you are using say one AC today is very likely projection wise if you say 8%, 8% increase say about 12 years' time, you are going to use two AC's or quantitatively that can be put I mean your use of the environment, your use of the environment would be two fold within two year, 12 years of time or 13 years of time. So this is what is significant, in the significance in the sense that you know we have remembered, we have always a limited natural resource. It's not like in any kind of, all kinds of natural resource like you know natural resource that we generally talk about say particularly renewable resources and nonrenewable resources like you know nonrenewable resources mostly as you know in the most cases is that the fossil fuels are nonrenewable resources.

There are renewable resources, there are other kinds of resources which may be nonrenewable but cannot be recovered at the present state of use. So there can be a third category. The use has been so much at a present time it cannot be replenished back to the system. Now this is what it means you know so physically what I want to mean is that you know that our lifestyle pattern should change in a manner in 12 to 13 years' time if we continue to grow in the same way would be like we would be using twice the amount of water that we use today. We would be using twice the amount of paper that we use today; we would be using twice the amount of say the materials like you know minerals that we use today. So this is what you know it has a tremendous paramount impact on the environment.

Now the question is can you compromise. This is you know a very pertinent question in the sense that you know whether you can compromise. To my mind what I would say is that this compromise is only possible when there is a global confirmative that means you know the states of America, the states of Europe, states like India, China all agree to grow in a coherent way you know with a mutually discussed methods of our plans but that is not happening. In fact if we observe the global affairs today, the differences are more, differences are more than that used to be because you know America thinks in one way, Europe thinks in another way, China thinks in another way, India thinks in another way. So it's all this thing, all these countries are taking up their own steps, there in their own way.

All they are trying to, mostly they are trying to see is that you know the public reaction is not against them, people are not generally against them, so this is what they are trying to play to the politics available I mean the kind of the situation they are in and generally trying to manage things more than putting their heart, more than putting their heart into actually doing the right things. It is not a case of India as such, it's not a case of a country in particular it is about all countries of the world today. There is a great lack of leadership, great lack of leadership in areas like environmental engineering or environmental impact remediation, reduction there is throughout the world. As such there is no basically very little leadership to cling to, so that we know which, on which we can depend on. Having said that let me give you some of the ideas you know say some ideas that we can expect like you know say about you know the world population as you can sees is the demand for, demand for resources.

(Refer Slide Time: 00:15:52 min)



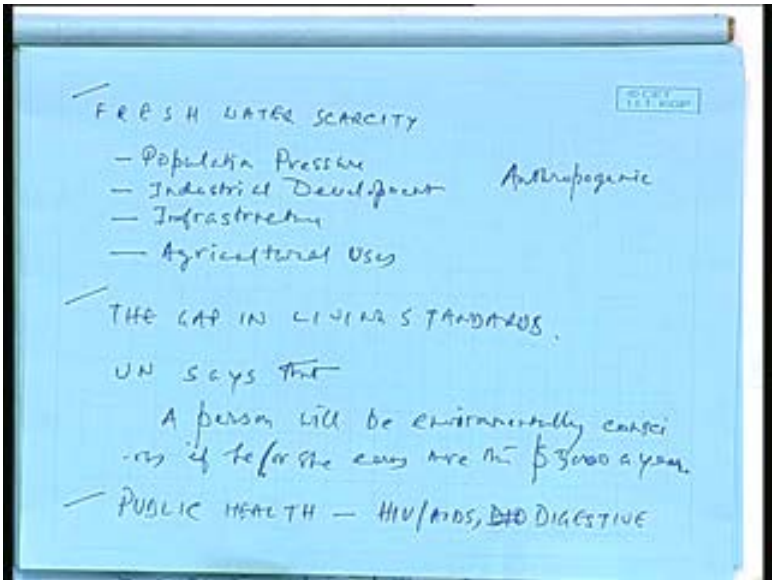
If you see this demand for resources, we just discuss about the increase in population, increase in population. Increase in population I mean you know is an important thing in the sense that you know if we just see today we have say about somewhat more than 6 billion people about say 6.25 or 6.3 and growing at a rate of 1.6%, this is the growth rate, global growth rate as you can see. If you can see now this projected by 2020 you know it would be about, it is going to be more than or equal to 7.7 billion at, this is at 1997 figure, this is about 1997 or say even 1978, 1998 or like that, this is what is 2020. So beginning this you can see this, this would have you can see this you know one thing can be very well I mean for all of you to understand here is this much of increase would lead to more than the percentage change in the population.

So is percentage change if you see this the environmental, the demand for resources would at least increase the demand for natural resources, demand for natural resources would be more than or equal to 7.7 minus 6 divided by 6, this is a practical significance. So you can see here you know the way you know the requirement would actually drastically increase, you know in today's environment as you can see this, this would be nothing but say about say 1.7 divided by 6 which would lead to say about how much percent, say about 30%, 25 to 30%. We are in now we will see that you know in the, as you go in the lecture itself we'll see you know how we have depleted.

So this is a great demand, this is a great demand say 25 to 30% increase in say about, say about 15 to 16 years from now. So 15 to 16 years you can see in average above 2% increase every year in terms of natural resources. Considering that we have already damaged a large part of the environment this is huge, this is tremendous I mean you know 2%, you have a 100 years before would have not meant the same thing that we would mean today. 100 years before or 200 years before this 2% increase wouldn't, would be, would have been insignificant but today it is not. Today it is a huge amount of resource, huge amount of material that would be actually spent on these purposes.

So this is one thing that is you know we would just begin to, this is one population you know that we said you know having said all this you know there are many more aspects like another very important thing is this you know is taking place is fresh water scarcity.

(Refer Slide Time: 00:19:45 min)



Fresh water scarcity this is also related to population I mean there is no denying the fact that you know this is related to population. This is a population pressure is suddenly one thing industrial development because all industries, almost all industries require water, a great amount of water this say industrial development then is a infrastructure, agricultural uses. It is being said you know if is being said, if today's war is being fought on oil, tomorrow's war would be fought on water. Water is going to be an extremely scarce resource, it is actually if you can see there is you know you can take down a line here that take down a line here, there are no resources there are no, there are no fresh water or fresh water resources both surface water as well as ground water in the world which are not impacted by which are not impacted by environmental degradation, environmental degradation.

Scientists have found in the Antarctic water kept under ice, kept under ice the traces of, the traces of, traces of organic pollutants produced by, produced by human or anthropogenic activity, anthropogenic activity, anthro, that is anthropogenic, anthropogenic activity. This term has a great significance in environmental pollution and control. We'll see that you know it's this is much of the environmental pollution or degradation that we'll discuss about would actually be related to anthropogenic causes. We'll see, we'll make a distinction also as to say which are natural causes of environmental, natural causes of various problems as well as anthropogenic causes that have led to environmental problems. So, we'll discuss about that later on but you know let us keep on this things very, this particularly this problems of fresh water is going to be a huge problem. So what I mean to say is there is no other, no sources, no sources of both surface and ground water resources in the earth today which are not been influenced or impacted by industrial activities anywhere in the world.

Not only that, I mean there is another important thing you just write down traces of, traces of gaseous pollutants like, gaseous pollutants like have been found across the continents, across the continents from the sources, from the sources in a country that travelled, that travelled, that travel several thousands of kilometers across the continents, you can make a correction there, across the continents in the water resources, in the water resources, in the water resources so in the water resources. So environmental problem, environmental problem is no longer confined, no longer confined within a state or even within a continent but across different, but across different continents, but across different continents. The intercontinental pollution is a topic of great concern today, is a topic of great concern today both for the scientists and the policy makers and the policy makers, both for the scientists and the policy makers, both for the scientists and policy makers.

So this is what is the, for example just like say you know if you are carrying out a certain industrial activity in India its pollution might reach Bangladesh. So even if Bangladesh say for example or say for a particular case may not be indulging in any kind of activity which is, which likely to give rise to pollution, it will be impacted by the activities in India. So, you see the complexity of the problem here is, so is Bangladesh can you know is in a, will be in a position to charge India about polluting its own country.

Similarly say across different continents it has been observed say you know the pollutants, gaseous pollutants of United States, the traces have been found in Britain. It has, the pollutant has actually crossed the Atlantic and went up to Britain to find a residence there to have settled there or it has moved. Particularly related is you know is particularly for particular pollutants like you know which are highly resistant pollutants like you know the pollutants, mostly the pollutants that we talk about say you know about say there's mostly the organometallics or higher organics like you know more than, more than the complexes which are or metal or organic complexions that generally derive from say upper range of the engine, they are highly persistent. Most of these pesticides you know this pesticides are any other substances they are highly persistent, they do not degrade, they can remain in the, in the environment without being effected for a long, long time.

Many persistent chemicals like you know the mostly say the all the kinds of an industrial washing agents, many of them they are so persistent, they would leave remain the traces can remain say 5 years, 6 years, 7 years or even 10 years in the same state without being changed. Now this is a, this is a great concern I mean this is a great concern for water pollution. In many cases this has resulted into different several kinds of, different kinds of problems of treatment. So it's the fresh water scarcity, the gap in another important aspect of say this the gap in living standards, the gap in living standards. It is generally observed you know the UN also says, UN says that, says that you can just write down, a person, a person will be environmentally conscious if he or she, if he or she earns more than more than 5000 dollars, more than 5000 dollars a year, more than 5000 dollars a year. This is generally an observation by you know different policy makers and study analysts like you know dollar 5000 a year, only then say you cannot expect a person you know he is a subsistence farmer or a particular person who is, who has a very low wage to be environmentally conscious. You cannot expect because you know he might be fighting for his basic necessities, you cannot blame him for various kinds of environmental I mean problems that might be related to him or her. It is generally observed so

you know, if the gap of living standards so you know what is, what is a failure is total we must say you know you say in a great term is you know that you know is it is a great failure that you know we have the wealth, the human kind has generated so much of wealth, so much of wealth. Today's world economy stands about you know 35 trillion dollars, its more than that, out of this 35 trillion dollars if you just observe this you know how this is, this resource is distributed across the world, you'll see that you know a large part of them would be you know America and Europe. May be about say about 30 trillion dollars or even 25 to 30 trillion dollars should be only confined in Europe, America and Japan, rest of the world is only subsisting on about 5 to say 10 trillion dollars. So this is, this imbalance is you know and essentially this part of, this part of the, this part of the countries or the continents is actually where the most of the people live, most of the people live in this regions but their sources of income, their welfare is so much less compared to the people of the other developed countries, other developed countries means in the sense particularly related to the America, Europe and Japan. So you see now, it is very difficult sometimes to I mean ask the developing countries or under developed countries to take steps in environment because for them it is just merely you know basic necessity.

In effect you know in many cases as you can say you know that you know the wealth is so much that if the whole world begins to spend or begin to lead life like the Americans do, like the Americans do today, it would require 8 planets. You can understand the difference now, say 8 planets should require, the resources of 8 planets should require if say about 6.15 or 25 billion people all over the world begin to go in the same way as the Americans go. This is, what is this disparity is actually is a, it's a great nuisance to the control of environment. There is an appreciation in a you know in an individual level when a teacher is talking to a student's, students you know he might be confessing all those thing but in mostly in the planning scenario or in a, when in an international Forum people generally shy away of talking like this because you know basically you know is kind of a blaming of, blaming one country and supporting the other I mean this is a bone of contention. You see your America refuses to sign pseudo protocol saying that only when India and China would do, I'll do it or we'll do it.

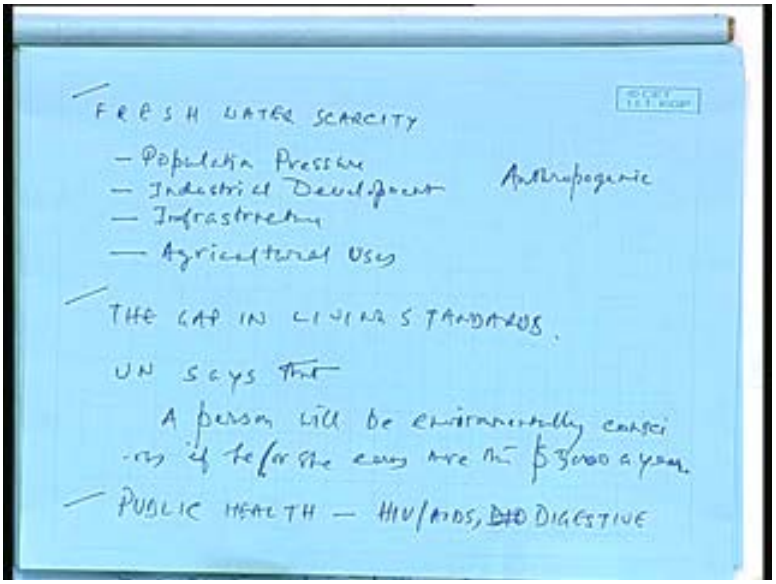
So you know is a, this is a kind of situation you know where there is a tremendous gap at one end, there is a tremendous demand at the other end, the demand for environmental pollution control checks but two world are not actually coming together. At the present time, if we see there you know there are, there is only what is actually going on is micromanagement small management of some issues here and there and some policies all very skeletal policies but it's not actually going off anywhere. There is a sudden flicker of hope though you know there are many cases you know where world has converged also we should not always blame the other countries or things like that but you know there are many cases like you know in cases like Montreal protocol as such as you know that you know that has worked towards a reduction of, reduction of say CFC in the world it has worked, it has worked substantially I mean where all countries of the world could converge into saying that they would reduce the use of CFC. See CFC's fridges and if you have seen all fridges or air conditioners or things like that in your home say 5 to 10 years back all were basically CFC fridges.

Now these CFC fridges are on the way out. In India now only the fridges which are small capacity fridges, refrigerators which are small capacity say about 165 liter or so they are still in CFC, the capacity is more than say 165, 180 or 220 or things like that, they have all moved into

non CFC ranges. So there is an adaption I mean we must not say there is, there has not been an environmental action, a total collaborative actions from different side it has happened but it has not happened substantially, it should have happened and the urgency is more. We cannot wait, the situation is such that you know all our water regimes are in I mean impacted, all our water regimes are polluted wherever in the world wherever you go and take of a water from any sources it might be a, it may not be fit for consumption, this is the situation today. Fit for consumption not for humans but also for other animals or plants or even species like that. So there is a great need, there is a great need and in spite of that if we think of in terms of growth, in terms of growth there would be always a more and more pressure on the natural resources.

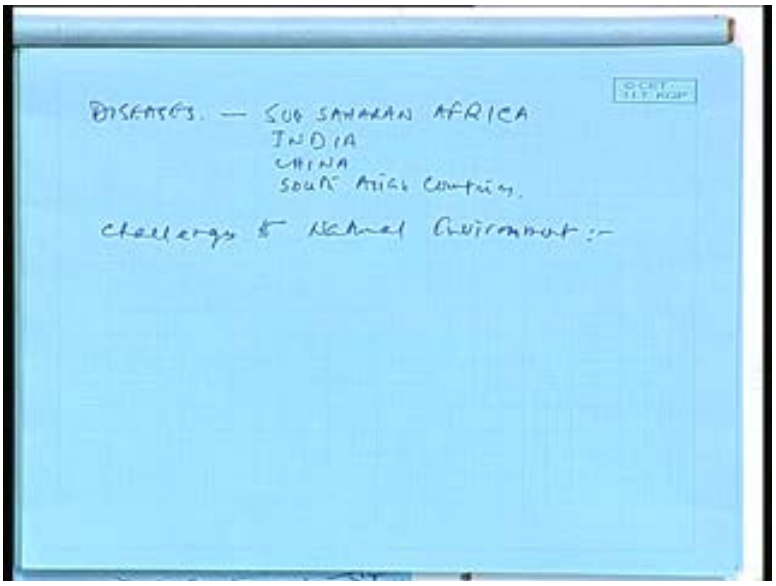
As I have explained you know what would happen so this, unless this gap on living standards come down if a African fisherman or an Indian farmer are not involved, are not involved in the whole work of environmental remediation where we'll be able to share our wealth with them there should be a mechanism by which you know we can share our wealth with them, till that time comes there would not be much environmental improvement throughout the world. There has to be a greater need for sharing, wealth cannot be accumulated at one's hand or at one's hand only, it has to be distributed unless that takes place the fate of the environment the global environment is not very good. It is bleak to say, as you know is over the way we are heading towards it would be extremely difficult, there is another issue is this public health.

(Refer Slide Time: 00:39:33 min)



Public health, this is public health is another issue which is you know of great importance you know that, you know this diseases like say diseases like HIV AIDS, HIV AIDS then you know the typical diseases you know have not gone down. Basically if you say the people, the children dying of diarrhoea today, diarrhoea digestive diseases are increasing.

(Refer Slide Time: 00:40:14 min)



So is public health part is also in alarming, you know large part of the world particularly the sub Saharan Africa, sub Saharan Africa, what I mean by sub Saharan Africa is that you know sub Saharan Africa is that you know there are a southern south Africa as you know, south Africa is a relatively developed country, there the people are relatively you know well off but in sub Saharan Africa you know this, there are lot of people who are actually suffering before all, because of public health problems. We have a severe public health problem in India as well India China, China then you know all this south, south Asian countries south, south Asian countries, south Asian countries like Pakistan, Nepal, Bangladesh, Bhutan all suffer from public health related problems.

The reason is you know the, why it is important in the basic case what is, why it is important in, when a particularly if a family you know suffering from, if a family is suffering from diseases or you know the typical health problems, its ability to generate income for its own subsistence decreases. As a result of which what happens is she becomes you know they become ineffective and as a result of which their being, well, welfare gets reduced. So because they are not in a position to earn, in such a situation it puts at extra pressure on the environment. So generally saying the people who are generally hale and hearty, generally who are dispensed with you know with good health, dispensed with you know a continuous flow of income, they are more environmentally responsive than who are not. This is what is the reason, this is why the public health is also important then there is a challenge to natural environment.

Let me challenge to challenges, challenges to natural environment. Let me give out a description from my book, this is since the end of world war two you just can write down few lines, since the end of the world war two the global economy has grown over 15 times. The consumption of fossil fuel has increased by a factor of 25 and industrial production has increased by a factor of 40, 40, this has led to, this has led to atmospheric changes that have altered more in last, more in last 100 years from the start of industrial nations more than that, more than that took place in the previous 18000 years, 18000 years, 18000 years. Abnormal climatic changes, insufficient

rainfall, rise of ocean levels, desertification have reduced 18 major 18, 18 major fisheries of the world, fisheries, 18 major natural fisheries of the world on the verge of collapse, on the verge of collapse, on the verge of collapse. So what it, what means is our major sources of you know fish reserves the major more than 18 such reserves have been completely destroyed or in the process of destruction by our industrial activity. So, it's directly related to the, related to you know the damages that has taken place. You just write down another important line, if current consumption rates continue all tropical forests, all tropical forests will be gone in 50 years of time, will be gone in 15 years of time with a consequent loss of, with a consequent loss of 50 % of total global species, 50% of total global species. More than 10% of, more than 10% of the earth, more than 10% of the top soil of the earth, top soil of the earth are already damaged and in a state of disrepair and in a state of disrepair that means which cannot be repaired, in a state of disrepair, in a state of disrepair.

So, you can see this, the state of the environment you know wherever we are whatever in a position we are in, we say is the impacts on the environment is certain. It is, there is no denying the fact and as we grow, as we develop further there will be more strain on environment, there is no denying, no escape from this fact. You know people try to generally you know in an various discussions, seminars, conferences you will see that you know people try to gloat over saying that development it can take place without effecting the environment it cannot take place, it does not take place at any point of time, any kind of physical development is suddenly going to affect. So our policies and priorities should be in reducing the growth, balancing the growth, equitably distributing the growth so that the benefits of the growth can reach to a larger population and doing it very sustain way that is you know in a slow space so that you know we can try to balance the impacts of the nature and we can also at the same time you know we bring down, we take a look about the other species on earth. It's not necessarily that we must be always looking at human centric way where we would be mostly concerned about our well, welfare and well-being.

Another some important issues like you just you know write down few lines emergence of new economies, emergence of new economies, employment problem, inequality in wage, inequality in a wage, rise in terrorism and organized crime, conflicts at different parts of the world. These are the issues which you know may not you know which has a greater significance on the environment, although may not always necessarily be connected with it. Although visibly they might look they are not connected but essentially they are also connected. It is very natural that you know the people of the region who feel that they are deprived, they would turn to hostile acts, they would turn to violent acts so things are related, things are essentially related.

So you know when you like to see them, all of them we might not see at one point only, it has to be the global equity, the sharing of the wealth, controlling the growth of wealth, controlling the, reducing the consumption bringing in more people in the decision making all are absolutely important in terms of environment today unless we take care of those things much of the talk that we make about environment would be reduced to almost nothing, okay. This is the state of the environment that I have discussed, you know you are in a position you would read more. I think you'll understand more also as we go into the next class, we will discuss about the environmental movement in the world, is already seen or parallel to that you know the impacts that I have said parallel to that there has been an environmental movement also. We'll see that you know

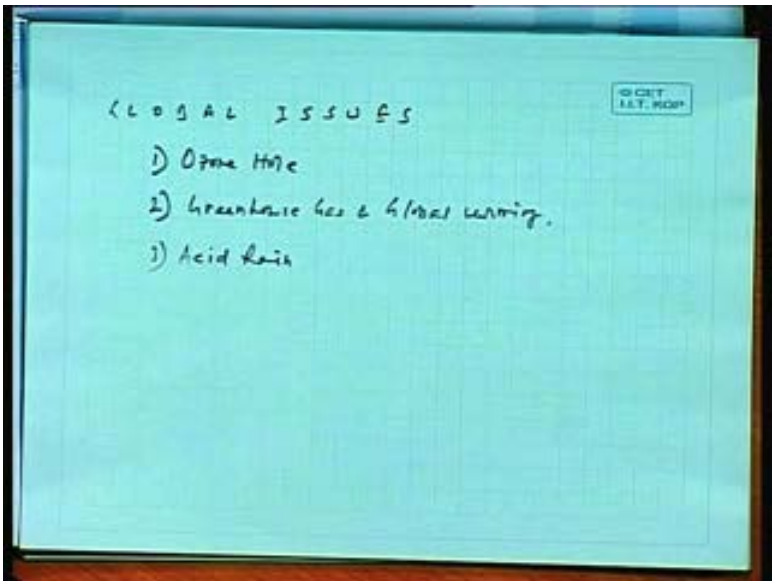
different concepts have given rise, the given different concepts have changed, different concepts have been you know either rejected or some are accepted, some have been developed further, all these we would see in the next class, okay, right.

Preview of next lecture:

(Refer Slide Time: 00:53:26 min)

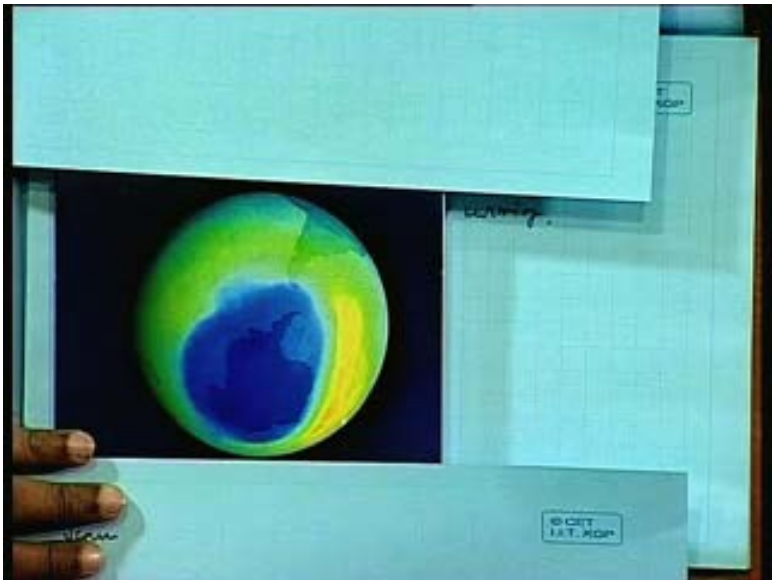
Okay, we will continue with the discussion that you know we have, where we have stopped in the last class. And I have also explained you know what are the effects of an environment as such on the earth the, what is the position as such you know how this you know the natural resources are getting depleted 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.

(Refer Slide Time: 00:54:09 min)



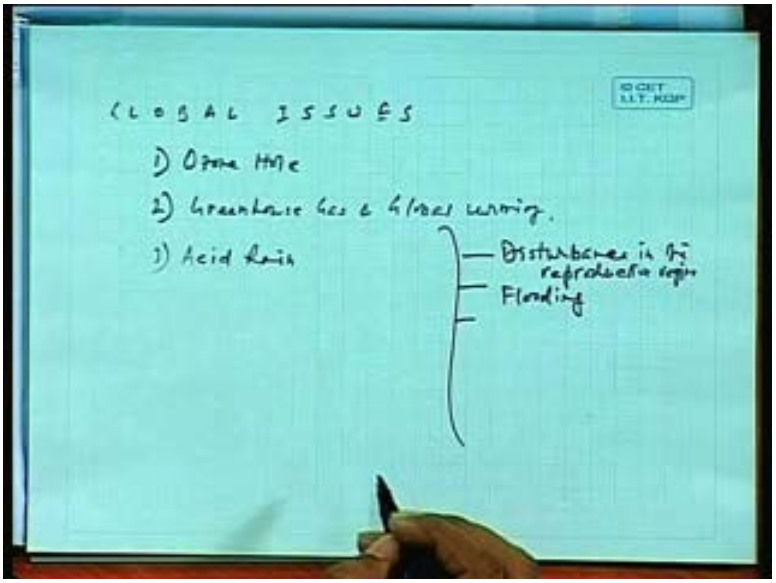
Say the global issues, in global issues, global issues which you know as such draw a lot of public opinion about this about environment, one of them is certainly that is you have known as is this you know is say ozone hole, ozone hole. Two is the greenhouse gas, greenhouse gas and global warming, global warming and the third one is the acid rain. So 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.

(Refer Slide Time: 00:55:18 min)



You can observe, 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 refrigerence in the natural atmosphere, natural environment. Now it is already happening, the 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 submerge in water now that they have to live 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 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 as attributes, you know the something like the impacts of global warming as you can see you know this typical global warming effects is like this.

(Refer Slide Time: 00:57:23 min)



Say the first is you know disturbance in the, disturbance in the reproductive regime, this is very important reproductive regime, say this they the total say reproduction system of the animals, the birds, all kind of species that 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 reside it 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 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…