Lecture-11

Topic → **Ecosystem:-** chapter-3 page-10

Deff:- An ecosystem is a group of biotic communities of species interacting with each other and with their non living Environment exchanging energy and matter

Ecology:-

Ecology deals with the study of organisms in their natural homes interacting with their surroundings. Ecology is often defined as "The study of ecosystems".

An ecosystem is an integrated unit consisting of interacting plants, animals and microorganisms whose survival depends the maintenance and regulation of their biotic and abiotic structures and functions. The ecosystem is thus a unit or system which is composed of a number of subunits, that are directly or indirectly linked with each other.

Open ecosystem:- which freely exchanges energy and matter from outside:-

closed ecosystem:- which is isolated from outside.

Ecosystem characteristics

Ecosystems show large variations in their size, structure, composition etc.

Structural features:-

1 Biotic structure:- The plants, animals and microorganisms present in an ecosystem form the biotic structure. These organisms have different nutritional behaviors and status in the ecosystem

and are accordingly known as producers or consumers

1.1 **Producers:-** They are mainly the green plants which can synthesise their food themselves by making use of carbon dioxide present in air and water in presence of sunlight by involving chlorophyll through the process of photosynthesis. They are also known as photo autotrophs.

There are some microorganisms which can produce organic material to some extent through oxidation of certain chemicals in the absence of sun light. They are known as chemosynthetic organisms or chemo-autotrops.

example: In ocean depths, there is no sunlight, chemoautotropic sulphur bacteria makes use of heat generated by the decay of radio active elements present in the earths core and released in ocean depths. They use this heat to convert dissolved hydrogen sulphide (H_2S) and CO_2 into organic compounds.

1.2 **Consumers:-** All organisms which get their organic food by feeding upon other organisms are called consumers, which are of the following types

1.2.1 **Herbivores:-** (Plant eaters). They directly feed on producers and are known as primary consumers e.g. animals, insect, man

1.2.2 **Carnivores:-** (meat eaters). They feed on other consumers. If they feed on herbivores, they are called as secondary consumers (frog) and if they feed on other carnivores, they are called as tertiary consumers (snake, big fish etc)

1.2.3 **Omnivores:-** They feed on both plants and animals (e.g. humans, fox, rats, birds)

1.2.4 **Detritivores:-** They feed on the parts of dead organisms, wastes

of living organisms, their caste offs and partially decomposed matter e.g. beetles, termites, ants, crabs, earth worms.

1.2.5 **Decomposers:-** They derive their nutrition by breaking down the complex organic molecules to simples organic compounds and ultimately into organic nutrients. Various bacteria and fungus are decomposers.

2. **Abiotic structure:-**

The physical and chemical components of an ecosystem constitute its abiotic structure. It includes climatic factors, soil factors, geographical factors, energy, nutrients and toxic substances. It can be divided further into;

2.1 **Physical factors:-** sunlight, intensity of solar flux, duration of sun hours, average temperature, max. and min temperature, annual rainfall, latitude and altitude, soil type, water availability, water currents etc.

2.2 **Chemical factors:-** major essential nutrients like carbon, nitrogen sulphur, salts causing salinity and various organic substances present in the soil or water.

All the biotic components of the ecosystem are influenced by the abiotic components and vice versa and they are linked through energy flow and matter cycling

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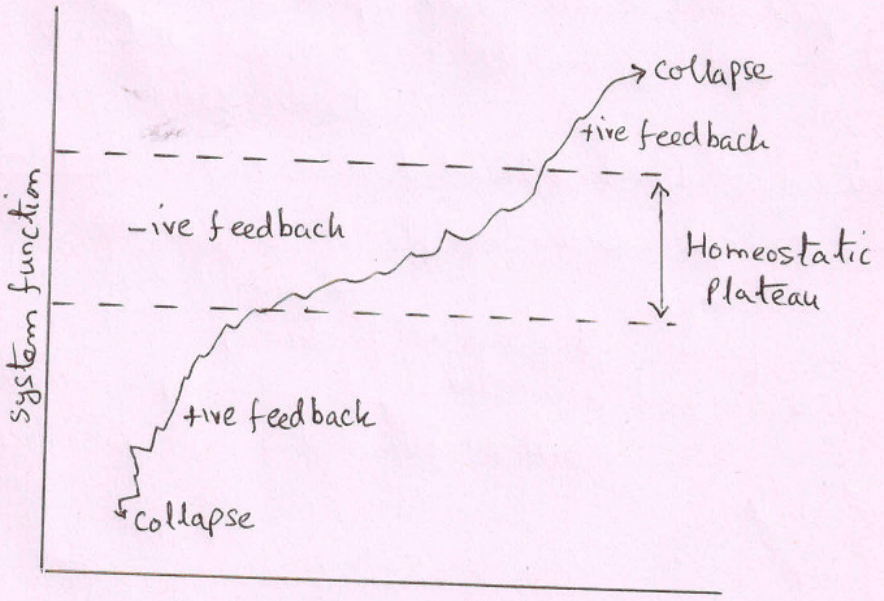
Ecosystem Regulation:-

All ecosystems regulate themselves and maintain themselves under a set of environmental conditions. Any environmental stress tries to disturb the ecosystem functions. An ecosystem tries to resist the stress by a property known as homeostasis. It is the inherent property of all living systems to resist change. However, a system can resist only within a range of tolerance known as homeostatic plateau. Within this range, the ecosystem can counteract. known as negative feedback mechanism. If the stress is too high, then positive feed back mechanism acts. It tends to take the system away from the optimal condition. Human beings should not try to contribute to positive feedback mechanism.



Lecture -12

Sustainable Development :-

It is defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs. In order to ascertain whether it is a sustainable development, we need to see whether;

* It protects biodiversity
* It prevents soil erosion
* It cuts off emmisions of CFC, SO_2, NO_2, CO_2
* It reduces waste generation
* It brings benefit to all.

The key aspects of sustainable development are;

(a) Inter-generational equity :-

This emphasizes that we should minimise any adverse impacts on resources and environment for future generations. i.e. we should hand over a safe, healthy and resourceful environment to our future generations. This can be done by stopping over exploitation of resources, reduce waste discharge and emissions.

(b) Intra-generational equity :-

This emphasizes that the development process should seek to minimize the wealth gaps within and between nations. The benefits of technology should seek to achieve the goals of intra generational equity - The technology should look into matters of drought in uncertain climates, vaccines for diseases, clean fuels for various uses.

Measures to ensure Sustainable Development.

(a) Use of appropriate technology :-

It is the one which is locally adaptable, eco-friendly, resource

efficient, and culturally suitable. It involves local resources, local labours, indigenous technologies, cost effective measures. Nature is often taken as a model.

(b) Reduce, Reuse, Recycle approach :-

It stresses on using the resources again and again instead of passing them as waste into streams and recycling materials. It reduces pressure on our resources.

(c) Prompting environmental education and awareness

It stresses to impart Environmental education. Introducing the subject from school level will generate a feeling of belongingness to the earth. The earth thinking will gradually get incorporated in our thinking and transforming our lives.

(d) Resource utilization as per carrying capacity:-

Any system can sustain a limited number of organisms on a long term basis which is called its carrying capacity. It is more important in humans as apart from food, they need so many other resources to maintain their lives.

Carrying capacity has two basic components;

* Supporting capacity i.e. capacity to regenerate
* Assimilative capacity i.e. capacity to tolerate different stresses.

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Environmental Monitoring

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L14

There are many environmental assets which need to be studied. They are; (studies should be repeated for purpose of monitoring)

(1) **Rivers Environment:-**

The following studies need to be carried out;

(a) **Background data:-** Note down the name of the rivers, its place of origin and its course or route. Perenial or seasonal.

(b) **Water quality observations:-**

* **Turbid or clear:-** If the water is clear, sunlight will penetrate its depth and promote growth of green aquatic plants. If the water is turbid, there will be very less amount of green aquatic life. Productivity will decrease.

* **Temperature of water:-** Note the temp. of water. If the temp. is high, find source of thermal pollution. High temperature gives rise to lesser dissolved oxygen resulting death of aquatic life

* **Presence of foam:-** Check for any foam formation on the surface of water. Find its source

* **Waste discharge:-** Check out for any waste discharge from house hold or industry. Note the type of Industry. Note discharge of sewage into the rivers.

* **pH value:-** Note the pH of river water by using a pH meter. It should be in the range of 6.5 to 8.5. Low pH indicates pollution by industries whereas high pH indicates pollution by municipal sewage.

(b) * observations of aquatic life :- we have to observe different life forms like small floating plants (phytoplanktons) and small animals (zooplanktons) and also rooted plants under neath. Also look out for fish, tortoise, alligators, water snakes. Draw a food-web diagram. Prepare a list of various uses of the river.

(c) * Human impacts :- see the impacts of humans near the river. Note incidences like sudden fish death, cattle death, skin problems to those who consume water.

2. Forest Environment :-

Note the following;

(a) Background data :- Note the name of forest and the type, tropical rain forest, deciduous forest etc. is the forest a part of biosphere reserve or national park? or sanctuary. Note special features of it.

(b) Forest structure :- note down the following;

* Types of dominant trees, any herbaceous climbers or woody climbers, type of canope (close or open)
* Type of growth :- Does the forest show a thick, dense growth or is it degraded.
* Shrubs :- Are there any shrubs, herbs, grasses of lower height
* Forest floor :- is there a thick or thin forest floor consisting of leaf litter, algae, fungus etc. is it multi layered or not.
* commercial uses :- Prepare a list of various commercial uses of the forest
* Ecological utility :- see if the forest is cooler, more humid. is the air fresh. what are the types of birds, animals and insects in it.

3. **Mountain Environment:** in it, note the following;

(a) **Background data:-** Note the name of the mountain and the range to which it belongs. Note the altitude, average rainfall and temp. of the area.

(b) **Natural vegetation:-** note type of forests present. Are the forests dense or thin. Look for some dominant trees and their uses.

(c) **Landslides:-** see if any land slide has occured recently. Ascertain the reason for it. See the mountain slope and forest growth on the slope. Take the help of native people.

(d) **Water sheds:-** Look for springs, rivers, canals coming out from the mountain. The land area from which water drains under gravity to a common drainage is the water shed. Gather information about use of water shed and its status.

(e) **Plantation and farming:-** Note the following;

* Tea plantation or farming (maize, wheat) on hill slopes.
* Type of farming (shift cultivation, traditional or modern)
* observe terrace farming, contour farming.
* Find out the water and nutrient requirement of crops.
* Are the plantations well suited to the hill environment.
* observe activities like mining, quarrying, tourism, construction, hydroelectric projects etc.

(4) **Industrially polluted area Environment:-** note the following

(a) **Background data:-** Note the name of Industry, its capacity, year of establishment, type of product and type and quantity of wastes, emissions.

(b) **Pollution aspect:-** observe stacks for emissions, toxic gases, obnoxious gases, and direction of wind. observe huge heaps of waste material present on site, its quality and quantity. Observe plantation growth near dumping sites. Find out if there is any ETP in the project.

(c) **Green belt:-** observe any green belt surrounding the unit. It has become mandatory for all industries to maintain a green belt round it. Tree leaves have got a capacity to absorve dangerous gases.

(d) **Health aspects:-** Health aspects can be obtained from native People. Water drawn from tube wells, spring may be polluted by toxic material and cause various ailments. Suspended and Particulate material in air should be studied for any skin irritation, allergy, respiratory diseases.

(5) **Water logged / Saline land Environment:-** observe the following

(a) **Background data:-**

visit the land in a rural area. An area having a permanent standing water is water logged. observe crusts of white salts on soil surface i.e. a saline soil. Gather information from farmers about background. Note type and duration of irrigation, the type of crop and fertilizers used. Was the land fertile before or not.

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Salinity and crop growth :- Note the following;

* Salinity :- find out the salinity (electric conductivity) For this, take 10 grams of soil and dissolve in 20 ml of water. The non saline solution has an EC < 4 . A salinity > 20-40 may not support crop.

* Does the soil support any crop. (salt tolerent crops)

* Remedial measures :- Find out the crops that support this type of soils . Note remedial measure taken by the farmers. Suggest your own measures .

ECO FRIENDLY PROJECTS (SOLAR ENERGY)

Solar Power Project -Tamil Nadu - India --648 MW

Solar power plant-Spain-60 MW

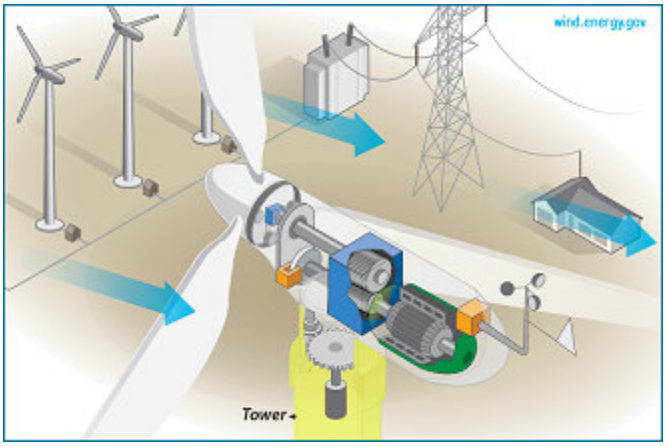
Waldpolenz Germany- Solar plant- 40 MW

ECO FRIENDLY PROJECTS (WIND ENERGY)

Shepherds wind Energy Project-USA-845 MW

Westereems wind farm Netherland-156 MW

Xinjiang wind power plant, China --

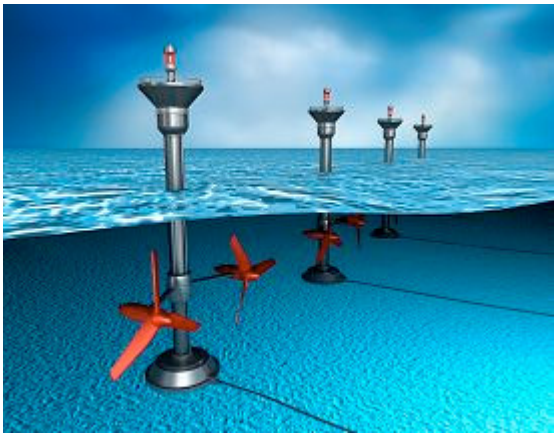


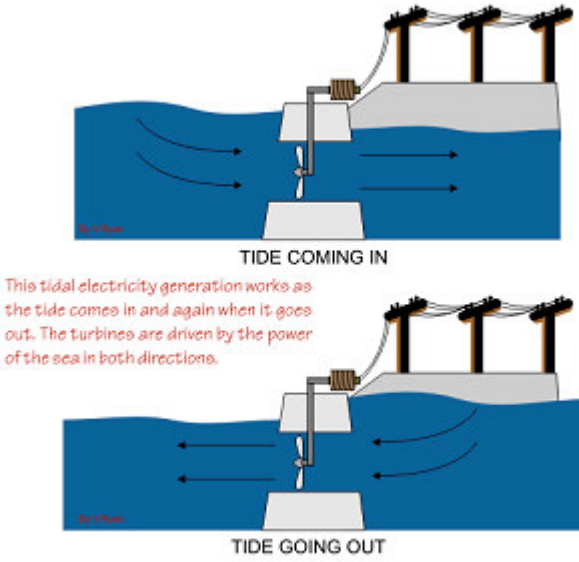
Section of a Typical Wind Turbine

Windfarm-Tamil Nadu-India

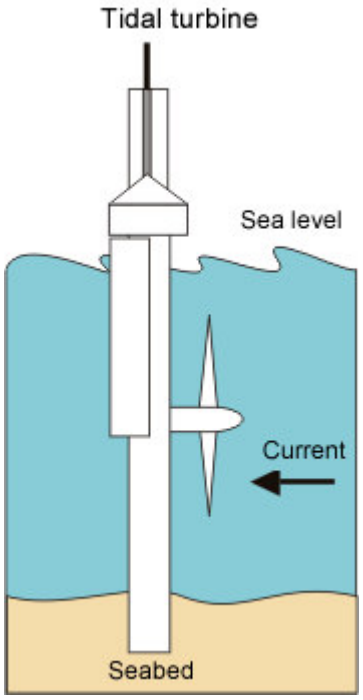
Altamont-California Wind farm--576MW

ECO FRIENDLY PROJRCTS (TIDAL ENERGY)





Ocean Tidal Energy Generator



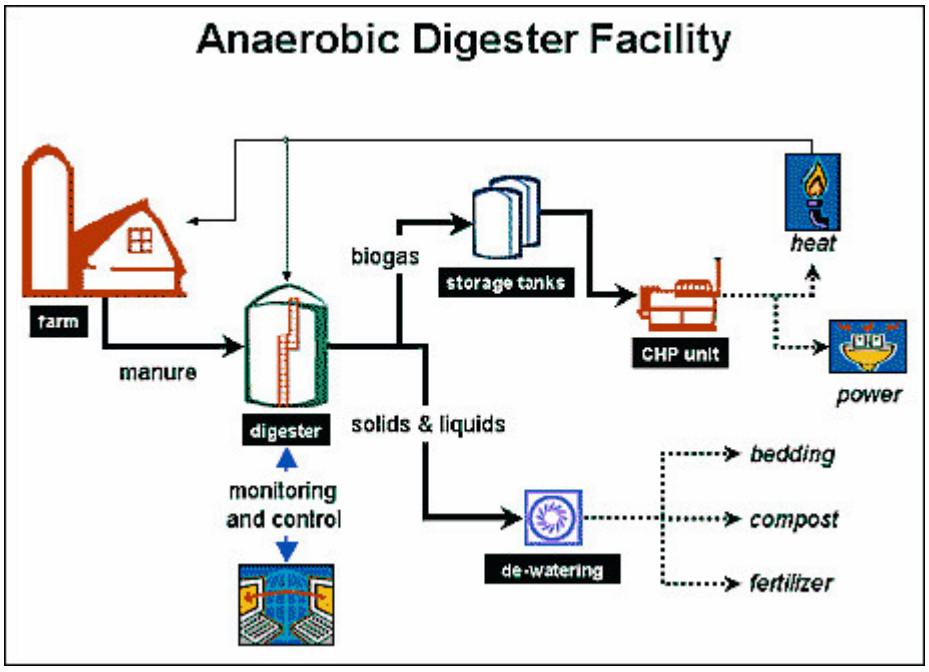
TIDAL TURBINE

La Rance Tidal Power Plant, France - 240MW

MeyGen Tidal Energy Project, Scotland - 86MW

Annapolis Royal tidal Generating Station, Canada - 20MW

ECO FRIENDLY PROJECTS (BIO GAS)



BIO GAS POWER PLANT UK--740 MW

BIO GAS DIGESTOR

TYPICAL BIO GAS PLANT FOR HOME