Environmental Science

Lecture 3

Forest Conservation

What exactly is **forest Conservation**? **Foresters and local people are working always together to conserve forests**. Because now we have realized as we are losing percentage of forest cover and acute deforestation, we are realizing the causes and effects of such a phenomenon. So conservation of forests has also caught up in a larger scale in many parts of the world. **Extractive reserves –protected forests in which local people are allowed to harvest products like fruits, fibre, medicine, etc. Main objective is to improve the life of people while conserving bio-diversity.** Like we've just spoken about it, forest conservation does not mean, not utilizing any of the resources of the forest. It means careful and calculated utilisation of forest resources, ensuring that we can continue using these resources, for a longer period of time and, even give it to our future generations and posterity.

Afforestation:-The conservation measure against deforestation is Afforestation. The development of forest by planting trees on waste lands is called afforestation. **The main objective of afforestation:- to control the deforestation; To prevent soil erosion; To regulate rainfall and maintain temperature, etc**.

The communities that are involved in Forest Conservation:-The Joint Forest Management:- This concept was introduced in the1980's. In JFM, local communities are involved in planning the Conservation Program eg.- the Tamilnadu Afforestation Project or TAP. **Social Forestry**:- This was used in India in 1976 and this included the plantation of Eucalyptus trees . The efficient use of wood so like we have just mentioned we are going to continue using wood just because forest resources are depleting, it does not mean we completely avoid the use of wood. But it has to be sensible use of wood, where wood can be replaced by other materials, let's go ahead and do it. Where wood cannot be replaced, lets go ahead and find alternatives of making sure, that the trees that we are cutting down are getting replaced somewhere in any other place as well.

Paper made from natural fibres and agricultural residues. China plans to make 60% of its paper from tree free pulp. So that is an effort that needs to be taken global over. Because consumption of paper is not going to stop overnight, or even reduce overnight. So a lot of publication houses , a lot of these book publishers or even schools, institutions, universities have to take a step and measures to make sure you are reducing the uses of paper, reducing the waste of paper. And a lot of these bodies within the government are also trying to reduce governmental records can be done over e-mail or it can be paperless trade. For eg. In India

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Some notable examples in the field of forest conservation :- You have the CHIPKO movement which was started by Gaura Devi. The Green Belt movement by Waangari Mathai. Struggle in Amazonia Chico Mendes. Red wood trees California by Julia Butterfly. So this is across the world in different places, like we just spoke about even recently. It is no longer a national issue or a local issue. Problems that affect the environment, the ecological cycle, the bio diversity are completely global issues and we have to help each other out in solving it.

Recommendations for the Conservation of Forests:-Stop destruction of forests; Use of sustainable Forest Management approach; Research and training program; Proper planning for the whole landscape and not the forest in isolation.

Case Study of Andaman Islands

What has caused deforestation in Andaman Islands? If you look with India gaining independence from British in 1947, there was a colonization scheme for the islands with 1000's of people brought from the mainland India increasing the demand on resources. You are mostly people don't even realize where the Andaman Islands occur. But it is obviously off the coast of Bay of Bengal. It's a very small Island and its dependant for most of its resources major resources to the outer parts of the country. Mostly its either Chennai, Hyderabad, Kolkatta and one of these areas that actually support it. The abundant forests and timber within it has become the source of generation of both income as well as employment. Today the timber based industry in Andamans comprises of two government saw mills, some small private saw mills and furniture making units, and three private plywood units. So this kind of regulation is required. You need to ensure that your timber based industry doesn't grow haphazardly. It is under the control of the government or at least the government is aware of how these resources are getting utilized.

Other causes of Deforestation;-**Strategic location of the Islands**:- The island chain is located in the Bay of Bengal close to the countries in south East Asia, North of an important commercial shipping line. One strategy of the government of India is to strengthen its claim over the islands and it has been to encourage more and more mainlanders to settle in the islands. **A lack of respect or acknowledgement of the life and culture of the ONGE tribe who are the original inhabitants.** The Indian government wants to ensure there are a lot of Indians living on the islands, so it does not leads to a political conflict or wars because of the natural resources that are so rich in these islands. So what they tend to do is they tend to having branch offices many of these offices in Andamans and on a circulation, they do tend to transfer people there, mainlanders or people from the country to go and stay there, at least for a couple of years. And

because of this, they want to increase the Indian population, even though it is a part of India it is weird to call that part Indian population. But the local ONGE tribe kind of pays a heavy price for this. **The Economic Policies:**-such as the subsidies offered to the timber based industry. **Industrial and Consumer Demand:-** such as the increasing demand for plywood from the markets of mainland India.

And these are **the Consequences of the deforestation in the Andaman Islands**:-the people who have the suffered the most are the indigenous communities like the **ONGE tribe** for whom these forests are just not resources but their homes as well**. Soil erosion has increased** due to increased runoff and less interception. You can see this entire hill side has been cleared off. So all the soil that is going to be there will come down in a land slide during rainfall and all the top soil ,fertility, everything is lost. **Higher water levels in local streams** because of the higher level of water runoff, the streams get more water which leads to flooding in the plains. **Increase in landslides. Short term gain but long term economic as well as environmental loss.**

The ONGE Tribe:- The ONGE tribe have been driven away from their homes and forced to move deeper and deeper into the forests. With poaching of their food sources like the wild pig, survival has become very difficult for them. Roads that are bulldozed in the forest to carry out the logging operations give the settlers greater and easier access to the areas that were inaccessible. This has facilitated greater poaching, but has also made it much easier for the settlers to move further into the forest to establish settlements. So once the tribal people are forced further into the forest and as the deforestation is occurring, the so called urban areas or the city areas are expanding, the out skirts of the cities are expanding and because of this the ONGE people are forced to move out of their own homes into areas that are losing identity, that are losing seclusion or privacy and they are getting inundated by people from the outer realms.

Sustainable Solutions to Deforestation:-The government should **discourage migration of people**. The island should be led to concentrate on its tribal people. **Removal of Subsidies** especially for the timber industries and the plywood industry so that they can create alternate sources of wealth and employment .And You can even include encouraging of fisheries ,and re deployment of people, inside the forest department for conservation and wildlife protection activities. **Education and awareness programs** in the islands about the fragility and importance of the islands and the real cost of destruction and to provide positive incentives to encourage conservation. So its very easy to actually say ‘lets educate and create awareness, because deforestation is no longer in a space were people are not aware of its consequences. Even an uneducated person who is living in an area, realizes that if I lose the tree, I’m going to lose shade. And if I lose the tree, the soil is going to become loose. So it doesn’t really have a direct attachment to education. It kind of becomes a part of our living and a part of the consequences.

Its like how you actually know the sun is hot. No amount of education is going to create that awareness. Everyone whose on earth realizes that, yes it is hot, I need shade. No school needs to be teaching that. Similarly awareness can only create certain amount of usefulness in the longer run. Especially maybe within the urban scenario, in schools and all those areas, yes, all of this creates an awareness because we do not know how the ONGE tribes live, how deforestation in tribal areas happens and all of that. But within the area, within Andamans where the intrinsic part of their culture it does not prove to have any recurring circumstance**.** **Improving the Rights of the Tribals** and making settlers aware of their sustainable lifestyles. This is very important because the indigenous tribes are very small and the dominant population in the islands is actually settlers from the mainland. So the original belongers to the Andaman islands are getting smaller and smaller in number and the people who have migrated to that area are getting larger in number. **The Green India Mission** aims to increase India's forest cover from the current 22% to a whopping 33%.

Water Resources

Water resources if you look at it, it's you have waters of different kind, you have the saline water which is our ocean. In our earth you have three different categories. Then you have the ground water and then you have something like the lakes and the surface water. So if you look at the percentage of it, you have the oceans is 97% which leaves a very 3 small measly percentage of 3% for our human consumption. This is a natural wetland. Water resources are sources of water that are useful or potentially useful. They can include agriculture uses, industrial uses, household, recreational, environmental activities. Virtually all these human resources require fresh water. So any of the activities man does from morning to evening pretty much everything requires water either directly or indirectly. 97% of the earth is salt water. Only 3% is fresh water that is slightly over two-thirds of this is frozen in glaciers and polar ice caps. The remaining unfrozen fresh water is found as groundwater with a very small fraction above the ground or in the air. Fresh water is a renewable resource, yet the world's supply of clean, fresh water is steadily decreasing. Water demand already exceeds supply in many parts of the world and as the population across the world continues to rise , so does the demand of water. But the supply of water continues to fall or decrease.

Awareness for global importance for preserving water for eco systems services, has only recently emerged, as during the 20^{th} century as more than half the world's wet lands have been lost along with their valuable environmental services for water education. The frame work for allocating water resources to water users, is registered as **Water Rights**. So everyone has a right to water to a certain extent and to a certain allocated value that we are allowed to consume. There is over consumption in some places and complete void of water in some areas.

Looking into **the Sources of Fresh Water**:- **Surface water** is water in a river, lake or fresh water wetland. Surface water is naturally replenished by precipitation and naturally lost through discharge to oceans, evaporation, evatranspiration and sub surface seepage. Although the only natural input to any surface water system is precipitation within its water shed. That is total quantity of water in that system at any given time is dependent on many other factors like weather. Because precipitation decides what is the level of water in that particular area or surrounding area. These factors include storage capacity in lakes, wetlands ,artificial reservoirs like dams. The permeability of the soil beneath these storage bodies, the runoff, characteristics of the land in watershed, the timing of precipitation and local evaporation rates. All of these factors also have affect proportions for the water that is lost. So when you have evaporation and other kinds of things that are happening obviously there is a constant loss of water happening naturally along with the usage from mankind.

Human activities can have a large and sometimes devastating impact on these factors. Humans often increase storage capacity by constructing reservoirs and decrease it by draining the wetlands. Humans often increase runoff quantities and velocities by paving areas and channelizing stream flow. So all of these are essentially after effects or results of our everyday activities. So you can see, previously ten years ago, independent houses had a lot of area left around them, which was just left as ground area, without covering it with cement pavers or concreting it. Now they concrete everything for better maintenance, because in a few rains it becomes slushy and you cannot cross that area. So now what has happened is our land is getting clogged, water is not, whatever rain that is happening is not reaching 100%, is not reaching either the ground water or the rivers, because man has concreted or water proofed entire surfaces of the built environment. And because of that it leads to water logging. In certain areas, roads are getting flooded. You cannot have the water table increasing when we are having impervious surfaces all around our built environment.

The **total quantity of water available at any given time** is of very important consideration. Some human water users have intermittent need for water. For example many farms require large quantities of water in the spring and no water at all in the winter. To supply such a farm with water, a surface water system may require, a large storage capacity to collect the water throughout the year, and then release it during the short periods in the summers when they want to need it for irrigation. Other users have a continuous need for water, such as a power plant that requires water for cooling. To supply such a power plant with water, a surface water only needs enough storage capacity to fill in when the average stream flow is below the power plants need. So it doesn't have to have a huge artificial reservoir. It could just have a tank sort of a thing that releases the water as and when is required. Nevertheless over the long term, the average rate of precipitation within a water shed is upper bound for average consumption of natural surface water from that water shed.

If you look at **the ground water scenario** over here, the discharge area versus the area that is not getting enough footage or enough greenery is there. A lot of the water is runoff, like we studied in our forest resources. The sub surface water and ground water is lost. And erosion happens when the soil is completely runoff. So if you have sub surface water or ground water which is actually fresh water located in the pore space of the soil. Pore space is nothing but the permeable space of the soil below the or above the rocks sometimes. It is also the water that is flowing within aquifers below the water table. Sometimes it is useful to make a distinction between sub surface water that is closely associated with surface water and deep sub surface in an aquifer also referred to as **' fossil water' or ' trapped water'.** This water could actually be there for decades or even sometimes centuries. And this is what sometimes comes during mining and all of that as springs.

So **how do we tackle with the increasing water scarcity**?:- Fifty years ago the most common precipitation was that of water, we had it as an infinite resource. We didn't think of it as that this perception was that lets not think of water as a non renewable resource. Its never going to be there. We are surrounded by oceans and seas and however much the population increases; we are always going to have water. But the adage is very useful in this scenario, of ' water water everywhere , but not one drop to drink', is very true. Because 97% of the water that you find is salt water, which is not potable, cannot be used even for industrial uses, unless even in a cooling plant it cannot be used, because the salt deposition destroys all sorts of machinery. The salt water cannot be considered as surface water or useful water. At this time there were fewer than half the number of people on the planet. People were not wealthy as they were today, consumed fewer calories, ate lesser meat. So lesser water was needed to produced their food. They required a third of the volume of water we presently take from the rivers. Today the competition from water resources is much more intense. And all of these changes that have occurred is within the last 50 years, not centuries ago, not 300, 400 years ago but very much within this lifecycle. This is basically because now you have seven billion people on the planet, their consumption of water thirsty meat and vegetables is rising, and there is an increase competition for water from industry caused by urbanization, bio fuel crops, water reliant food items. In future even more water will be required to produce food because earth's population is forecast to rise to 9 billion by 2050. An additional 2.5 or 3 billion people, choosing to eat fewer cereals and more meat and vegetables could actually add an additional 5 million km to the virtual canal mentioned above. So you have a virtual canal of water in our hive, in our mind because this water supply is considered finite. We have only X litres of water in our future and how do we go about distributing it in this vast population. So when you have a water body in our mind with so much capacity, how do you go about feeding the ever increasing population? Not only in terms of direct consumption but indirect consumption in industrial areas. In areas by cities while building, while construction. All of this requires water. Even to cure cement, cure concrete everything water is required. One third of the world's population does not even have

access to clean drinking water, and that's one of the studies that occurs in all over the world. The main mission of developed countries is, how do you go about supplying clean drinking water to parts of the world where drinking water is a luxury, and they don't even have a sip of water to drink or consume. It leads to a lot of economic diversity because of this, a lot of social diversity because of this, and a lot of haphazard development. So to actually avoid a global water crisis, farmers have to strive to increase productivity, to meet the growing demands for food, while industries and cities find ways to use water more efficiently.

Depletion of aquifers due to expanding human population:- Competition for water is growing such that many of the world's major aquifers are getting depleted. This again due to both direct human consumption as well as agricultural irrigation by ground water. Millions of pumps of all sizes are currently extracting water from ground water throughout the world. Irrigation in dry areas such as Northern China and India is supplied completely by ground water and this is being extracted at an unsustainable rate. Because ground water is depletion cannot be resurgent as much as surface water. Because for ground water to get replenished its not sufficient in one rainfall that's going to change. The rainfall has to get absorbed by the ground, it has to go through different layers of the soil and then settle down under the water table. And when this rate of taking out the ground water cannot be quantified, because these sumps are drying up in many areas and as a result of that more sumps are coming up. We are not trying to find out what can be done as an alternate source of getting water . Cities that have an experience aquifer drops between 10 to 50 meters include Mexico city , Bangkok, Manila, Beijing, Madras and Shanghai. So that's where are water table is at the current time. So lots of conflicts occur because of water and that is what they say is even going to be the reason for world war three. Because water is one resource that man is going to fight for. Land comes in second. But without quality water, wars will be fought and not just political reasons. Because there are parts of the world that are dependent on salt water solely like the middle eastern parts which are surrounded by only the sea and they have no rivers. They are so dry and arid that they have no ground water. So there is obviously fierce competition for fresh water and this will definitely become a source of conflict and wars in the future. So you have world banks stepping in, United Nations stepping in, to find out what can be done to better the situation. The water wars hypothesis actually has its roots very much in history were it happened in Indus, Jordan and Nile. These rivers became the focus of many civilizations and civilizations that became extinct because of the lack of rivers or because of lack of water in these rivers. So however while some links have been made between conflict and water, they don't actually necessarily have to represent the norm or the future. If we take these water based issues and try solving them in a sustainable manner which will enable not only the human environment to grow in a better fashion but also the ecological cycle to continue in a well mannered fashion. It is very important to create a balance between consuming water resources rather than over exploiting water resources.

The only known example of an actual inter-state conflict over war water took place between 2500 and 2350 BC between Sumerian states of Lagaash and Umma. Water stress has more often led to conflicts at local and regional levels. Even for example the Kaveri water that is, conflict between Karnataka and Tamilnadu is because of water. It is not a political reason, it is not because of the people or jobs scenarios. Water is a main cause of conflict. Water stress can also exaberate conflicts and political tensions which are naturally not caused by water. Gradual reductions over time in quality or quantity of fresh water can add to the instability of a region, by depleting the health of a population, obstructing economic development, and exaberating larger conflicts.

World supply and distribution:- Food and water are two basic human needs. However global cover figures from 2002 indicate that of every 10 people, roughly 5 have a connection to a piped water supply at home either let it be in their own house or right outside.; 3 make use of some sought of improved water supply such as a protected well or standpipe; 2 are unserved; In addition 4 out of every 10 people live without any improved sanitation. At the Earth summit 2002, governments have approved a plan of action that, half by 2015 the proportion of people unable to reach or afford safe drinking water. It actually defines reasonable access of water to atleast 20 litres per person per day from a source within 1 km of the user's home. They also have a plan of action to half the proportion of people without access to basic sanitation. Basic sanitation as a private or shared but not a public disposal system that seperates waste from human contact. Water supply and distribution is very crucial especially as population growth is rapid, and in countries such as the middle east , Africa and Asia, the large urban and peri-urban areas will require new infrastructure to provide safe water and adequate sanitation. This actually suggests growing conflicts with agricultural water users, who currently consume the majority of the water used by humans.