# Definition and Concept of ecosystem

A living organism can not survive in an isolated environment its survival depends on both physical and other living components of the environment for nutrition and energy. Thus, in a living system there is a constant interaction of organisms with each other as well as with their physical environment. This total assemblage of components along with their interaction with each other is called an ecosystem.

The term ecosystem was coined by A.G. tenslay in the year 1935. Ecosystem is a vast and complex natural system, It consists of large pools of material resources and living organisms supported by a source of energy which is the sun. There is a constant exchange of materials and energy between different components of the ecosystem. Thus, Ecosystem can be defined as a natural, functional, stable, and dynamic unit of both living and physical factors interacting with each other.

An ecosystem can be very small in size, like a drop of pond water or very large like a tropical rain forest. Sometimes on ecosystem is present within another ecosystem, as also sometimes an ecosystem may show a well-defined boundary. The diversity of ecosystem may vary when one ecosystem lies within the other.

## Types of ecosystem

There are two main types of ecosystem -Natural and artificial(man-made). A natural ecosystem may be either terrestrial or aquatic. And the artificial ecosystem is maintained and manipulated by human beings. Example-Rice or wheat fields, or an aquarium, or a spaceship. Every ecosystem has its unique biodiversity, nutrient sources, climatic conditions, and set of physical features.

## Ecology

It is the study of ecosystem and all its aspects. The term ecology was given by Earnst Haeckel. It is the study of the ways in which …………..

The main objective of ecology is the scientific study of maintenance of ecological balance and role of human beings in the degradation of environment … oilkos- Which means the house and its study.

Types Of Ecosystem

## Forest ecosystem

### TROPICAL FOREST

It can be of two types- tropical rain forest and tropical deciduous forest

Tropical Rain Forest

1. Temperature is warm, relatively constant.
2. Precipitation is high (200cm to 400cm annually)
3. Soil is poor in nutrients.
4. They are vertically layered ecosystems.
5. They have great biodiversity.
6. Broad leaf evergreen trees are dominant.

Example – Rubber, Teakwood, plants like pineapple and orchid, insects like ants, beetles, sharp coloured birds, tree frog, monkeys, etc.

Andaman and Nicobar Islands and western ghats, parts of north east India have such forests, these forests are under high demand of wood.

Deciduous Forest

1. They are heavily influenced by seasonal rainfall (50 to200cm rainfall) with several months of heavy rainfall followed by months of dry periods.
2. Temperature is warm all year round.
3. Many of the trees drop their leaves during dry period.
4. They are found in parts of central and south America, Australia, Africa, Asia particularly India and Myanmar.

Example- Peepal tree, Sandal wood, Bamboo, Sal, Teak, Animal species like tiger, elephant, pig, dear, rhino.

### Temperate Forest

They are again of two types-

Temperate Rain Forest

1. Precipitation is high (more than 130cm).
2. Rainfall during all seasons.
3. Winters are mild and summers are cool.
4. Soil is poor in nutrients; however, organic content is high.
5. These are found at mid latitudes in northern hemisphere, smaller areas in Australia, south Africa, South America……….

Example- Maple trees, Fir trees, Hemlock trees, they supply lot of wood and the animals are woodpecker, squirrel, bear

Tropical Rain Forest

1. 75 to 100cm evenly distributed rainfall per year.
2. Summers are hot, winters are relatively cold.
3. Topsoil is rich in nutrition, organic matter, lower soil is clayey
4. May areas of Canada, eastern half of us, some parts of Asia and Europe have this type of forest.
5. Trees form a dense canopy overlying the shrubs
6. broad leaved hard wood trees that shed their leaves in winters dominate in such forests.

Example- oaks, birches, aspen, and even maple trees are present and animals like woodpecker, wolves, turkeys are present in these forests.

Borail or Taiga Forest

1. Annual rainfall ranges from 13 to 20 cm
2. Climate is more or less humid.
3. Soil is acidic and poor in mineral content.
4. Summers are short and cool, winters re harsh and long.
5. They are distributed throughout southern half of Canada, much of Russia, and parts of northern Europe.
6. They are called evergreen coniferous forests.

Example- Cedar, Spruce, most birds are migratory, very few frogs and reptiles, wolves, beers, squirrels, hare are there.

Arctic tundra

1. Extremely cold region
2. No trees.
3. Permanently frozen subsurface soil, the frozen layer is called Permafrost.
4. Rainfall less than 25 cm per year.
5. Winters are long, harsh, Summers are short
6. Temperature ranges between -30 to 10 centigrade.
7. Soils are nutrient poor.
8. They have little organic matter.
9. Very low species richness.
10. Vegetation are mostly moss plants, lichens and small shrubs, Animals like arctic foxes, snowy owl, snowshoe hares, migratory birds and insects are common in short summers.
11. Healing is very slow (if damaged).

Desert Ecosystem

1. Very dry areas found in both temperate and subtropical regions.
2. The temperate example is Gobi Desert in china, the subtropical example is thar desert in India.
3. Average rainfall less than 25 cm per year due to lack of water vapour in the atmosphere, daily temperature varies between extreme heat and cold.
4. In a hot desert, maximum goes more than 50 centigrade, whereas in cold deserts, temperature may fall below -30 centigrade.
5. Soil is low in organic matter, but very high in mineral content.
6. They have very low but scattered vegetation
7. Plants can adapt to water conservation and physical defence.
8. Example cactus, euphorbia, babool, keekar, animals like snakes’ rodents, beetles, rodents.

Grassland ecosystem(Jhum Cultivation)

Tropical Grassland

1. They’re found in equatorial and sub equatorial regions such as ………………
2. They receive low rainfall which is seasonal (50 to cm
3. Temperature is warm almost all year.
4. Soil is low in essential nutrients.
5. In afric they are called Savannahs, IN south America they are called Pampas, whereas in western parts of asia they are called stapies.
6. The main plants are grasses and thorny trees example acacia, trees in this region are drought resistant, among animals’ elephants, leopard, some reptiles, termites, overgrazing sometimes converts the grasslands into a desert like area.

Temperate Grassland

1. These are distributed in north America, Russia, Canada, parts of Europe.
2. Rainfall is highly seasonal (25 to cm annually).
3. Summers are hot and winters are cold.
4. Soil is rich in organic matter and is thus fertile.
5. Grasses cover 60-90 % of the vegetation.
6. Trees grow near water bodies like a river or a stream flowing in the grassland ecosystem.
7. Horses, goat, sheep, wolves, are commonly found.
8. Grasslands of Canada, North America are called Prairies
9. This is also known as Jhum Cultivation and it includes clearing forest cover or green cover due to drying and burning. After harvest, the land is left as such for some time and later regeneration of vegetation is allowed (few years later).

### Aquatic Ecosystem

This is a water body. Unlike a terrestrial ecosystem which depends on climatic factors like temperature and rainfall. Aquatic Ecosystems depend on their physical environment like degree of light penetration, depth of water, nature of the bottom substrate and saline conditions (content of salt dissolved in it)

Those will little salt dissolved are called freshwater ecosystem and those which have high salt content are called marine ecosystem.

### Fresh Water Ecosystem

These Ecosystems include which have still water and streams and rivers which have flowing water, they also have marshes and swamps which are called wetlands. Therefore, there are three basic types of freshwater Ecosystem.

1. Lentic (lakes and ponds)

These are standing bodies of water.

Light decreases with water. This process is called thermal stratification. The zone where enough light is available is called Photic zone and the zone where little light penetrates is called aphotic zone.

The saline conditions, oxygen concentration, and nutrient content differs among lakes and it can vary with season. the region with rooted and floating vegetation is called Littoral Zone. It is near the shore.

Plants like water lilies, Fresh water algae grow in this zone, Animals like frogs, turtles, many fishes, some worms, are present in this region.41% of the worlds fish species are present in freshwater ecosystem.

The region of the open water beyond littoral zone is called limnetic zone. It is a deep-water region, and it extends down as far as sunlight penetrates. Main organisms are phytoplankton, zooplankton (very small fleas, insects). This area also has large fishes.

1. Lotic

Lotic is streams and rivers. They have fast flowing water. The nature of the stream changes greatly between its starting point which is called source and its end point (mouth). The most important feature of the stream is its current. Head water streams are generally cold, clear, turbulent, and swift. Whereas downstream the water is warmer and turbid. The salt and nutrient content generally increases from head water towards the endpoint, while oxygen content decreases in the same course. Rivers and streams depend on land as all energy comes from the organic matter that falls into the stream from land sources. The downstream contains more producers than the decomposed matter. Some rooted plants, phytoplankton’s, and liver wards are the main producers of this ecosystem. Main consumers are bacteria, fungi.

1. Wetlands

These are habitats which have water almost all year round. They support plants that are adopted to water saturated soil. Wetland soils are waterlogged and anaerobic for most part of the year. They are rich in organic matter. Woody plants dominate the vegetation called swamps, whereas marshes are dominated by mosses. Dragon flies, frogs, birds, alligators, are present in wetlands, migratory water birds called foul is present in wetlands.

Wetland Ecosystems support many organisms but they are also important for survival of human beings due to climate change and protect human settlement from floods, but they are terrible places to build houses as they act as natural sponges absorbing water and then gradually releasing it.

Marine Ecosystem

It covers nearly 71% of the earth’s surface and it contains approximately 97% of the total water present on the Earth. They are the largest ecosystem of the Earth, they include open oceans, polar regions like artic and Antarctic region, they include inter tidal zones and coral reefs, high salt content. The light availability geography, and tides are other important features of marine ecosystem. The marine environment is subdivided into several different parts

1. Inter Tidal zone

This is a transitional zone b/w land and ocean. It is periodically submerged and exposed by the tides twice daily on most marine shores. Oxygen and nutrient levels are high. They are renewed which each turn of tide. The bottom portion of this zone is either sandy or rocky. They support attached marine plants, seagrass, and algae, sponges, starfishes, small fishes and crabs are common consumer of this ecosystem. Oil pollution is a threat to this ecosystem.

Overfishing and waste dumping is damaging this ecosystem

1. Marine Benthic Zone

This consists of sea floor below water surface. It is devoid of light. Very low water temperature. Very high-water pressure, oxygen is present in sufficient concentration, brown algae called kelp (macroscopic) *fucus* are the common plants of this ecosystem, sea urchins, crabs, oysters and some fishes are common consumers of this ecosystem.

Overfishing and dumping is a concern to this ecosystem

1. Coral Reefs

They are formed largely from the calcium carbonate skeletons of corals, they provide a surface on which many other kind of organisms live, they are sensitive to temperature, they require high oxygen level, Corals need a solid substrate for attachment some unicellular algae live within the tissues. Multicellular red and green algae form a part of coral reef community. Sea anemones, crabs, snails, fishes, sponges. Coral reefs are considered amongst the most productive ecosystems on Earth.

They are under threat due to global warming and ecosystem.

Estuary

It is a transition area where fresh river water and salty sea water meet. Saline conditions of the water keep on changing within the estuary. Nutrients from the river make it very productive. They act as breeding sites for fishes and crabs. They have plenty of worms, oysters, Among plants(producers) they have algae, marsh grasses, and mangroves(salt tolerant trees/halophytes) are trees that grow in the coastal area. It is a small tree; they mainly grow in saline or brackish water (natural water saltier than river water). They are adapted to low water concentration of waterlogged soil. Example- Rhizophora is a mangrove (they are salt tolerant trees). Pollution and filling of water from upstream has disrupted estuaries worldwide.

Dredging- Clearing the riverbed by taking out mud, weeds, and other debris. (damages Estuaries)

Dredging is the act of removing silt and other material from the water of water bodies.

Example- Bhitarkanika is the second largest mangrove forest

Biome

It is a community of plants and animals that have common characteristics for the environment in which they exist. There are 5 biomes - Aquatic, forest, grassland, desert, and tundra.

Man Made Ecosystems

They are created to copy the conditions of natural ecosystems. They are controlled by man. For example-Botanical garden, zoo, crop fields, and aquarium.

## Structure of Ecosystem

The Structure of ecosystem consists of two distinct components- biotic and abiotic, which interact with each other to form a stable ecosystem.

### Abiotic Component

They consist of the physical environment, inorganic substances like carbon, nitrogen, water, etc. and the organic component, proteins, carbohydrates. It also has the climatic conditions such as sunlight, temperature, humidity, and rainfall pattern. The abiotic component includes soil which is called the edaphic factor, pH of soil and salinity of soil.

### Biotic Component

The biotic components of ecosystem include all living organisms such as plants, animals, microbes, and human beings. They are categorized on the basis of how they obtain nourishment, and what is their role in the ecosystem. They are classified into three groups-

1. Producers/Autotrophs- This category includes organisms that contain chlorophyll and convert solar energy into chemical energy. They perform the process of photosynthesis, trap solar energy, and convert it into chemical energy by using carbon dioxide and water.

6CO2+ 6H2O--🡪6O2+C6H12O6

Plants are the main producers on earth. Algae and phytoplankton are the producers of aquatic ecosystem.

1. Consumers/Heterotrophs- They are organisms which cannot produce their own food and obtain it from other organisms for their survival. They are categorized into four categories depending on their feeding habits
2. Primary consumer/Herbivores-

Example- grass eating animals- Cow, goat, rabbits, etc.

They are first order consumers.

1. Secondary Consumers/Primary carnivores- They live on the flesh of primary carnivores.

Example- frogs, fishes, snakes, lizards, etc.

1. Tertiary Consumers/Secondary carnivores- They eat flesh of primary carnivores or the secondary consumers.
2. Top Carnivores-These are the largest carnivores which eat flesh of tertiary consumers and can not be eaten by any other animal. Only they are decomposed/decayed after death.

Example- Lion, tiger, etc.

\*Omnivores\*

3. Decomposers/saprotrophs- Bacteria, Fungi, some insects, worms, vulture eat away the dead bodies of producers and consumers and break it down into smaller particles releasing simple substances as by products. The by products are water, CO2, CH4, nitrates, phosphates, sulphates, etc. These simple substances are reused or absorbed from soil, water and air. As nutrients by plants i.e. producers resulting in a cyclic exchange of materials b/w biotic and abiotic components of the ecosystem.

## Functioning of ecosystem

Functioning of ecosystem depends on two things,

1. There must be a constant source of energy
2. There must be continuous exchange of materials b/w different components of the ecosystem.

Energy flow in an ecosystem follows first law of thermodynamics and shows conversion from one form of energy to another with reduction in capacity to do work. The energy is utilised to run the nutrient cycle in which nutrients get into the body of the organisms. Some energy is however liberated when an organism dies. The functional aspect of ecosystem involves the rate at which materials like carbon, hydrogen, oxygen, nitrogen, etc. circulate and the rate at which energy flows through it.

Energy is defined as the capacity to do work a/c to first law of thermodynamics, energy is neither created , nor destroyed but it can be transformed from one form to another.

A/c to second law of thermodynamics, any process which involves transformation of energy, occurs spontaneously, degradation of energy from concentrated form to dispersed form takes place.

The function of ecosystem thus can be understood through concept of productivity, and food chain.

Productivity

Productivity of ecosystem refers to the rate of production of organic material from inorganic components i.e. the total amount of organic matter accumulated in per unit area per unit time.

Productivity is observed/ measured at 3 diff levels--

1. Primary productivity

2. Secondary productivity

3. Tertiary productivity

PRIMARY productivity

The rate at which Sun's radiant energy is stored in the producers during photosynthesis is called primary productivity. It is of 2 types- GPP (Gross Primary Productivity) and NPP( Net Primary Productivity)

GPP is the total amount of energy gained through photosynthesis in primary producers whereas NPP is the gain of energy by producers after allowing the loss due to respiration. Thus, NPP is equal to GPP - respiratory loss.

Secondary productivity

Secondary productivity refers to productivity at consumer level. The consumer utilises the food material and during respiration it is used or assimilated.

Tertiary Productivity

This refers to the rate of storage of organic matter which is not consumed by the consumers. It is the rate of increase of biomass of producers left over by consumers.

Food Chain

The transfer of energy or the flow of energy from one trophic level to another in an ecosystem takes place through food chain and food web. Each level is called a trophic level, it is a feeding level of a grp of organisms. A food chain is a sequence which shows transfer of food energy from one organism to another through a series of action of eating and being eaten, the food produced by an autotroph is eaten by primary consumers on which secondary and tertiary consumers feed. Ultimately the dead organism is decomposed by the decomposers and it goes back to producers in the form of inorganic compounds. 80-90% of the potential energy is lost in the form of heat energy. There are types of food chains

1. Grazing food chain.
2. Detritous food chain.

Grazing food chain

It starts from green plants and other producers, from their the energy passes through various levels of consumers. Example- IN NOTEBOOK

Detritus food chain

This starts from dead organic matter and goes to detritus feeding organisms (detritivores) and then to their predators. These chains do not require sun light; therefore, no photosynthesis occurs. AT bottom of lakes and ocean they can be found.

In grassland when dead leaves are present, this chain may start. For E.G. In notebook

Food chain and food web advantages

1. Maintain biodiversity in nature.
2. Provide energy to every organism.
3. Maintains nutrient cycling and energy flow in an ecosystem.
4. They maintain ecological balance by maintaining size of population.
5. Food chains cause biological magnification of toxic substances and pesticides and thus top carnivore is affected the most.

Food Web

Food chains are not found in isolation. 5-6 food chains operate simultaneously in an ecosystem. These food chains are interlinked with one another to form a food web. The interlocking pattern formed due to interaction of various food chains is known as food web. It provides stability to the ecosystem.

Ecological pyramids

Charles Elton was the first to observe in 1927, that the number of consumers at the last step of the food chain or the top trophic level is always less when compared to the number of organisms at the base of the chain. He gave the term ecological pyramids and defined them as diagrammatic representation of the food chain. They can also be defined as graphic representation of flow of energy or material transfer through food chain. There are three types of pyramid.

1. Pyramid of number, which shows the number of organisms at each trophic level in an ecosystem. This pyramid varies from ecosystem to ecosystem, and it can be of three types:
2. The upright pyramid of number- This type of pyramid is observed in a grassland ecosystem and an aquatic ecosystem. The organisms at the base of the food chain in these ecosystems are always more in number. For example – In a grassland ecosystem the number of grasses i.e. the producer is always high, followed by primary consumers like grasshoppers, or rabbits, the secondary consumers like snakes and lizards are even lesser. Finally, the top carnivore, say the eagle or hawk are least in number. Thus, the pyramid is upright.
3. Partially upright- This is found in a tree ecosystem, where a large tree supports a number of birds, which are then eaten by top level consumer, like falcon, eagle, which are smaller in number and form somewhat upright pyramid.
4. Inverted pyramid of numbers- This is seen in a parasitic food chain, where primary producer supports a number of parasites, which further support number of hyper parasites leading to the formation of inverted pyramid of number.
5. Pyramid of biomass, represents the total biomass of an organism at each trophic level, in an ecosystem at any time. In this pyramid, the weight of an organism is taken into consideration.

For most ecosystems, the biomass of producers is large, which gradually decreases with each successive layer forming an upright pyramid. However, in certain aquatic ecosystems the pyramid of biomass is inverted, as we know the weight of phytoplankton which are major producer at a given point will be lower than the weight of the consumer such as the fishes, or say zooplankton.

1. Pyramid of energy, shows the rate at which the energy is passed from one trophic level to another level, at each level there is a decrease in energy, and thus, the pyramid is always upright. At each trophic level during transfer, there is a loss of energy.

Lindeman’s law of flow of energy

Lindeman showed in 1942 that the flow of energy occurs from one trophic level to another at the rate of 10 %, during this process a major part of energy stored in food is lost, in the form of heat energy. This heat is radiated into the atmosphere and can not be reused by plants and animals.

Material Cycle/ bio-geo-chemical cycle/ nutrient cycle

The food chains shows the solar energy is converted by the producers/autotrophs as carbohydratees, fats, and proteins is transferred to primary consumers, than to secondary consumers, and finally tertiary consumers. The decomposers break them into simpler forms which are used as nutrients by autotrophs. In this way complete cycle of essential nutrients take place but energy does not cycle in the ecosystem. It flows in a unidirectional manner, and can never be returned to the sun. this is referred to as linear flow energy model. There is a two-channel energy flow model also which is y shaped, one arm of the letter y represents the grazing food chain, and the other the detritus food chain. It confirms the layered structure of the ecosystem and the two arms differ in the manner in which they influence the primary producer. Every ecosystem is controlled by nutrient cycle and energy flow, but in each ecosystem but in each ecosystem the physical factors vary. The activities involved in the cycling of material include biological, geological, and chemical processes. Therefore, nutrient cycles are also called bio-geo-chemical cycles.

These cycles are of 3 types – carbon, oxygen, nitrogen, in these the atmosphere is the reservoir. In nitrogen cycle, Nitrogen enters the ecosystem via nitrogen fixation, which is conversion of nitrogen into various compounds. 78% of air is nitrogen in the atmosphere similarly, carbon, which forms framework of organic molecules is fixed in the form of atmospheric carbon dioxide is fixed

Sedimentary rocks are the for sulphur and phosphorus cycle, weathering of rocks adds phosphate to soil which is absorbed by plants and used in the synthesis of organic compounds. There is no atmospheric phase in these two cycles. Large amount of phosphorus is seen to be present in sedimentary rocks of marine origin.

Hydrologic cycle

Water cycle depends on rainfall, water moves through various components of ecosystem such as atmosphere, hydrosphere, lithosphere and biosphere.

Homeostasis- something which is balanced

Ecosystem homeostasis is equilibrium or a balance of organisms in an ecosystem. This means population of species in the ecosystem are relatively stable. Overtime these population might change but for short period. Thus, homeostasis is a state of steady internal, physical, chemical conditions within an ecosystem. It is a self-regulating process by which stability is maintained within an ecosystem.

Ecosystem services

Ecosystem provides a range of services. this is a new concept, if we leave our biodiversity undisturbed within an ecosystem, then the help it gives us, are referred to ecosystem services. It can be defined as process and conditions of natural ecosystem which supports human life. They can be direct/ indirect. Direct eg – Resource for consumption like fruits, fodder, beverages … or commercial purposes like timber, medicinal plants. Indirect eg- no consumption like bird watching (entertainment), scientific research, functional value such as climate regulation, water quality, maintaining natural cycles, flood control, protection form soil erosion, ethical values, emotional aspects.

### Ecological succession

Ecological succession is a process through which ecosystems tend to change over a period of time with modification of the physical environment resulting in development of complex communities. Each stage of succession is called seral stage. It has its own characteristic species composition. The time involved in ecological succession may extend to several decades. Succession generally occurs due to the activity of organisms which change the environment continuously and it becomes favourable for some other kind of organisms. The first species that colonises a barren land is called the pioneer species and the last long lasting stable community is called the climax community. Succession can be divided on the basis of

1. Source of energy and nutrition
2. Autotropihc – In autotrophic the rate of production is always more than the rate of respiration
3. Heterotrophic- In heterotrophic succession, the rate of respitation is greater than the rate of production during initial phases.
4. Primary succession occurs in an area which has never been inhabited before. It occurs on entirely new land without any established soil such as a bare rock surface or water.
5. Secondary succession occurs in an area which was preoccupied by some type of community and was devastated by a natural disaster or by human activities such as deforestation, forest fire , excessive grazing, floods, etc.
6. On the basis of interaction
7. Autogenic – IN most cases the community which is formed reacts with the environment, modifies the environment and results in replacement of its own community by some new modified community. This is called autogenic.
8. Allogenic – In some cases one community is replaced by another community due to some external forces, such as increase of chemicals and nutrients or pollutants in an ecosystem or a change in the components of the area/ ecosystem. Eg- Eutrophication, etc.

Due to Nature of the habitat

1. Xerosere Succession – It occurs in dry conditions, like on bare rocks or sand dunes and it involves various stages

Cresto Lichens starts on a rock where no lilfe pre existed, these life species produce acids which corrode the rock which helps in the formation of soil and second stage is observed, called pholio lichen stage. In this stage leaf like lichens grow which slows process of soil formation, more humus is formed, soil moisture develops, soil fertility is increased and the third stage is formed which further converts to herbs stage, shrubs stage and the climax forest stage. All these stages takes

1. Hydro sear Succession – It occurs in a water body where the pineer community is formed and it gets converted into a terrestrial community The various stages of this are submerged stage, eg hydrilla, sea weeds, elodea. Floating stage . Reed swamp stage Eg sagiterria, typha. Marsh meadow stage, Eg- Cyperus,etc. Wood land stage, Eg – Poplar, shrubs and trees. Climax stage, in which acer forest.

### Environmental Movements

Chipko Movement – This was a powerful movement initially started by Chandi Prashad Bhatt and sundar Lal Bhaguna in April , 1973. Chipko means to embrace or to hug. A group of women in a village of Uttarakhand hugged the trees to protect them from the loggers who came to cut them for using the wood commercially. Gaura Devi was leading the group, they all blocked the tree loggers and warned that if forest is cut, soil will be washed away, land slides and floods will be common and their homes would be destroyed. They would not be able to get forest resources, They said, “ *cut us down before you cut the trees*”, This movement had its inspiration from an event which happened 300 years back when a few women of Bishnoi community lead by Amrita Devi hugged the khejri trees in Rajasthan. 300 years ago all these women were killed, however in the 1973 Chipko movement, the government had to intervene. The movement gained world wide attention, it was praised all over and the trees were saved. The contractors were forced to withdraw, the forest was protected from destruction. Chipko day was celebrated in New York in 1987. The effect of this movement was also seen in 1980 in the Uttar kannad region of Karnataka, western ghats. It was called epiko movement( to hug in south ).

Tried to clear the forest but a 38 day long protest, lead to successful protection of natural forest cover and the government had to withdraw their orders.

Grass land ecosystem

Altiperfacture is located in the northern part of Xin Jaing, a region in china near the border of Mongolia. This is bounded by high mountains in the north and cut of by dessert towards south. The area has very hot summers, very cold winters and snow, low rainfall. Most of the grazers have a difficult life moving from winter fields to high summer fields for feeding their livestock. That is cattle, sheep, goat, horses. They have to cover a distance of 200 kilometres. Over last years a development program has been implemented to produce and conserve fodder by cultivating land with a winter feed – Alfa Alfa . This work by started by UN - F.A.O.. The development program has helped a number of grazers as they are getting food for their cattle even in winters. More families visit that area as they can carry more animals.

Desert Ecosystem

Southern California Deserts have been extremely altered by human activities and it may take centuries for the insensitive but fragile ecosystem, to recover without intervention to restore natural habitat. The two deserts Colorado, Mojave deserts. Both the deserts cover 38000 square miles. Development of highways, military training exercise, livestock overgrazing, utility centers, air pollution, and spread of non-native plants have altered the ecosystem over the last century. Natural restoration of the ecosystem is very slow due to high tempperatures, stong winds, low rainfall, and llow soil fertility. Desert soils support long lived plants which are sensitive to human disturbance and slow to recover. Natural recovery may take thousands of years and thus very less chances of restoration of this ecosystem.

Aquatic Ecosystem

Threatening the bio diversity in Rudra Sagar lake which is a Ramsar site, located in Tripura, increased population growth near the lake with more human activity is threatening the sustainability of Rudra Sagar lake. Its biodiversity is being disturbed. This lake is an important site for many water fouls, it has a rich aquatic diversity. Threats like overfishing, Eutrophication, acidification, toxic contamination are threats to this and many other lakes of the world. Lake has become acidic, The water has become cloudy or turbid, turbidity means more bacteria, water pollutant plants are growing, E.g.- water hyacinth, excessive algae has created a pressure on this lake. Restoration work has started which requires dust management practices to check the pollution, active involvement of both local and NGO’s to restore this lake has started.