Fundamentals of Environmental Pollution and Control
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Lecture No. # 04
Water Pollutants

Today we'll begin the discussion with the water pollutants. Water pollutants as you know is one of the major causes of health related problems, health and welfare related problem facing the mankind today. Water is becoming a very precious commodity I mean in the sense that you know in a, in a global sense water is perhaps becoming as precious as the other commodities that we know of say fuel, oil or any other things solid fuels, oils and things like that. There are many contentious issues with water as we have already told you in some of the classes. Now apart from that you know this water pollutants, in the field of water pollutants would be mostly concerned about, mostly concerned about hydrosphere, hydrosphere.

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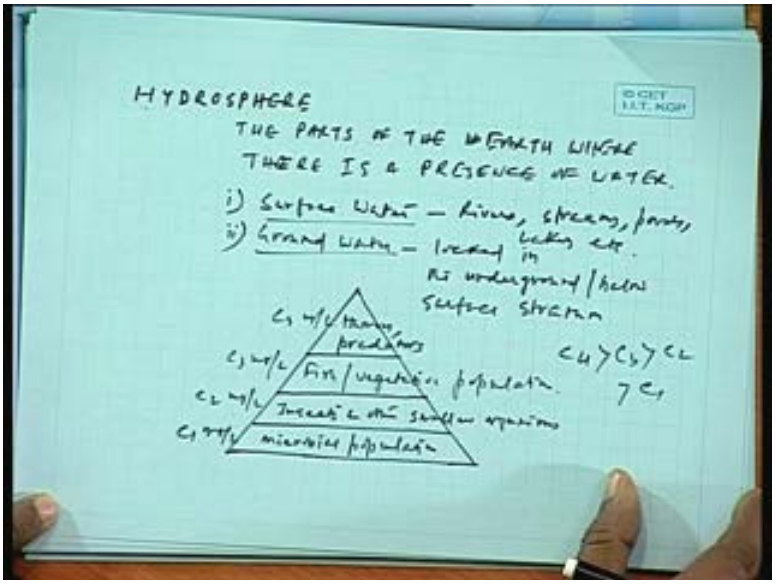

This is hydrosphere is to, is to explain this. The hydrosphere is the parts of the earth, the parts of the earth where the parts of the earth, the parts of the earth, where parts of the earth where there is a presence of water, where there is a presence of water. So here this one is if we just try to begin discussion by this you know this is hydrosphere which would be mostly related to us I mean that we would be mostly interested in two aspects of water I mean the sources of water on the earth, one is popularly known as surface water, surface water or these rivers, streams, ponds, lakes etc. And we'll be also interested you know in the ground water, the water that is not generally observed seen on the surface except there is an arrangement to bring them out, all right. Now so this ground water is another area mostly the water locked in, locked in the underground strata, underground or you know below surface, below surface stratum, below surface stratum. So these two are you know these two becoming you know most important for us you know we'll

discuss mostly about this two, the importance effects on different pollutants on this, on these two.

Now to explain you know a generally the influence of, generally the influence of this how this pollutants actually reach from one place to another, we'll just begin this discussion you know where we would say that, sketch pen just a minute okay. Anyway let us you know with this, with this finally you know what we try to see here is say you know this can be explained you know this is how water essentially impacts the food chain. This is the food chain you know in a water has how this, the effects of pollutants in the water has actually affected the number of food chain in a food chain disruptions. What has happening here is this is if you just see this, this is where the mostly the microbial population, population, microbial population then this is the other insects and other small organism insects and other smaller organisms then finally is, finally is the fish, fish or you know the vegetarian population, vegetarian population, vegetarian population and then finally is this the larger mammals is like, like, humans, humans say the predators, predators like you know the typical predators that you know lions, tigers all these you know remaining at the top of the food chain.

What is happening is in most cases, the pollutants you know this is at every stage there is an increase so there is an increase. So if you just see, if you just see the concentration rising this is a say a C_1 milligram per liter, C_2 milligram per liter, C_3 milligram per liter if you just observe and C_4 milligram per liter, we would observe that you know C_4 being always more than C_3 more than C_2 and more than C_1. This is how the concentration actually is increasing in the food chain, this would result in, this would result in few other things you know few other things is one of them is it is except apart from, apart from this you know travelling in the food chain the contaminants and the pollutants moving up in the food chain they would also have two important aspects, two important effects.

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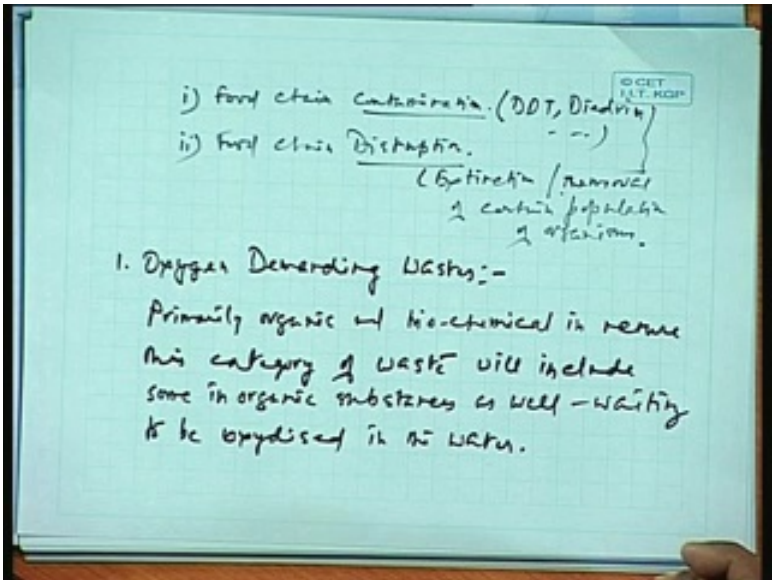

Number one is that food chain, food chain contamination, food chain contamination and also food chain contamination and food chain disruption, food chain disruption, food chain contamination and food chain disruption. The typical food chain, food chain contamination will try to observe is you know the fishes, the vegetables that are that particularly you know these are some of the sources which are actually getting affected due to, due to the progression of a different concentration of pollutants up in the food chain, right. This is contamination taking place you know you just try to understand this is almost all fishes, almost all meat or almost all vegetables that we eat today there is a considerable degree of a insecticides spread on them, there will be a considerable degree of you know other pollutants you know the particularly the pesticides, insecticides then rodenticides all kind of the highly resilient organic compounds and some other organic, inorganic compounds also combine them together remain there as move up in the food chain and finally come to our food, come to our food.

It's not the question of only our food or the food population, the population that you know the humans eat but at the same time we can see you know this is what would be simultaneously going to affect different kind of populations also other than humans say it's not a only a case that you know that the humans should be effected, there will be many other organisms, many other living beings, many other I mean bio organic populations would be impacted by this, excuse me. Now this is one aspect, this is one aspect without harming you know what is this food chain contamination that we finally most famously know about DDT is say a food chain contaminants you know what is actually a progressing up in the food chain and remaining there. There are DDT, there in instead of there are many other insecticides that we generally known of it says dieldrin and many others. The food chain disruption, the food chain disruption is another aspect where I would, I would also explain this the food chain disruption is suppose a food chain disruption would make a particular population to almost we suffering so much that you know it does not, it would not begin to exist anymore. Say a sudden kind of population so sensitive, so sensitive to the pollutants that it would not begin to survive in that environment at all.

So, what would happen is inevitably if you can see the food chain, a part of in the food chain in the food pyramid, the pyramid that I have drawn here you would see that this is vanishing completely. So as a result of which what would happen is that you know there would be a disruption in the, disruption in the food chain and disruption would lead to decrease in a certain kind of population of fishes, certain kind of population of other living organisms which are you know say something like say any other organisms like the goats, the cows you know the kind of the population which might also survives. So here so you can see this. This is what is you know is related to the food chain disruption.

So these two aspects are extremely, extremely, extremely impacting our life. They have serious consequences in our life is food rate chain disruption would as you can extinction of, extinction of, extinction or a part or removal we can say a removal of extinction or removal of a certain, certain population certain, certain population of organisms, right. So, we can see this you know we are trying to observe this as a, when we are trying to see this as a food chain contamination and food chain disruption we can see this, this taking place the removal of certain population of organisms. Now having say come to this you know let us know begin to classify the different kinds of water pollutants. To name the different kind of pollute water pollutants, the first thing

that comes to one's mind is the, is that of, that of oxygen demanding wastes, oxygen demanding, oxygen demanding wastes.

Number one say this primarily, this primarily organic, primarily organic and also biochemical in nature, biochemical in nature primarily organic and biochemical in nature. This category, this category, this category of waste, this category of waste will include, will include this category of waste, will include some inorganic substances as well waiting to be oxidized in the water, waiting to be oxidized in the water. Now this waiting to be oxidized you know is something like this is you know here what is unless they demand oxygen, the oxygen in the water should not deplete. This is the most important fundamental things there you know it's not necessarily that if certain kind of reactions are not going to take place which would involve oxygen which would consume oxygen, the oxygen is not going to deplete in water. Let me give you a simple example like you know if you just take you know if you just take 3 beakers, 3 beakers, in each of 3 beakers if you just put in your different kind of wastes like typical wastes that would be that will be typical type of wastem that would be handling generally.

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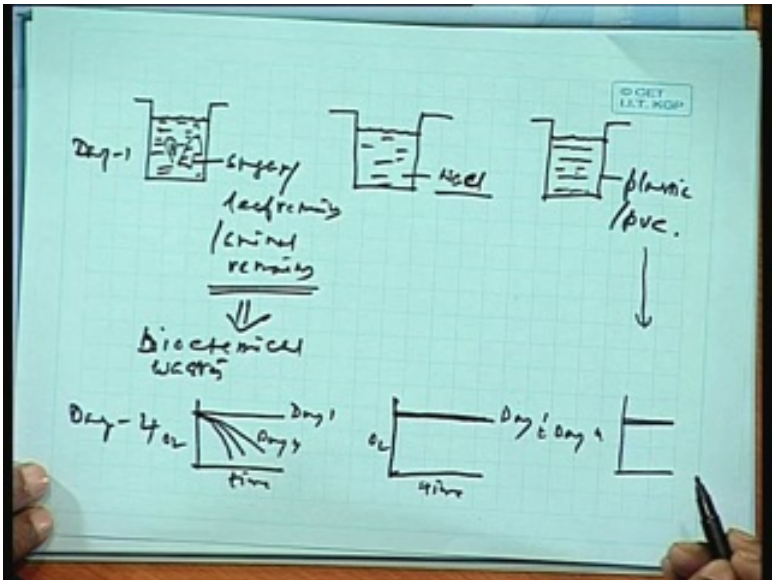

Say you know something like you know if you take a 3 beakers and if you just fill in with water, if you just fill in with water and then you say this is in this case you just, you just fill in with water, you just fill in with water and then on the similar quantity of water, similar quantity of water then you put in as you can see, you know as you can see if you just put sugar in this say mostly the sugar if you have added sugar in this, sugar or if you have added any other biochemical wastes like you know a typical biochemical waste may be a typical biochemical waste may be you know anytime say leaf remains, leaf remains say animal remains, animal remains etc every animal remains etc.

If you just put them in this and if you just say you know this is say something like this. So you can just putting things like this and also you know you are putting sugar or you are putting any other carbohydrates for that matter, any other simpler carbohydrates and also you know if you

just putting in say a highly a salts say you know if you know putting a NaCl here, if you are putting a NaCl say salt here in this solution, salt here in this solution, if you are mixing salt and if you are just mixing salt here similarly if you are just putting in say any a plastic or PVC kind of substances here plastic or PVC kind of substances here, a plastic or you know PVC or any kind of substances here. So this is basically a substance you know which we have, which would mostly lead to you know for our case we'll consider them as biochemical, biochemical, biochemical wastes, biochemical wastes.

This is a say organic, inorganic wastes say consider this to be an inorganic waste and this says a, say a poly carbon, poly hydrocarbon waste. So you can say this, this is a poly hydrocarbon waste if you just see consider this you know after say if this is one day, this is the day one of the experiment, day one of the experiment, if you just consider this day two of day say four of the experiment, day four of the experiment you would see that the oxygen level here, the oxygen level in the water, oxygen level in the water dissolved oxygen, dissolved oxygen present in this water say is going down, is going down like this depending on, depending on the waste characteristics it would begin to deplete like this whereas here, here you would find a perhaps you know if you just start with the same level of oxygen we would just observe may be almost the same level of oxygen remaining there.

The oxygen not getting displaced, the oxygen not getting displaced, the oxygen level remains same say it's a day 1 and day 4 this is day 1, day 1, day 1 and therefore day 1 and day 4 would be same, similarly day and day 1 and day 4. So here you can see this, this is oxygen level oxygen in water, this is with time, this is oxygen time that I have say and also if you can just think of say similarly of the plastic or the PVC waste we will also see that this plastic or PVC waste will also not deplete any just because, just because they are not biodegradable, they are not biodegradable. So you know the microorganisms or any other things would not be able to decomposed in water in a very short time, in a relatively very short time we'll observe that here also in the day 1 and day 4, the oxygen level would continue to remain same.

So if it is a biochemical waste, if it is a biochemical waste or say basically a primary hydrocarbon or a simple carbohydrate being mixed with the water in some quantity, we would observe that you know this would be the reason being is there would be a depletion in the level of oxygen. This depletion in the level of oxygen, this depletion in the level of oxygen is due to, due to the oxygen demanding, oxygen demanding reactions that would take place, the oxygen demanding reactions that would take place.

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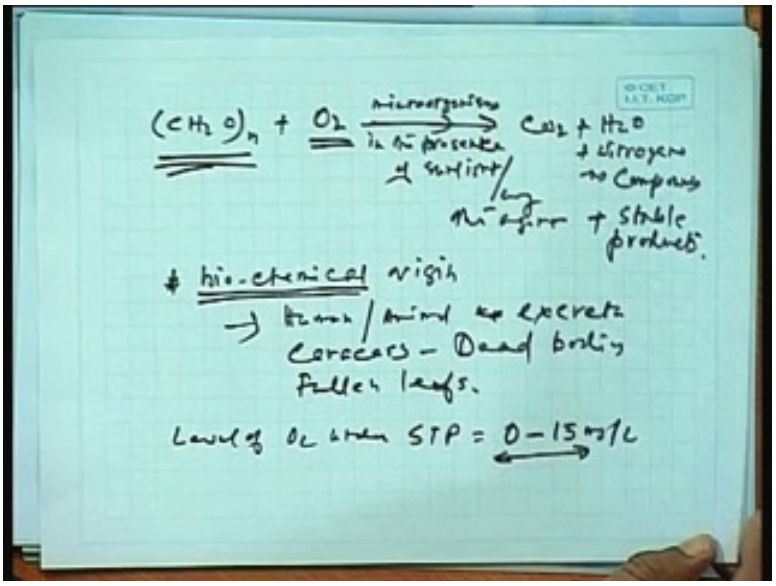

So you can see here if you just observe it you know right in the terms of the hydrocarbons you know simple hydrocarbons and if you just observe this like this with the help of this microorganisms, microorganisms, microorganisms and there may be another you know say any other agent like you know light of say in the source of in the presence of, in the presence of, in the presence of, in the presence of sunlight or any other agent or any other agent or any other agent who would observe that this one would lead into Co_2 forming, it should form H_2o, there would be certain other gasses you know this can be you know various variety of gasses that would be form you know what time if it is, if it is what time on the fifth day if you just see you will find also some kind of you know some kind of nitrogen also being formed or nitrogen dioxides nitrogenous compounds, nitrogenous compounds plus some other stable products, stable products this is what we are going to expect.

So you can see this demand this is where the oxygen would be actually taken off. This is known as these are the, this, this wastes should be known as oxygen demanding wastes, this waste should be known as the oxygen demanding wastes. So this oxygen demanding wastes for our simple definition here the oxygen demanding wastes are primarily of biochemical origin, that is you know this human animal excreta, excreta then the caracars, caracars that is you know the typical body of say the dead bodies, caracars so dead bodies, fallen leaves, so with this you know why this I mean is coming up in the top is this you know this is, this is where the starting of the environmental concerns begin. Actually this you know this biochemical origin you know this typical when the cities begin to develop sewage became a problem, sewage is the, sewage is the all kind of the human wastes.

So the management of human waste became a problem and this primarily when there were, this, the animal or human remains or you know this there faeces or faeces or say the excreta came in contact with water. The water begins to be, began to be polluted. When we say the polluted what I meant to say here is there would two kind of situation here. One is, one is the depletion of

oxygen, one is the depletion of oxygen another it is the growth of microorganisms, these two things are extremely important in case of drinking water.

Essentially what the water we would drink necessarily should have a very little number of microorganisms, it should not have a high degree or high microorganisms, high level of microorganisms as well as it should not have, it should not have a very reduced level of oxygen because you know there are this increased oxygen is required for our different metabiology, metabolical reasons, for different metabolism purposes we require this oxygen and this as you can see. At the same time let me also explain that in of the oxygen as I have might have said in some causes that in oxygen is not very highly dissolvable in water is in fact feebly dissolvable in water, the level of oxygen, level of oxygen in under level of oxygen under, under STP standard temperature pressure is between you know the level that we generally find is oxygen level can go down to 0, 0 it can rise up to say 15 milligram per liter.

This is the, this is the range in which oxygen would remain in water. This is not sufficient, not a very high range as you can observe 15 milligram per liter would be the oxygen but this 15, this range becomes extremely critical, extremely critical for the health and welfare of not only animal, not only human population but also of several major populations of fishes, smaller animals, larger animals altogether. So this is what you know this is how this oxygen depleting substances essentially deplete oxygen from the water and as a result of which you know it can lead to a different degrees of contamination, okay.

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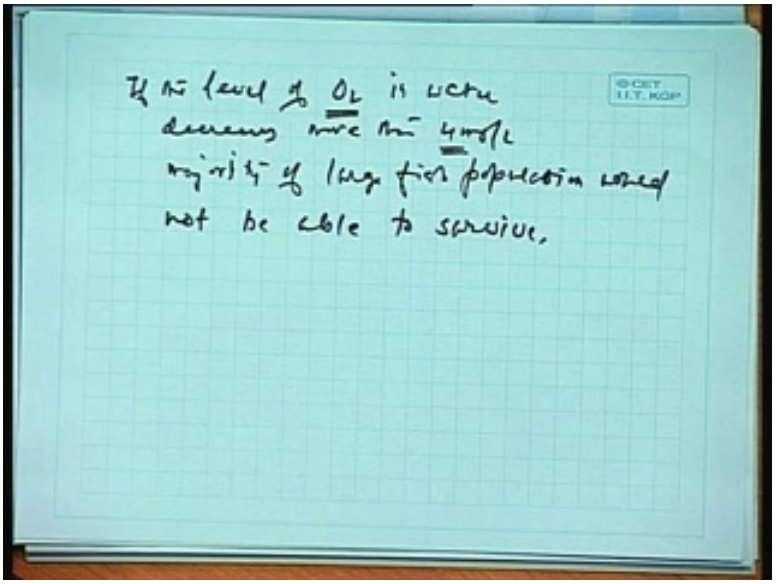

Now having said this we will come back to this discussion again but let me move forward on this, you know another important thing is you know another important that I want to mention here is if you see this if the, if the level, if the level of oxygen in water, if the level of oxygen in water decreases more than, more than say 4 milligram per liter, 4 milligram per liter decreases more than or say decreases less to the level below 4 milligram per liter that is you know if the water level, the oxygen level in water becoming say 3 2 like this in such cases most of majority

of, majority, majority of large fish population, large fish population, large fish population would not be, would not be able to survive, would not be able to survive. And if this water, if this water is generally consumed by a human population as well, human population as well, we would observe a certain kind of, we would observe a certain kind of prevalence of certain kinds of diseases like you know that is say gastroenteric diseases say like a typically like a dysentery then diarrhea dysentery diarrhea or you know any other amoebial diseases that can be associated with water. So, this is the level of oxygen is critical.

Secondly another important part is the as I said the level of oxygen needs to be high because you know this oxygen this oxygen also helps us, also helps us in the metabolism. So it is required that you know some of the higher level of oxygen is generally supplied. So you know the drinking water or the water in the pond or wherever the oxygen level in the water if goes down below a certain level there, there might be any other organisms should begin to survive. And not only that in most cases when a large population that is what is also you know a food chain disruption, a change disruption that I am saying say if the large fishes are say decreasing in a number in a, in a particular water environment what would essential mean is there will certain populations of insects on which the fishes prey on, they would also increase, they would also increase in number.

Say as a result of which you know you will see, you will find unwanted population, unwanted population of insects, microorganisms, other microorganisms, ciliated microorganisms all of them the population increasing in water. So, this is where this oxygen demanding wastes are extremely important to understand. Why this oxygen level actually goes down in water? We have seen that you know how this mechanism of oxygen getting down, the level of oxygen going down in water. This is one aspect you know this is you know about this oxygen demanding wastes, we would also begin to start another, another of this, another different kind of water pollutants and that is about this you know this is the pathogens, pathogens.

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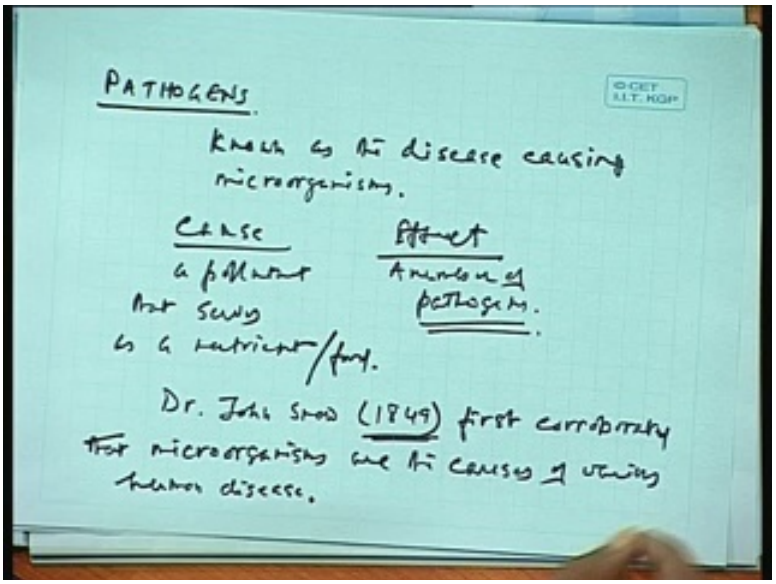

Pathogens are known as, known as the disease, a disease causing, disease causing microorganisms. The pathogens are essentially not pollutants themselves but they are, they have a cause and effect relationship with the pollutants like you know if the, if the, if the oxygen level is going down and if the concentration of waste in the water increase the population of pathogens also increase. So, the pathogens are a, has a cause and effective relationship so the cause is, cause is, cause is, a cause is a pollutant, a pollutant and the effect is, effect is a pathogen effect in a number of, number of pathogens but since the importance of pathogens, the importance of pathogens are so high the importance of pathogens are so important that you know they can be categorized as a pollutant. But essentially as I have say pathogens are pathogens are always there I mean in a natural environment, you will always find organisms which are not so friendly to our living system which are not essentially very friendly to our living systems but none the less when their concentration remains under control, they are not actually very disruptive, they are not as actually causing any diseases like you know as you can see this microorganisms mostly the microorganisms we are dealing with taking about, these microorganisms are you know they are everywhere in fact you know this the microorganisms are basically the reasons of the evolution of the total living kind.

So, the microorganisms are everywhere, you can just go you know finally you can find in the ionosphere also somewhere in this 20, 30 kilo meters above the surface of the earth as well as you will find in deep sea trenches which are say about 5 to 10 kilo meters below the surface of the surface of the sea water. So, you can see the wide range you know they are remaining in different, they are extremely competitive organism which can you know given a chance, given opportunity they would be essentially in able to increase their numbers, they are increasing, they are able to increase their numbers with such a rapidity, so much of ferocity that you know it can cause disruptions at a very, at a very early time, in at a very early time that can cause disruptions.

So this is where the pathogens are extremely important in the sense that whenever there is a certain pollutant, whenever there is certain pollutant going in to a particularly, a organic or inorganic pollutant which is, which serves as a pollutant that serves, that serves as a you can write that serves as a nutrient, nutrient or food, essential nutrient or food would be, it would give rise to increase in the number of pathogens, you know just to try to give a small example here. Say during a, during in your course hols, you will find during particularly during the time of say rainy season when the incidents of say digestive diseases, digestive problems begin to increase. One of the major reasons is, one of the major reasons is the water, the water pipes generally being over flooded at points you know that due to water. This water, the water may supply the microorganisms to enter into the flow of, flow channel of the water. As a result of which you know the number of pathogens increasing, the concentration of pathogens in the water might increase so much that it would be able to a disrupt the bodily resistance. It should be able to disrupt the resistance of the body and can result into various kinds of digestive diseases.

So, in similarly when the water level is low particularly water, water level is low in say you know in a particular reservoir or a particular say particular streams or anywhere, the nutrient level becomes so high, the nutrient level in that water becomes so high, the water becomes so much mineralized that can also invite a higher incidents of, higher incidents of microbial population. So, these in two cases the microbial population would be able to disrupt the life and there are several kinds of diseases that we are generally known of in fact with the understanding

of with this pathogens only the environmental engineering as such started when Dr. johns Snow, Dr. johns Snow first found in, first found in 1849 in first found, in a first, first corroborated, corroborated that that microorganisms are the causes of various human disease, you can say that about this time, about this time only people begin to be aware or the birth of a environmental science has taken place, about this time remember this it is not only 1849 it's about only 150 years from, from now, only 150 years back people first got the idea that the microorganisms can cause different kind of diseases, all right.

Now this is, this is to suggest that till before that time for all kind of diseases people use to have or all kind of problems you know their life they use to have that can relate to diseases, they had an idea that is basically super natural and you know it's because of certain Godly act that you know they suffer but only at about this time, at about this time 1849 first the microorganisms where first identified as the causes of various human diseases particularly the digestive diseases. So, here again as I have said this, the pathogens as I have said they are extremely competitive in nature, this pathogens are mostly this pathogens we would describe you know in that four groups.

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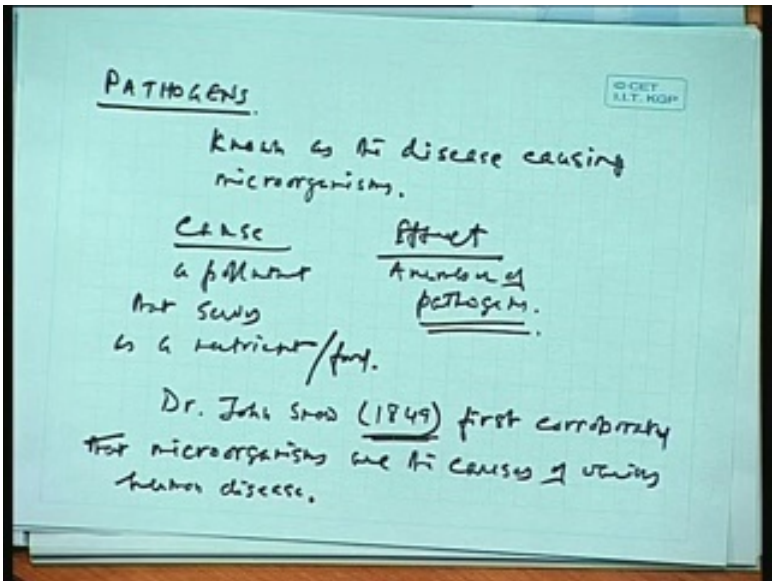

These pathogens are, pathogens are you know they are mostly this, might this virus, bacteria, protozoa and fungi, virus, bacteria, protozoa and fungi. So these are, these are basically known as the disease causing pathogens, these are disease causing pathogens that are generally related in, many of them are related to water many of them are related to water. So this is, this is particularly the disease causing microorganisms, this is they should be when you are dealing with this, this is the mostly, this four group of, four group and their variates, some of them have an protozoa and fungi they have a some, some pathogens might have a property which have a common of something of fungi, something of protozoa something will have, something of protozoa something of bacteria. So this kind of things you know the variates also there, these are the pathogens which can, which are related to the different kind of diseases.

So, here again just to give an some kind of idea you know here it can see that you know there are many kind of diseases that you would just generally there are three kind of diseases that we generally relate to this is one is this they are a, they there pathogens related is water borne, water borne pathogens in a pathogens which are, which are generally water borne then water contact and water, water hygiene. So this water borne, water contact, water hygiene these are the mostly say the pathogens if the say this, they are carried by water they are generally carried by water they washing hands, food, food through washing hands, food say utensils. These they are, they these actions related to these things, they are, they spread and this are this pathogens can result into the different kind of diseases like you know the some of them can be a related to diarrheal diseases, diarrheal diseases, diarrheal diseases then you know guinea worm, right.

These are the typical diseases that over say about over 10 million children under 5, over 10 millions children under 5 years of age die because of water borne diseases every year, every year more than, more than 50 millions children, more than 50 millions children die because of the diseases related to, related to guinea worms, related to this guinea worms below 5 years of age in a, in different parts of the world. Mostly in the countries like you know south Asia, south, south Asia then south America, Africa, sub Saharan Africa in all those places this water borne diseases take away almost about 50 to 60 million children every year and 60 and many of them, they many of them becoming effected and then finally perishing to that. So about this is a relatively very high figure, this is what you can see this water contact diseases are say you know this is the invertebrates, invertebrates existing in water mostly invertebrates you know this is pathing like schistosomiasis, this is the kind of diseases like you know that are generally related to schistosomiasis. Schists, schistosomiasis, leptospirosis, schistosomiasis, leptospirosis these are the, this is, these are the typical you know this sees like diseases you know they are generally you know invertebrates like a, they are, they are of different forms.

Schistosomiasis is a basically a very painful disease which is you know which is a painful and very nagging kind of diseases you know where there the skins and a different parts of the body getting effected by the large worms. It's not basically the small pathogens is basically the invertebrates, invertebrates would be ciliated, ciliated organic cells, ciliated living cells. This ciliated living cells can be extremely you know pervasive they can reach to various kind of the body, various parts of the body by different transport mechanism in the body and can remain there and can be extremely painful and extremely painful and irritating over 200 million people throughout the world are affected by this kind of diseases, 200 million peoples extremely are related to this kind of diseases.

We also find an water hygienic kind of related diseases connected with this, with this skin diseases, skin diseases, all kind of skin diseases you can say write, you can write here skin diseases water hygienic related that is you know a short of water, water hygiene is short of, short of water, short of water. These two are basically related to short of water uses say you know this is water hygiene related diseases are like this which you are going to have if we are not taking bath say for 30 days, the kind of diseases that that you are just going to have in case you are not taking the bath for say about 30 days. So like this you know these are, they are many kind of diseases they have skin disease, very eye diseases also, eye diseases trachoma you know it's an eye diseases, a conjunctivitis.

Conjunctivitis, it's a typical conjunctivitis diseases as you know during the time of say a heavy monsoon and also you know very hot climate in such situations and in the presence of various garbage's you will find that you know this kind of diseases actually originate, originate and it can be, it can be related about say you know this particular diseases can be about 500 million people, 500 million people, 500 million people are affected by this water hygiene related diseases, water hygiene related diseases, water hygiene related diseases. So this can be, this is what is you know one of the major kind of you know as I have said the pathogens are essentially as a cause and effect relationship with the pollutants wherever say you know the water short in supply or water is pollutant in such situations, the pathogens generally multiply and the pathogens can cause to various physiological disturbances, various kinds of physiological disturbances to animals and human beings. So here this is about this you know the next thing is nutrient, nutrients the third one is the, third one is the nutrient.

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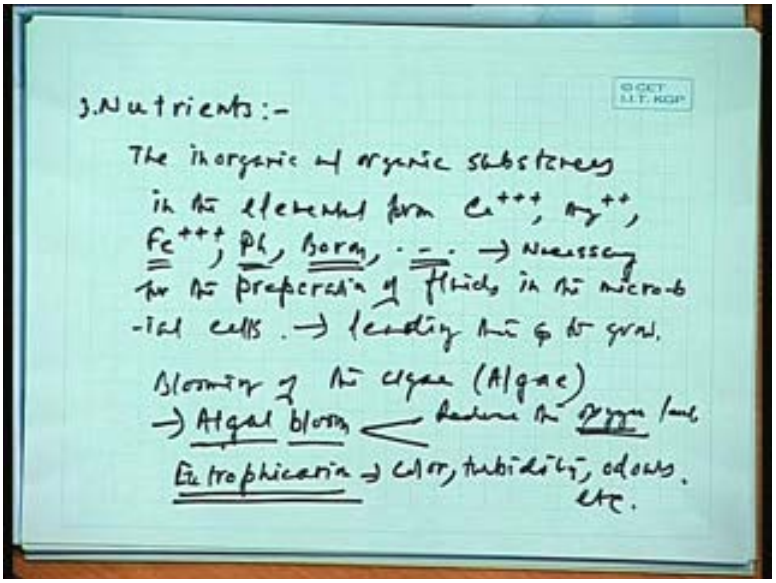

What is a nutrient? The nutrients are, nutrients here is cases you know is here is in all cases the nutrients should be mostly related the substances, the both the primarily inorganic, inorganic and organics substances, organic substances. The inorganic and organic substances generally in the elemental form, generally in the elemental form, in the elemental form, in the elemental, elemental form, elemental form of say you know just like you know calcium, calcium, magnesium then iron then all kind of you know elemental form that we generally would be taken by, taken by the microorganisms, taken by the microorganisms. This calcium, magnesium, phosphorus, this phosphorus, boron, boron all kind of substances these elemental nutrients, these are, these are the elemental nutrients they are necessary for, necessary, necessary for the matrix a say this a, the necessary for the preparation of, preparation of fluids in the, if the microbial in the, microbial cells preparation for, preparation of the fluids in the microbial cells and leading them to grow leading them to grow, leading them to grow. When they are in huge supply, when there is in a great supply of nutrients in the water, when there is a great supply of nutrient in the water or when there is the water level has gone down so much that the concentration of nutrients has increased. Earlier say this particularly takes place during the summer time.

You see the, observe the ponds you know this during the summer time when you will observe that the water level has gone down, the water level has gone down in such cases the water is basically rich in very high nutrients, all this nutrients should be in great supply. This results in, this results in what is the most important thing about this is, this results in the blooming of the algae. This is blooming of the algae, blooming of the algae, this algae or it is called as the algal bloom, algal, the algal bloom, this algal bloom. This algal bloom drives away, this has a impact, this is, this basically takes place because of the very high concentration of nutrients and rich nutrients, high concentration and rich nutrients in the nutrients also have to be very rich in the sense of you know in the balanced portion of, balance proportion all this a elemental irons or elemental substances. This can be you know in the presence of, remember all this in the presence of certain carbonates, bicarbonate, sulphate, sulphide and things like that.

So here this algal bloom which would lead to, this algal bloom would reduce, reduce, the reduce the oxygen level because this algae for their photosynthesis, photosynthesis, for their photosynthesis and for their photosynthesis would take away oxygen and also and as a result of the which you know this algal bloom would takes place, they would drive away all other organisms in the water. It is particularly the algal bloom, if we have observed you know if you just go near a streams or a small stream or a typical say channel where water has been stuck for a quiet sometime and you will find that the water looks greenish, the water looks particularly quiet greenish and if you see in the, if you just take a note you will find that there are a huge algal population being present just below the surface of the water or just above.

You know some of may be observed at the top but most of them would be at the below, this is called the water is this water is almost striped of oxygen. This water would mean that you know this algae, algae just because for there you know different photosynthesis purpose would also you know photosynthesis or you know for their own consumption for own respiration they would consume high level of oxygen. This oxygen would lead to the reduction in the level of oxygen in the water, this particular, this particular phenomena is known as eutrophication, eutrophication and such water would be characterized by a high colour, colour, turbidity, turbidity, odours etc.

This is one, one major problem throughout the world eutrophication, whenever the water level goes down, whenever the water level goes down or the algal population suddenly finds enriched level of nutrients also added with the micro nutrients. In such cases they, they their population begins to increase in such a rapid manner that it would stripe of all oxygen, it would drive away all other organisms then the fishes would begin to would not be able to survive in that environment. Then you will find that the other microbial, many other higher microbial population would not be able to survive and in such cases the water would completely devoid of oxygen and this water can result in you know this result water can result in you know different kind of diseases, different kind of disruptions and particularly say major problem throughout the world wherever there is construction, there is a mining activity there is any kind of in certain agricultural activity this eutrophication is a major problem now because you know in many cases the enriched in the nutrients, enriched nutrients result into the sudden depletion of oxygen in the water which can result into algal bloom. This algal bloom would finally lead to eutrophication, okay. We'll, we'll stop here, we'll again start this, we'll begin this discussion with this water pollutants two in which we know will further discuss on this topic right, okay. Thank you very much.

Preview of Next Lecture:

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So, you start the discussion in where we left yesterday that is about the nutrients, in a nutrients that you know I was also explaining you about you know what are the different types of nutrients and what are their implications like you know eutrophication that I discussed with you. Now as you can see you know this nutrients or this can be coming from both the nutrients if you just try to write this nutrients, the nutrients come from different sources like you know organic, organic or say you know biochemical sources.