Environmental Science

Lecture 2

Forest Resources of India

If you actually look at the overall layout of forests in our country, you can see there is obviously an extra over exploitation area is the northeastern area and then you have the states of Uttarkhand, Himachal Pradesh and parts of Jammu and Kashmir. And another very important belt over here is in and around Chattisgarh, Orissa and Madhya Pradesh. And in the south the most important forest belt that we have is the Western Ghats. And because these are the areas that have a concentration of forests, these are the areas that are benefitted by it, as well as face the problems caused by it in the longer run. So, if you look at the northeastern belt over here, you have different types of forests, and because of that the rivers and all of them are all inter connected. Similarly Uttarkhand, Himachal Pradesh and Jammu and Kashmir also have an intrinsic relationship, because of the type of forest and forest cover. And the Western Ghats in the south, is very much telling and it continues on to have political impacts as well in the longer run.

Now looking at the **Types of Forests in our country** we'll be discussing this in detail. But to just show you an overall layout of where the forests are. In the northeastern belt and in the Western Ghats alone there is a small strip of tropical evergreen vegetation. But the maximum that you see in our country is the thorny vegetation and the deciduous vegetation which is the predominantly marked by yellow.

Now if you look at **the Different Types of Forests in our country** , you have **the Moist Tropical Forest**. So this is referred to as Tropical wet evergreen. So where you find these are the western Ghats,. The states that has it is Maharashtra, Karnataka, Kerala. **Tropical Semi Evergreen**:- semi evergreen as the name suggests they do have a period were the leaves do fall. Trees are barren. Not like the first category throughout the year they are perennial trees were they are evergreen. In this you have the lower hills of the Western Ghats. Then you have the **Tropical Moist Deciduous** which is found in Dehradun and Mahabaleshwar. Damp forest of Sundarbans, Bengal delta and Andamans. So you can see over here is the tropical evergreen and over here you have the semi evergreen which is pretty much forest cover with shrubs and a lot of smaller plants. It is not only the tall evergreens like you see in Karnataka over here, you even have shrubs and grass, different kinds of grass in this lower hills of the western Ghats. Here you have the moist deciduous. You will see the forest cover is not as dense as that is in the evergreen. A lot of sunlight does penetrate through into the forest and these are the mangroves or the moist damp forest you find in Bengal delta and Andamans. Western ghats are another bio- active forest cover of India. Here you have the Kudremukh national park in Karnataka**.**

Dry tropical forests:-. Here you have again the different types you have are the **Tropical Dry Deciduous** which is found in Madhya Pradesh and Uttar Pradesh. Again you can see a different colour in the foliage. It is not as dark as it is but a lot of yellow and lighter green is involved. And again there is a shedding period for these leaves and they do not stay permanently evergreen. Then you have the **Tropical Thorn forests**. You have in Delhi, Punjab, Gujarat. You might think what exactly is a thorn forest? In ways of it doesn't provides in terms of forest cover, you can see it is very sparse a lot of it does get dry because of the intense heat in those states. But they to provide for a very important element of preventing water runoff. Whatever little precipitation is there it helps the land and the soil absorb it in a better manner. And then finally you have the **Tropical Dry Evergreen-** Eastern Ghats in Andhra Pradesh and Tamilnadu. Again this is very similar to the wet evergreen, dark, thick forest with very little light permitting in the forests. Madhya Pradesh has the largest forest cover in India. This is the protected forest in Van Vihar National park in Madhya Pradesh.

Montana Sub-Tropical Forests;- These you have the **Coniferous Forest** . The **Sub Tropical Broad** you have Shillong in the north east and Niligiris in the south. Sub tropical all of these you can see are a very hill station type of mode you have over here, at a much higher elevation above sea level. It is no more plains. It is no more forest in a plain level or surrounded by rivers. Its in the source of the river if at all there is a river by it. You can see the quality of air very foggy, thick dense forests, tall trees. So these are the typical characteristics of coniferous forests. The second you have here is the **Sub Tropical Pine forests**. This you find in Arunachal Pradesh and Kashmir. Then you have **the Subtropical Dry Evergreen**. This is found in the foot hills of the Himalayas. So in the foot hills, what happens is, the density of the forest cover isn't as much as it is in the upper slopes. Light permeability is much higher. Visibility is much higher, versus you can see in Shillong and Niligiris the air quality, the visibility is much lower. Arunachal Pradesh has the second largest forest cover in India and its largest primary forest cover. Above is the Bong-bong falls within a forest. So you can see the inter relationship between water for water resources and forest resources and how intrinsically they are connected to each other.

These are **the Montana Temperate Forests**. You have **Montana Wet Temperate** in Niligiris and Palmi hills. **Himalayan wet temperate** which you find in Assam and Himachal Pradesh. **Himalayan dry temperate** which you have in Kashmir. So like in this image that you see tall trees with fur right in the tip of the trees, surrounded by a lot of different foliage shrubs, and grass. So it is not only a dense forest in terms of the girth of the trees, but here the density comes in the forest cover of shrubs and smaller plants.

Then you have the **Sub Alpine Forest**. You have the **Moist Alpine Scrub** which is in the higher Himalayas. Because of the moisture in the air and closer it is to the higher altitude it is, it has a constant dew which is happening on the plants. So it is moist alpine scrub. And the lower you

come here you have **the Dry Alpine Scrub** which is around Sikkim. So different we have about 16 different forest types. And the most common you find within our country is the **Tropical Dry Deciduous** which covers about 38%. **Tropical Moist Deciduous** which covers about 31% and **Tropical Thorn** nearly about 7%.So these 3 types of tropical deciduous forests accounts for nearly 76% of forest area in India. Nearly 96% of the forest are owned by the government and 2.6 by corporate bodies and the very small percentage in private ownership.

We'll move onto the **Function of Forests**:-Now we have seen the different types of forest that exists within our country and because of these different forests types, the climate surrounding these areas are different. The types of trees that grow there are different. The types of foliage is different. So the functions will also differ vastly. So we have 4 prominent broad functions- **protective function, productive function, regulative function, accessory function.**

So if you look at the **Protective Functions**;-Forests provides protection against soil erosion, droughts, floods, noise and radiations. So one of the main important reasons is, if forests are cut, that is the main reasons ,of especially in hilly areas, when rain occurs and floods occur, landslides happen because there is not enough forests cover to prevent the water runoff. Soil erosion happens again because of lack of water runoff, because the top soil gets eroded which means we lose the fertile components of the soil. So soil erosion you have two types of soil erosion. Number 1 where you have the removal of the top soil which is all of the nutrients or value of the soil. And the second is what we just spoke about in hilly areas where it causes landslides and complete disruption of different layers of the soil. Floods another very important phenomena that occurs and droughts as the other extreme other end of the spectrum were you have no water because of the complete lack of forest cover.

Productive Functions:- if you look at they produce various products like gums, resins, medicines, katha , honey, pulp bamboo, timber and different kinds of fruits.

If you look **at Regulative Functions** :- The forests regulates the level of oxygen and carbon di oxide in the atmosphere. The forest also helps in regulating temperature conditions. Like one of the prime examples if you look at is, when you climb up any hill station, number 1, yes, the altitude does change so the temperature drops drastically. But you have a lot of hilly regions up north, were again the altitude does change, but the temperature you will feel does not drop as much, because of the lack of forest cover or lack of trees. So trees play a very important role. So now you can see the cycle of carbon cycle is happening over here. You have the trees, you have the decomposition, the soil organic matter gets collected. Then some of it goes into nutrient uptake. Then mineralization. That is the minerals get absorbed by the soil. Then you have a lot of gaseous loss and then co2 getting emitted. So you have below the ground one entire cycle taking place, above the ground. Above the ground carbon dioxide is a crucial component and

oxygen is another crucial component for all kinds of living things to exists especially for plants and human beings to co-exists in a very compassionate manner.

So **Production of Oxygen**:- During the photosynthesis process forest release oxygen tremendous amounts, because it is a very important gas for human survival ,and therefore is referred to as lungs of the earth. Even in within a city area, if you have a park it is referred to as a green lungs space, because that's where the air gets pretty much purified or the concentration of oxygen is much higher in those areas.

Accessory Function:- Forests provide aesthetics, habitat to various flora and fauna. Besides that it also has a lot of recreational value or tourism related value. So this again becomes a two edged sword in the sense. the habitat it provides to flora and fauna is very important. It is an essential part of our bio diverse culture. At the same time, when tourism happens in these areas, and if it is not eco friendly tourism, or not done with any sort of rules and regulations, we in turn start hampering the flora and fauna of that forest and thereby we reduce the value of that forest by detracting from it. So this becomes a viscous circle then. So lots of forests areas are left to be away from the human touch, away from tourism and there are certain parts of the forest, closer to certain urban areas that are left open to tourism, so that there is a balance that can be maintained.

Ecological Importance or Uses of forests;- So **regulation of global climate and temperature**.:- Forests plays a crucial role in regulation of Global climate and temperature as the forest cover absorbs the solar radiations that would otherwise be reflected back into the atmosphere by the bare surface of the earth. Transpiration of plants increases the atmospheric humidity which affects the rainfall, cools the atmosphere and thus regulates the hydrological cycle.

Reduction of Global Warming:- The main green house gas co2 is used by forest for photosynthesis and this acts as a sink for co2, thereby reducing the green house effect due to co2.

Conservation of soil:- They prevent soil erosion by binding the soil particles tightly by the roots. They also reduce the velocity of wind and rain which are chief agents causing erosion. So what trees and plants essentially end up doing is, they offer a lot of resistance. Well let it be heavy rains, or lot of dry winds. So whatever the cause obviously helps in the prevention of soil erosion and because of soil erosion there are number other factors that hampered by humans as well as they are effecting humans in the longer run. So actually having a forest cover proves to be very useful.

Improvement in Fertility of Soil:- The fertility of soil increases due to humus formed by the decay of forest litter. So you have the habitat to the wildlife. They provide the habitat for high wildlife species which could actually, like we just mentioned, lead to the endangerment in the

longer run. Because humans are taking over, part of these forests, because we have realized how useful these forest are. Let it be for the timber. Let it be for the resins or the different kinds of gums we get from the trees or the different kinds of fruits or the leaves, whatever the reason, we are over exploiting these forests. And the rate of usage of these trees has to match the rate of growth of the new trees that are being planted. So we have to make sure we do not tamper with this balance.

Absorption of Air Pollutants:- Forests absorbs many toxic gases and air pollutants and obviously help in keeping the air pure. But this again is only within a set of balance. If you have a forest cover of say 1 square km and it has a, it's a densely packed forest it can only absorb certain amount of air pollutants and poisonous air. Beyond that realm if it goes, the forest is going to get affected by that.

Economical Importance of Forests:-number 1**- Timber**:- You cannot imagine life without wood. Wood is intrinsically woven in our lives. Wood is used for commercial purposes like making furniture, other items like boats, bridges and other everyday uses**. Fuel wood**:- This is used as fuel for cooking and other purposes but by the poor people or the local tribal people . **Raw materials for wood based industries.:-** Forest provide raw materials for various wood industries like paper, pulp, sports goods, furniture, match boxes, etc. **Food:-,** fruits, roots, leaves of plants and trees along with meat of forests animals provide the food to tribal people. **Miscellaneous products**:- like medicinal based products like resin, gums, medicines ,katha , honey are also provided by forests.

Deforestation

Now What happens in the other end of it when we start depletion of forests resources or start cutting down the trees in a haphazard manner. So like exploitation of forests is nothing new. Since man has come on earth he has obviously depended on trees let it be for keeping himself warm, for firewood, for cooking his food, let it be anything. Since man has been on earth depletion of forests resources has occurred. The only change that has happened in the recent time is, because of over population and over pollution, depletion of forests has happened in a larger scale, and it does not match the rate at which the new trees are getting planted or trees are growing. The rate of growth and the rate of cutting down trees are nowhere in coherent balance as compared to what it should be to ensure that we continue having a healthy forest cover.

The **Main Reasons for Large Scale Depletion** you have are ;- expansion of agriculture, so more forests have been cleared for agriculture; Large areas of forests lands have been cleared for urbanization and human settlement; commercial exploitation of forests; forests fires ; mining activities in forest areas; forests diseases are also partly responsible for depletion of forests. But

this is not under the control of human beings and another thing is it is a very small percentage. You can see in all these points that we have discussed human related and man causes half of these or more than half of these problems. Nature is responsible for a very small percentage. Forest fires initially what could be considered as an element of nature is now also being utilized by people to clear forest and blaming nature as an after result. Were you actually light 1 tree on fire and ensure that it is cleared so an entire forest would be cleared out for whatever reason it needs to be cleared out. And when an area of forests is cleared out you just don't lose the trees, you lose out on birds that require for pollination, you lose out on bees, you lose out on the smallest of smallest insects and animals that are dependent on that forest area. And all of this has a huge impact on the bio diversity or the ecological cycle in the longer run.

Adverse Effects of Depletion of Trees:- It has contributed to the rise in temperature. It has contributed to lesser precipitation that is rainfall or snow depending on which ever area. It is responsible for increased rate of soil erosion. It is responsible for increase in the frequency and volume of floods. It has led to the loss of soil productivity. It is responsible for the loss in bio diversity. It has lead to extinction of several species of plants and animals and it causes an imbalance in the eco system. So a lot of these adverse effects are also related to each other in the sense that lesser precipitation means droughts and if you have a higher rise in temperature it means global warming. Then when you have soil productivity going down because of soil a type of soil erosion. And you need when you have extinction of several species because of forest fires or forests related diseases, loss of bio diversity and eventually causing an imbalance in the eco system. So even these adverse effects are interlinked to each other and can cause a domino effect or a chain reaction. A typical what you would see in many forest areas, thick densely populated forests were actually the fire services cannot even reach. You just see blazing forests and you have to just wait for nature to play its own role to douse these fires.

Conservation of Forests:- **Regulated and planned cutting of trees**. So this is very crucial. Like how you've poaching of animals, there is even poaching of trees. Certain trees are not meant to be cut, especially trees that grow very slowly and mature at a very slow rate. They have to be not at all cut, or even at all, if they are cut, it should be within planned intervals of time, where suitably other saplings are planted in the forest. And when you think of saplings in a forest, it just does not mean a foot tall plant. You have to wait for it to become a miniature tree for it to start growing well. If you just plant 100 saplings in a forest, may be only 10 would mature into trees. The others would die because of weather conditions, diseases, pests, or any other reason. So all of these saplings have to mature into trees. And for that to happen you need to plant atleast 1000 or 10,000 to have a successful forest cover. **Control over forest fires; Reforestation or Afforestation;-** Reforestation and afforestation are actually slightly different from each other even though the end game is lets make sure our forest are thick and green. **Reforestation** is could even be going to a developed area and if that developed area is no more

in use or lacking in use you could create a lot of forest cover like plants and replant certain saplings or trees can be transplanted there. **Afforestation** is within the same forest as and when you keep cutting down trees, you need to ensure that new plants are planted. **Check on forest clearance for agriculture and human habitation and settlement; Development of green belts around cities; Checking of mining activities in forests areas; Protection of existing forest areas and conservation of threatened species of trees.** So it is very important that even though forests just grow in their own pace and it is usually referred to as 'wild Forest' and not a planned forest. There should be a body within the government that is incharge of making sure and identifying the different species of trees, plants and shrubs and grass within that forest. It is only then that we will know if illegal cutting is happening or illegal poaching of certain elements of trees are happening. And another thing is pulling the tree right from the root. Usually cutting of trees is done in a planned fashion by people who know where to cut in the tree. Cutting the tree from the root ensures that the tree will take forever to grow again. But if you cut it at the right place for different species of trees, the tree will continue growing and we can still benefit from the timber and other aspects of the tree. **Social forestry and agro forestry; Development of national parks and game sanctuaries; Development of botanical gardens; Development of seed banks; Forest Management; and Proper role of the government in forest conservation.** So if you look at a couple of these points over here especially with game sanctuaries, national parks and botanical gardens, all of these three elements actually involve a tourism angle. Because tourism cannot be just discouraged completely, because a lot of revenue is generated by tourism and this revenue can further be put into the development of the forest. But tourism has to be eco-friendly tourism, responsible tourism and not detracting much or taking much from the nature's resources or forest resources. **Conservation of forest**, **replanting, seed banks** all of these are very important. Making sure we can protect our earth and its not only creating new forests but preserving our current forests.

Deforestation:-It means **reckless or large scale felling or cutting of trees** by man for commercial and other purposes. The FAO that is the Food and Agricultural Organisation of the United Nations defines change of forest with depletion of tree crown cover more than 90%. So like we've just discussed, when you use machinery to fell trees, it cannot be done in a regulated manner. When its just a bob cat with the machine saw going and cutting down forest, you cannot decide where exactly the individual tree can be cut, and whether it can re-grow again. If its not done in an organic fashion, that tree is dead right from the root. So we have to ensure that the deforestation doesn't actually mean cutting down any tree. If the cutting down of trees is done in a regulated organic fashion such that in a couple of years the tree can be productive again. It cannot be referred to as deforestation. The terms reckless and large scale are very crucial to define what deforestation is. It is a complete removal of forest cover, without making an attempt to ensure that the life of the forest continues. It is completely removal of forest

cover, so it can be used for another purpose entirely, say an urban development or it could be a theme park, it could be any of these reasons.

Causes of Deforestation:- Desertification; soil degradation and soil erosion; Loss of vegetation cover; Destruction of natural habitat and loss of wildlife; Changes in climatic condition; environmental pollution; Damage to the eco system; Reduction in soil moisture. So the causes and the effects are again inter related. Desertification is a cause of deforestation yes, but as an effect of what happens when forest cover is removed is also a continuation of the same process.

How do we go about Controlling Deforestation?:- Prevention of human settlement in forest areas; Check on expansion of agriculture into forest lands; Prohibition of setting up of agriculture into forest lands; Check out on reckless cutting down of trees; Controlled mining in these areas; Check on construction of large dams in forest areas; and check for controlled grazing in forest areas. If you look at the cycle over here you have **Intermediate treatment, Reforestation, harvesting, Site Preparation**. All of this goes in to be a clear cycle of how afforestation helps and at the same time we are utilizing the resources of the forests. We are not saying the forest should not be untouched or unkept. It just means that the level we take from the forest we have to give back at the same rate.