Sustainable Planning and Architecture

Lecture 3

Ecosystem

An eco-system includes all of the living things (plants, animals and other organisms) in a given area, interacting with each other, and also with their non-living environments (weather, earth, soil, water, sun and atmosphere)

So what they are saying is, in an eco-system it's an interaction between living and non-living things in a day-to-day life as we can come across, we can see how sun helps the plants to create Photosynthesis and by Photosynthesis create its own food. And living organisms like cows dependent on the plants and we are dependent eventually on the both plants and animals for over own lively hood.

So, Ecosystem simply means "Ecological systems" Ecology is the study of ecosystems.

Going to detail about ecosystem that are different scales so first let's see how it works in smaller scale consider a small puddle at the back of your home. In it, you may find all sorts of living things, from microorganisms, to insects and plants. These may depend on non-living things like water, sunlight, turbulence in the puddle, temperature, atmospheric pressure and even nutrients in the water for life.

So as you see in these picture the sun which is present in the right side it the creating sun light which is used by plant to create Photosynthesis and this is eventually giving out energy as in the form of food for insects and other organisms like snails, frogs which are using the water for its lively hood. And then these water and animals which means we are dependent on them. Even the small insects by tadpoles, flies and water weeds are been interconnect with is eco-system. Whenever it get disturbed and whole different scenario happens which disturb the entire nature of this pool.

Anytime a 'stranger' (living things(s) or external factor such as rise in temperature) is introduced to an ecosystem, it can be disastrous to that ecosystem. This is because the new organism (or factor) can distort the natural balance of the interaction and potentially harm or destroy the ecosystem

If anything strange organisms or external factor such as raise in temperature occurs in that ecosystem it may destroy as we saw in the earlier picture consider the same puddle as example if there is raise in temperature and these water get completely drained off, so in that case fish eventually dies, Tadpoles which is present within the pond also dies and then this will not have any water veers to grow, it will eventually make the frogs, snails and star. Everything is interconnected even though it is small factor which is extremely important in the ecosystem and we cannot eliminate even one factor which is neglected as less of the importance.

Usually, biotic members of an ecosystem, together with their abiotics factors depend on each other. This means the absence of one member, or one abiotics factor can affect all parties of the ecosystem.

What they are saying is like biotic factors are living things which is like plants, snails and water veers and everything, so abiotics factors such as environment and the gases present around it sun, solar radiation and everything over comes around the non-living organisms. So both are interconnected with each other and one cannot be neglected.

Unfortunately ecosystem have been disrupted, and even destroyed by natural disasters such as fires, food, storms and volcanic eruptions. Human activities have also contributed to the disturbance of many ecosystems and biomes.

So, we know by natural disasters and calamities. How much place can be destroyed consider the reason floods that been happening here which is reducing the ecosystem and disturbing the ecosystem which takes months or years to restore to back to actual normal form. Suddenly increasing the water or temperature it may kill all the fishes which may look like a small thing. But it will affect on a larger scale over all ecosystems of aquatic creatures.

Looking further into Biotic vs. Abiotics Factors

As we tolled before biotic factors are living examples such as (plants, animals, fungi, bacteria) these are the ones which create its own food with use of Abiotic factors which are non-living examples such as (water, sunlight, soil, air, temperature).with the uses of plants provides Photosynthesis and plant lives with the help of water and plants also need soil for its stay and then plants also takes air

which it as carbon dioxide and its need an ideal temperature for which to grow. This plant is eventually been eaten by animals and decomposed by fungi and bacteria.

Scales of Ecosystem

Ecosystem comes in indefinite sizes. It can exist in a small area such as undemeath a rock, a decaying tree-trunk, or a pond in your village or it can exist in large forms such as entire rain forest. Technically, the Earth can be called a huge ecosystem.

So, we cannot define a ecosystem is a definite scale, so is completely indefinite it can happen in numerous numbers in different scales just below the tree trunk are under a rock, we are also a part of ecosystem, we are on the larger scale even on a rain forest an ecosystem occurs. So combination of different small scale which can form an indefinite scale of an ecosystem

As we seen in this picture in decaying tree trunk you have the humidity as in atmosphere which make this tree to form fungi, ants, rotten matter and other insects such as frog , snake are also present in these area. There is interaction between these things which forms the abiotics organisms and which is dependent on non-living organisms such as humidity, sun and temperature.

Let us see how these live members relate to each other in the tree-trunk ecosystem:

Humidity: which is abiotic factor, provides moisture for the tree to decay so, the tree-trunk is depending on humidity to be able to decay.

As we know so, when the tree decays there is a lot of humidity present. When we touch a tree, which is been decayed we can feel it can be completely wet so it happens due to the presence of water content in the air. This is humidity.

And then the decaying trunk provides fertile grounds for tiny green plants to grow. So when there is humidity naturally the smaller plants, we can see even in-between the concrete flooring we can see small cracks which forming small plants to grow which its due to the humidity is been present in the ground. Likewise same happens in the decaying tree- trunk. And then tiny green plants become food for **bugs and insects** that live around that tree-trunk.

As we said before, since these plants are growing it becomes as a food for the bacteria and smaller insects which is been present and due to the humidity content around the tree. Bugs and insects become yummy food for smaller animals like this frog!

So we must have noticed in a decaying trees there will be lot of frogs, snakes, snails it all present because there is lot of food from the smaller planet which is been growing due to the other two factor that we discussed before, and the frog becomes dinner for the big snakes hiding under the tree. So, we might also notice snakes which is been feeding on the frog which is ventrally dependent on other factors all these part of ecosystem which is been found under decaying tree trunk.

So, there you go! You will notice that if one member is taken out, the entire relationship will be affected. For example if a fire burns out the tree-trunk. The insects will starve to death, and the frog will have no food, and the snake will have to go somewhere else to look for food. The ecosystem will be no more. As we told before let say if the tree has been caught up with the fire everything complete dry so, what will happen is the humidity doesn't exist anymore and the plants and small insects which are present in the tree due to the humidity, will everything completely get destroy other organisms such as frog and snakes which is been eating on the smaller planet which is been created due to the other factors which is the no more present. So, they cannot be there because there is no food. So they will start eventually moving out in search of food to some other ecosystem, this ecosystem will not exist that time

To make thing simple, let us classify ecosystem into three main scales.

Micro:

A small scale ecosystem such as a pond, puddle, tree trunk, under a rock etc

In a Micro scale as we discussed before like decaying tree or a small pond in which we can see smaller insects and few other organisms such as big-snails and frogs which is been depending and there is interaction between each other. That is been classified as micro scale of ecosystem.

Messo:

A medium scale ecosystem, such as forest or a large lake

Messo is like a medium scale of ecosystem in which it happens with more number of organisms compared to micro scale. Which is been small and finite, when we go to messo lot of other biotic and abiotic members get involved which make the scale even mush bigger.

As we saw on a large pond or a forest, so first everything start with a climate the which is been dependent on plants and plants which is been present due to topography and soil and because of plants. There is animal so we cannot take any one of these element from the ecosystem because it will destroy the ecosystem completely. So this comes under the messo scale of ecosystem.

Biome:

A very large ecosystem or collection of ecosystems with similar biotic and abiotic factors such as an entire Rain forest with millions of animals and trees, with many different water bodies running through them.

So as we know these Rain forest and serious forest, this is been present on the world, which covers lot of Akers and area. Which has lot of different varieties and different specious of animal and plants. Which is been interconnected with each other and also everything becomes a part of the ecosystem. Even one thing is spoiled the entire ecosystem will spoiled. This happens in the larger scale like tropical or deciduous rain forest trees and forest.

Individual is a smaller scale is a finite and Population includes a collective of individuals which also forms biome and then community which is different categories of different specious, which is been involved by the population which forms different community for example when we see these picture, we can find different animals which is been running around, which forms different community like (group of tiger, group of lions, owl or dear). It as the environment and community which is the part of population and which is an individual as well which is connected by the environment sunlight and air. And these everything forms a biome. Which is on a more of country level ecosystem and these is the part of Biosphere which is the entire earth.

- Ecosystem boundaries are not marked (separated) by rigid lines. They are often separated by geographical barriers such as deserts, mountain, oceans, lakes and rivers. As these borders are never rigid, ecosystems tend to blend into each other. This is why a lake can have many small ecosystems with their own unique characteristics. Scientists call this blending **"ecotone"**

Consider a large forest are a lake in which they are lot of smaller ecosystem which is been happening so we cannot put a boundary, this ecosystem will happen at only these area, these ecosystem will happen in these area. So its more like a dynamic things which happens even if there is no food in one ecosystem, one specious might come to next ecosystem, so there is no specific region or boundary which can separate this there is lots of transition ecosystem which happens too. So these are called as blending ecotone.

- Ecosystems can be put into 2 groups. If the ecosystem exits in a water body, like an ocean, freshwater or puddle, it is called an **aquatic ecosystem.** Those that exist outside of water bodies are called **terrestrial ecosystems.**

  so ecosystem is been divided into two category which is like aquatic water system which happens in the water within the water community more like water, veers and plants which grow within the water snakes, water veers and tadpoles which is present only in the water usually it cannot come out. Other ecosystem which is been divided is called terrestrial ecosystem which happens outside the water body the ecosystem happens within a forest or much bigger scale like a biosphere all these comes under **terrestrial ecosystems.**

As we seen this is the pond it shows different ecosystem so if you consider this as an aquatic ecosystem that is a interaction between these elements and which is called as aquatic ecosystem. And then land ecosystem is the plants and trees. And other animals which may be present only in the land But when you compared these animals such as tortoise or frog, which can stay even in land and water so this forms a transitionally ecosystem they depend on the both their ecosystem in aquatic or land ecosystem, so this transition ecosystem is called ecoton. This usually forms in mossier lands.

Levels of organization in an Ecosystem

To understand the levels of belonging in an ecosystem, Let us consider the diagram below.

So this happens in the individual level, population, community, ecosystem and biome and biosphere now let see how everything is interconnected.

Individual, Species, Organism:

An individual is groany living thing or organism, Individual does not breed with individual from outhauls. Animals, unlike plants, tend to be very definite with this term because some plants can cross-breed with other fertile plants. In the diagram above, you will notice that gill, the goldfish, is interacting with its environment, and will only crossbreed with other gold fishes just like her.

When you saw this picture, this individual which shows one fish which can interact or crossbreed with the same fish which is of the same category again like gold fish these forms an individual ecosystem.

Population:

A group of individuals of a given species that live in a specific geographic area at a given time (Example is Gill and this family and friends and other fishes of Gill's species). Note that populations include individuals of the same species, but may have different genetic makeup such as hair/eye/skin color and size between themselves and other populations.

When you move on to population it still the collective individuals which found the population it does not include anything from the outside. So it cannot include any gill fish or cat fish which is not its own breed, so this population everything may not be the same like humans we are all different each one is different same way it happens in other species also considering the fish.

Community:

This includes all the population in a specific area at a given time. A community includes populations of organisms of different species. In the diagram above, note how populations of gold fishes, salmons, crabs and herrings coexist in a defined location. A great community usually includes biodiversity.

As you seen these picture lot of other individual from different community which is been interacting and it forms a ecosystem involving different species, when you look at these picture it as plant, gold fish, scorpion, jelly fish and some other fish from different community.

Ecosystem:

As explained in the pages earlier, ecosystems include more than a community of living organisms (abiotic) interacting with the environment (abiotic). At this level note how they depend on other abiotic factors such as rocks, water, air and temperature.

When you look at this picture of this ecosystem so there are different communities as you compare these picture to the earlier one you might not find the presence of water in the previous picture which shows this biotic factor which is water, which is non-living organism it is very important for the fishes and other organisms to survey.

Biome:

A biome, in simple terms, is a set of ecosystem sharing similar characteristics with their abiotic factors adapted to their environments.

As we discussed earlier, biome is a more of large scale different ecosystem happening together with members from different communities put up to together to. As we seen in this picture we can find different ecosystem which is been happening which together to form a biome, when you see this might be one ecosystem and this might be completely another ecosystem which is not dependent this fish might be interact in these area and these will be interact in these area these are like collective ecosystem which is been happening which forms biome.

Biosphere:

When we consider all the different biomes, each blending into the other, will all humans living in many different geographic areas, we form a huge community of humans, animals and plants, in their defined habitats. A biosphere is the sum of all the ecosystems established on earth.

Biosphere is a collective of different biomes which forms different ecosystem which are interdependent on each other so we are also a part of this ecosystem and biosphere not one of the specious can be neglected are consider as less of importance that's why even when different specious are becoming exiting government make different policy and awareness to save these tigers and lappers to and save these ecosystem. So we may not be sure what type of hazard it will bring to the ecosystem and finally they are extent.

What is biome?

Biomes are very large ecological areas on the earth's surface, with fauna and flora (animals and plants) adapting to their environment. Biomes are often defined by abiotic factor such as climate, relief, geology, soils and vegetation.

A **biome** is NOT an ecosystem, although in a way it can look like a massive ecosystem. If you take a closer look, you will notice that plants or animals in any of the biomes have special adaptations that make it possible for them to exit in that area. You may find many units of ecosystems within one biome.

As we discussed before, biome is a collective of different ecosystem which is been happening even in your day-to-day life in your garden or pond berry close to you will find different specious dependent on that location specifically to that climate and whether condition. For example certain tropical animal which is available only in the tropical region planet, It cannot survey in different condition because the temperature and climatic condition id completely different which is not they are designed for that so the biome is formed.

There are five major categories of biomes on earth. In these five, there are many sub-biomes, under which are many more well defined ecosystems.

FOOD CHAINS

All living things need to feed to get energy to grow, move and reproduce. But what do these living things feed on smaller insects feed on green plants, and bigger animals feed on smaller ones and so on. As we discussed before animals feed on the plants and plants get their energy from sun we are dependent on both plants and animals to get their energy to go reproduce and to move around. This feeding

relationship in an ecosystem is called a **food chain**. Food chains are usually in a sequence, with an arrow used to show the flow of energy.

The sun produce energy which is necessary to plant to grow and the plant is creating its own food and snail feeding on a plant which takes is energy and help its to grow. And we know snails eaten by frogs, and frogs are eaten by snakes and finally the snakes eaten by owl. It's like a food chain. These are the elements which cannot produce their own food and they are dependent on each other their own growth and reproduction.

A food chain is not the same as a food web. A food web is a network of many food chains and is more complex. See the food web illustration below-you can pick out a basic food chain from the web: **Green plants Grasshopper Frog Bird Hawk.** So food web is the collective of chain which is been connected each other

ENERGY TRANSFER

Energy is transferred along food chains, when food chains happen like how energy is transferred from one element to other and the reaming is given to the biosphere.

From this picture we will find different energy which is been transferred and which is been lost the environment.

Tropic levels of food chains

The levels of a food chain (food pyramid) are called **tropic levels.** The tropic level of an organism is the level it holds in a food pyramid.

These are different levels of food chains at the tropical level as you see the sun which is been dependent the energy get transfer from smaller level to higher level.

For this food chain to produce there are producers and consumers. The producers are basically the specious which produce their own food and consumers are the once which are dependent on the producers their growth. As we seen this picture **The sun** is the source of all the energy in food chains. Green plants, usually the first level of any food chain, absorb some of the Sun's light energy to make their own food by photosynthesis. Green plants (autotrophs) are therefore known as **'Producers'** in a food chain.

The second level of the food chains is called the **primary consumer.** These consume the green plants. Animals in this group are usually herbivores. Examples include insects, sheep, caterpillars and even cows.

This shows the Ecological Pyramids like produces the first level and herbivores which is dependent on the producers and secondary consumers dependent on primary consumers and then finally tertiary consumers.

The third in the chain are **Secondary Consumers.** These usually eat up the primary consumers and other animal matter. They are commonly called carnivores and examples include lions, snakes and cats.

The fourth level is called **Tertiary Consumers.** These are animals that eat secondary consumers.

Quaternary consumers

How the entire ecosystem connected with the food chain and energy transfer is happening.

- Quaternary consumers eat the tertiary consumers!
- Quaternary consumers are not in all food chains

The Carbon Cycle

The carbon cycle is very important to all ecosystems, and ultimately life on earth. The carbon cycle is critical to the food chain. During the food chain process carbon dioxide is very important which forms a carbon cycle. Basically in the air on the atmosphere present around us, Carbon gas which is present so living tissue contains carbon proteins, fats and carbohydrates. The carbon in these (living or dead) tissue is recycled in various processes.

When you see this picture carbon is present in the environment which is been taken absorbed by the plants this the food cycle living organism like humans, animals they all give out carbon dioxide which is been let out the environment and again its absorbed by the plant. It’s like a cycle.