

Energy flow

understanding

Are scientists
of life involved

Energy flow is the movement/transfer of energy between the elements of a system by biotic and abiotic means. As energy flows between different parts of a system it is transformed into different forms of energy.

A **food chain** indicates the transfer of energy from producers through a series of organisms.

Green plants and algae are called autotrophs or producer organisms, as they capture solar energy to transform it into the form of energy they need (such as adenosine triphosphate) in the process of photosynthesis.



Herbivores or primary consumers receive energy by consuming other organisms like producers.



Carnivores are secondary consumers as they eat the primary consumers as their source of food/energy.



Tertiary consumers, sometimes also known as an apex predator, are usually on top of food chains, capable of feeding on secondary consumers and primary consumers.



Decomposers or saprotrophs recycle organic material into chemical nutrients like carbon and nitrogen.

In each ecosystem the flow of energy is much more complex than can be illustrated by a linear food chain. A **food web** is a mixture of interrelated food chains which provides a more accurate picture of the feeding relations.

Energy transformation is the process of changing one form of energy to another and takes place in a number of ways. The land surface, oceans and atmosphere absorb solar radiation, thereby increasing their temperature (heat energy). Warm air containing evaporated water from the oceans causes convections (heat transferred from water to air). When this warm air reaches a high altitude, where the air is cold, water condenses what causes rain creating the water cycle. The latent heat of water condensation amplifies atmospheric phenomena such as wind, cyclone or anticyclone. Other examples include Bioluminescence in which chemical energy is transformed into light energy; and Muscular activity in which chemical energy is transformed into mechanical energy.

An **energy pyramid** provides a means of describing the feeding and energy relationships within a food chain or web. In food chains the solar energy absorbed by producers does not add to 100% in the next level (so on); at each trophic level energy loss occurs. The causes of loss from the pyramid include respiration, growth, generating heat and movement. On average only 10% of the energy cascades on to the next trophic level.

The loss of chemical substances from nutrients is also observed. For the animals at the end of the food chain less chemical material is available (energy), so they need to consume more food. This explains the shape of the energy pyramids typical pyramid.