

Introduction to Environmental Science.

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Energy flow in an ecosystem:-

- Flow of energy takes place through food chain.
- Main source of energy:- sun
- Solar energy \rightarrow producers (store as carbs, proteins & fats)
 \downarrow 90% energy loss
primary consumers.
- Flow of energy - unidirectional and continuous
- Follows the laws of thermodynamics.

Models of energy flow in ecosystem:-

(1) Single channel energy flow model:-

- Flow of energy takes place in a unidirectional manner through a single channel of green plants or producers to herbivores and carnivores. Fig:1, depicts such a model.
- Gradual decline in energy level due to loss of energy at each successive trophic level in a grazing food chain.

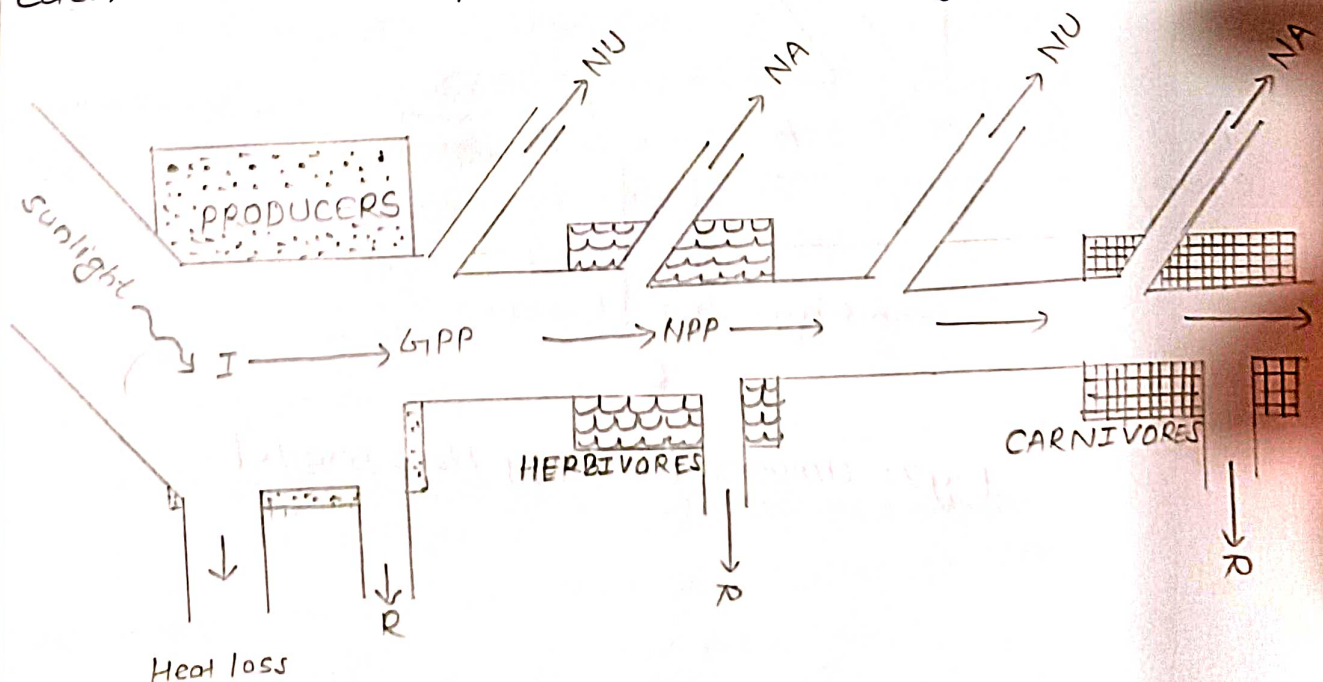


Fig:1 one way energy flow model.

I = solar energy input, GPP = gross primary production

NPP = Net primary production, NU = Energy not used

NA = Energy not assimilated, R = Respiratory loss.

(2) Universal energy flow model:-

→ As the flow of energy takes place, there is gradual loss of energy at every level, thereby resulting in less energy available at next trophic level as indicated by narrower pipes (energy flow) and smaller boxes (stored energy in biomass). The loss of energy is mainly the energy not utilized (NU). This is the energy lost in locomotion, excretion, etc or it is the energy lost in respiration (R) which is for maintenance. The rest of the energy is used for production (P).

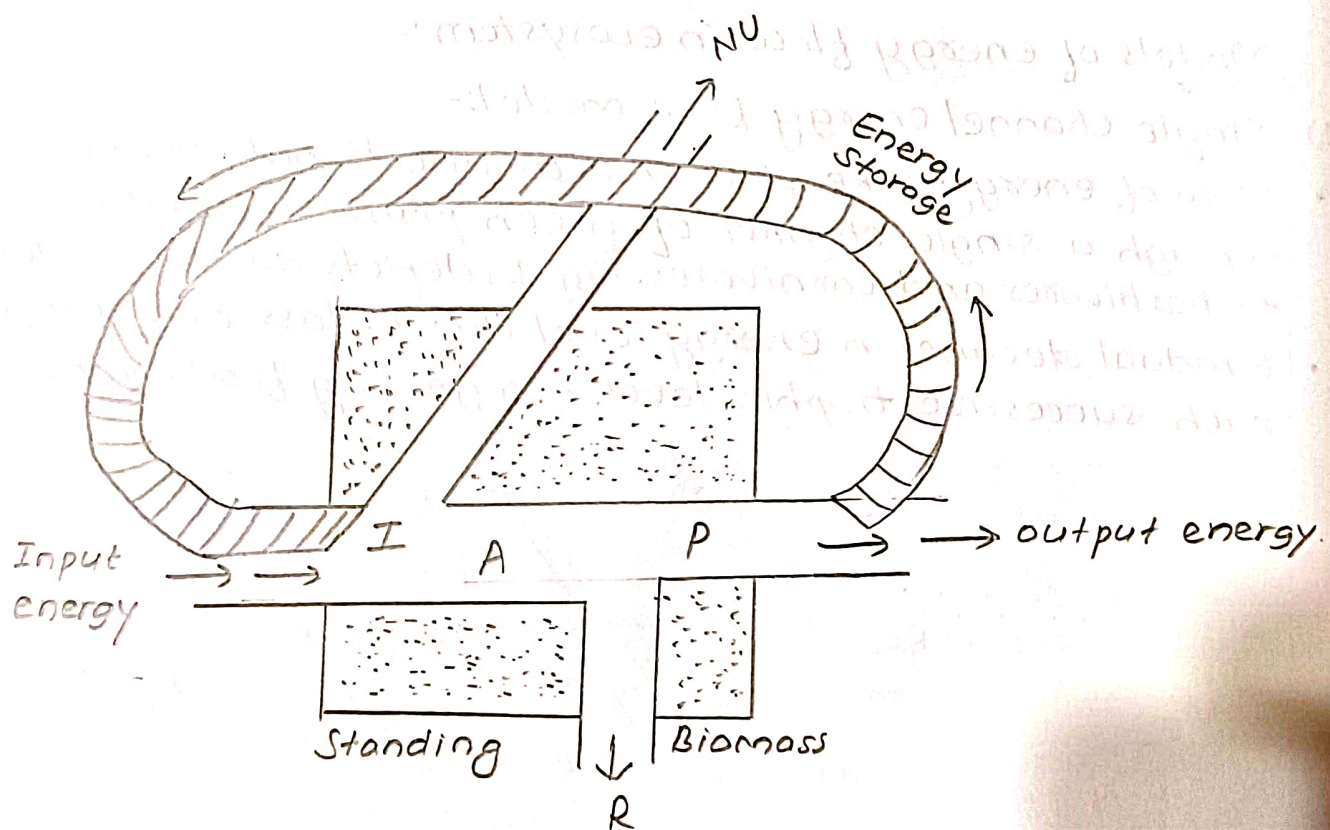
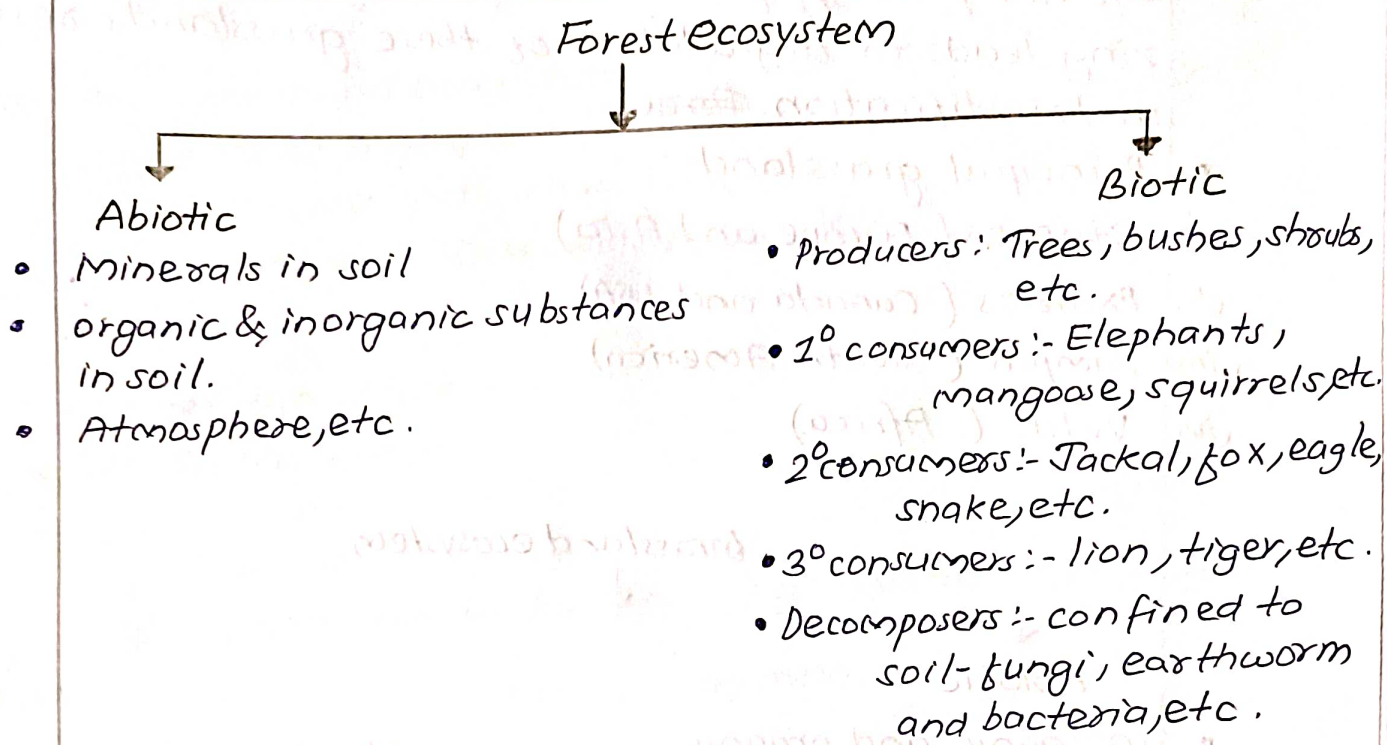


Fig 2: Universal energy flow model

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→ These are the ecosystems having a predominance of trees that are interspersed with a large number of species of herbs, shrubs, climbers, lichens, algae and a wide variety of wild animals and birds.

The forest ecosystem has two parts:-

- The non-living or abiotic aspects:-
The type of forest depends upon the abiotic conditions at the site. Forests on mountains, hills differ from those along river valleys forests also vary in their plants communities in response to the type of soil.
- The living or biotic aspects:-
The plants and animals form community that are specific to each forest type for instance coniferous trees occurs in himalayas. Mangrove trees occurs in rivers deltas. Evergreen forests of the western Ghats and North east India are most rich in plants and animals.

Grassland ecosystem:-

Grasslands are dominated by grass species but some also allow the growth of a few trees and shrubs. Rain is average but erratic. limited grazing helps to improve the net primary production of the grassland but overgrazing leads to degradation of these grasslands resulting in desertification. ~~There~~

• Principal grasslands:-

- (i) Steppes (Europe and Asia)
- (ii) Prairies (Canada and USA)
- (iii) Pampas (South America)
- (iv) Velds (Africa)

Grassland ecosystem.

Abiotic

- inorganic and organic compounds in soil and aerial environment.
- essential elements like C, H, N, O, S - water.
- Nitrates, sulphates and phosphates - soil
- Nitrogen in air.

Biotic

- Producers: Grass, tor-grass, blue moor-grass, false oat grass, etc.
- 1^o consumers: Deer, sheep, etc.
- 2^o consumers: Snake, jackals, fox, etc.
- 3^o consumers:- Hawks, owls, etc.
- Decomposers:- Penicillium, Mucor, cladosporium, Rhizopus, etc.

Types of grassland ecosystem:-

(1) Tropical grassland ecosystem:-

- extend upto about 20° on either side of the equator.
- Average rainfall of this ecosystem is about 50 to 100cm.
- Deers, lions, giraffes are seen in this ecosystem.

2. Temperate grassland ecosystem

- Found mainly in the center of the continent where the average rainfall is 75 to 100cm.
- mainly found in Europe, Asia, etc.
- Buffalo, zebra, kangaroo are found in this ecosystem.

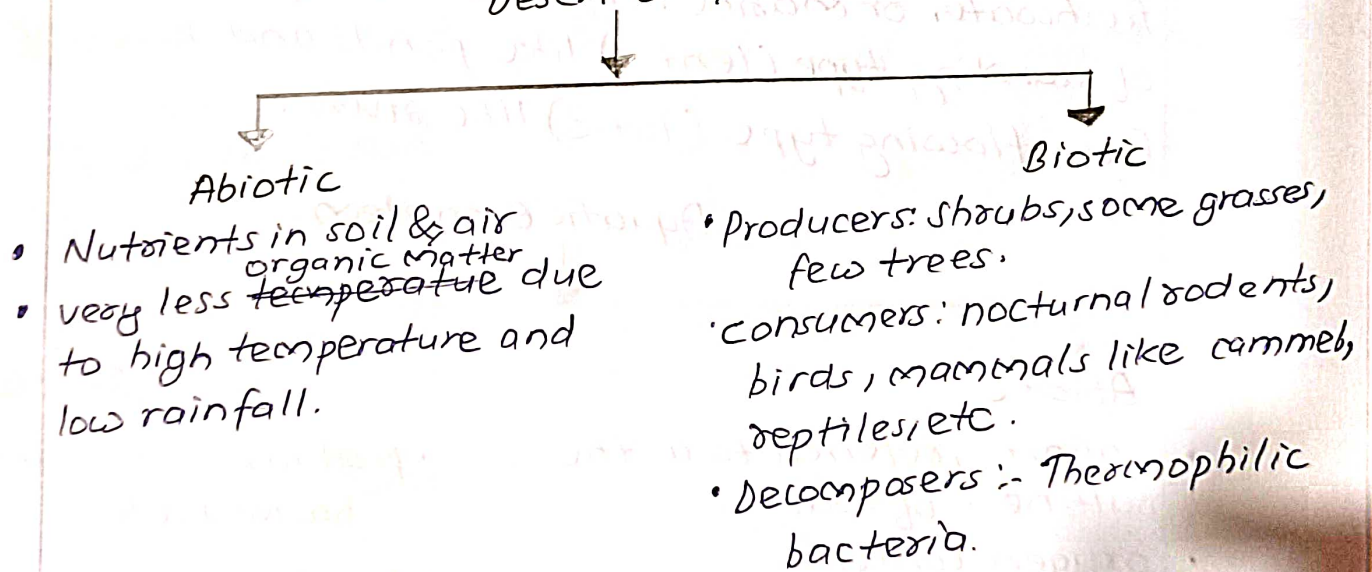
3. Polar grassland ecosystem.

- located at higher altitudes.
- are covered with snow all year.
- The temperature is usually below 10°C .

Desert ecosystem:-

- Negligible rainfall
- 17% of earth surface
- hot days and cold nights.
- Abundant minerals but very less organic matter in soil.

Desert ecosystem.



Types:-

1) Warm desert ecosystem:

- Climate is hot and dry in nature.
- The amount of rainfall here is very low.
- Sahara of North Africa, Thar of India are few examples.

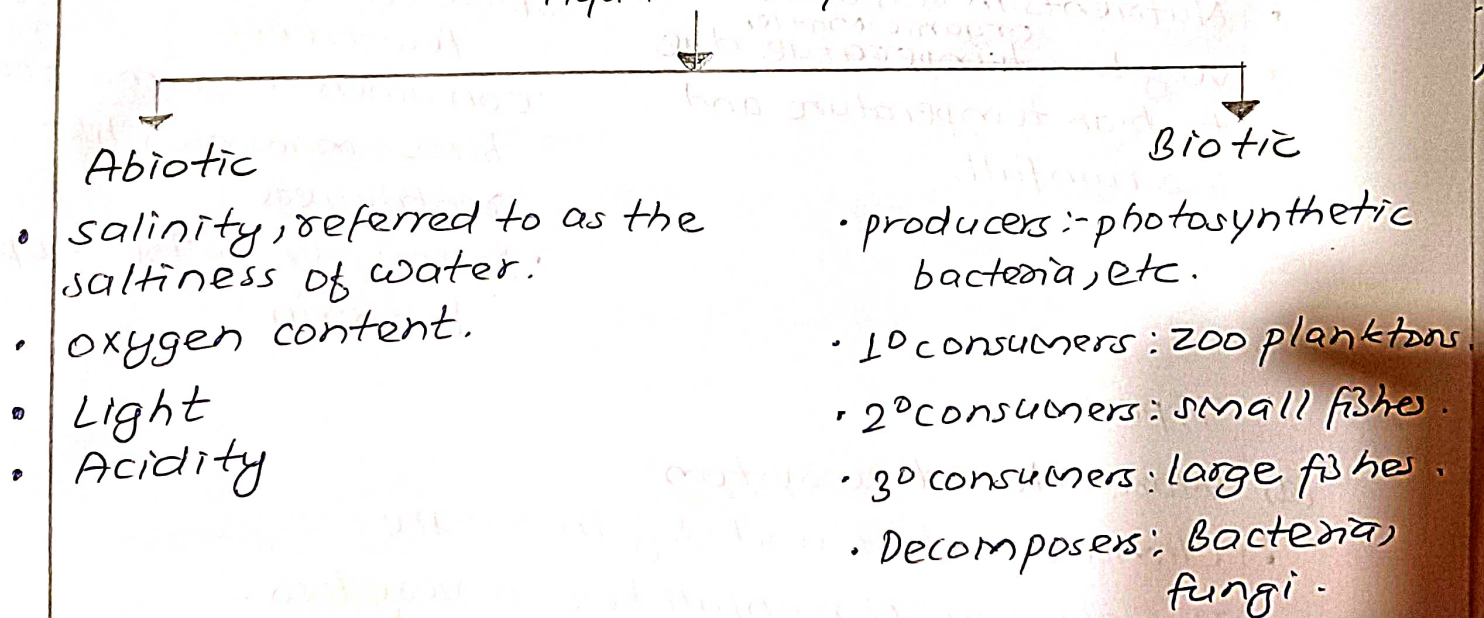
- (2) Semi-arid desert ecosystem
- This ecosystem has small sand dunes, hard rocks, etc.
 - The amount of rainfall is more than normal desert ecosystem.
 - The Great Basin of North America is an example.

- (3) Cold desert ecosystem.
- The climate of this ecosystem is very cool in nature.
 - It receives rainfall in winter.
 - It has large snow mounds.
 - Greenland and Antarctica region desert are example.

Aquatic Ecosystem:-

Aquatic ecosystems are dealing with water bodies and the biotic communities present in them are either freshwater or marine. Freshwater components are further of standing type (lentic) like ponds and lakes or free-flowing type (lotic) like rivers.

Aquatic ecosystem.



(1) Marine Ecosystem:-

- It is the largest of earth's aquatic ecosystem and exist in water that have a high salt content
- It covers more than 70% of the surface of earth and accounts almost 97% of Earth's water and 90% of habitable space on earth
- Marine ecosystem are further divided into:-
 - (a) oceanic zone
 - (b) benthic zone
 - (c) Intertidal zone.

(2) Freshwater ecosystem:-

- They are the subset of Earth's aquatic ecosystems.
- They include lakes, ponds, rivers, streams, springs, bogs and wetlands.
- Freshwater habitats can be classified by different factors, including temperature, light penetration, nutrients and vegetation.