

Effects of Pollution

EFFECTS OF WATER POLLUTION

Water pollution affects man, aquatic animals as well as the environment.

Effects on Environment — Animals, Marine Life and Vegetation

Due to water pollution, the process of photosynthesis is obstructed. This affects the growth of aquatic vegetation. All the chemicals that are drained into the water have harmful effects on every organism that lives there.

The effect of water pollution on marine animals and plants is visible in two phenomena—*eutrophication* and *biomagnification*.

Eutrophication: It is the process of depletion of oxygen from waterbodies occurring either naturally or due to human activities.

The process of eutrophication takes place due to introduction of nutrients and chemicals through discharge of domestic

sewage, industrial effluents and fertilisers from agricultural fields. The consequent nutrient accumulation results in phenomenal growth of phytoplankton and algae, thereby, reducing the penetration of oxygen, light and heat into the waterbody. As a result, most of the organisms die, draining water of all its oxygen.

Biomagnification: The term *Biomagnification* means increasing the concentration of various toxic substances along the food chain. Toxic substances at the level of primary producers get concentrated at each trophic level as they move up the food chain. The phenomenon of concentrated toxic deposition at the higher trophic level is known as *bioaccumulation*. For example, if there are traces of toxic chemicals in water, then their concentration in algae will be much higher. When fish eat the algae, the concentration of toxins will increase further. Therefore, accumulation of a small amount of toxic chemicals in water can have a serious impact on the fish that live in it.

An example of the phenomenon of Biomagnification was first noticed in Illinois (USA) where elm trees were sprayed with DDT. A large number of birds like robins died near these trees. It was later discovered that these birds perished due to DDT poisoning. The lethal dose came from earthworms which they consumed. Earthworms had concentrated DDT residue by feeding on fallen elm leaves.

The other effects of water pollution are:

- (i) Phosphorus and Nitrates from the fertilisers and detergents contaminate surface water where they act as nutrients

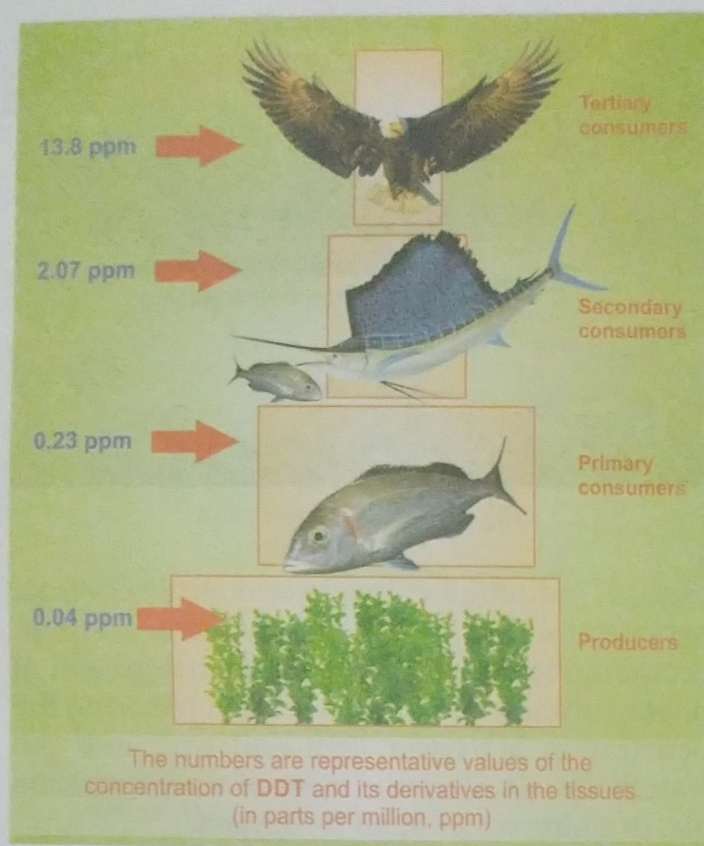


Fig. 18.3. Biomagnification

and promote the growth of oxygen consuming algae. This in turn, reduces the amount of dissolved oxygen in water and kills fish and other aquatic organisms.

- (ii) Industrial effluents result in the addition of poisonous chemicals such as Arsenic, Mercury, Cadmium, Lead etc., which kill aquatic organisms. These chemicals may reach human body through contaminated food (i.e., fishes etc.)
- (iii) Hot waste water released from power stations increases the temperature of water resources, reduces its oxygen level and makes it incapable of supporting life.
- (iv) Sea water polluted with crude oil leakage causes oil spills which contaminate sea water and lead to the death of marine organisms.

Effects on Human Health

Pathogens: Most of the wastewaters especially sewage contain pathogens (disease causing organisms) like bacteria, viruses and protozoa. These pathogens enter the human body from contaminated drinking water and are responsible for several waterborne diseases

like cholera, typhoid, diarrhoea, dysentery, hepatitis, polio and jaundice.

Toxic Compounds: Pollutants such as heavy metals, pesticides, cyanides and many other organic and inorganic compounds are harmful to all organisms. Some of the toxic substances do not undergo biodegradation and remain in the environment for a long time.

Toxic substances polluting the water ultimately affect human health. Some heavy metals like lead, mercury and cadmium cause various types of diseases.

- (i) Mercury dumped into water is transformed into water soluble methyl mercury by bacterial action. Methyl mercury accumulates in fish. People in Japan suffered from a disease called *Minamata* which resulted in numbness of body parts, vision and hearing problems and abnormal mental behaviour. This was caused by the consumption of methyl mercury contaminated fish caught from Minamata Bay in Japan.
- (ii) Pollution by the heavy metal, cadmium, caused the disease called *Itai-itai* among the people in Japan.
- (iii) Water contaminated with arsenic causes mental disorders, liver damage (cirrhosis), lung cancer, ulcers in gastrointestinal tract and kidney failure.
- (iv) Fluoride containing pollutants cause a disease called *fluorosis*, which causes discolouring of dental enamel and black and brown stains on the teeth. It also causes respiratory and gastrointestinal problems.

EFFECTS OF SOIL POLLUTION

Soil pollution affects human beings and animals indirectly through food chains. The effects of soil pollution on environment, human health and other organisms are discussed below.

Effects on Environment

- (i) Nitrogenous fertilisers produce toxic concentration of nitrate and nitrite in the leaves.
- (ii) Industrial and chemical wastes cause pollution of underground water.

(iii) Nitrogen and phosphorous from the fertilisers accumulate in nearby water bodies with agricultural run-off and cause eutrophication. Chemicals may percolate and contaminate groundwater resources.

(iv) Land and soil pollution is responsible for loss of fertility and productivity of soil.

Effects on Human Health

(i) Soil contains many pathogenic bacteria, viruses and intestinal worms which are transmitted to man by the consumption of fruits and vegetables. These pathogens cause various types of diseases.

(ii) Radioactive fallout on vegetation is the source of radioisotopes which enter the food chain through the grazing animals. Some of these radioisotopes cause abnormalities.

(iii) Use of human and animal excreta as manure pollutes the soil. Excreta contains pathogens that contaminate the soil and vegetable crops and affect the health of human beings.



Fig. 18.4. Effect of Radiation

Effects on other Organisms

(i) Particles in the sewage may clog the micro holes of the soil and destroy the micro-organisms necessary for the soil enrichment.

(ii) Radioactive material moves away from the soil into crops, livestock and human bodies through food chains.

(iii) Many pesticides are absorbed by plants and reach animals and humans via food chains.

EFFECTS OF RADIOACTIVE POLLUTION

Radioactive pollution is caused by testing of nuclear weapons, establishment of nuclear power plants, mining and refining of radioactive substances like uranium, thorium and plutonium and during medical treatment using X-rays.

Effects on Environment

Radiations emitting from radioactive materials and the disposal of radioactive wastes cause pollution and damage the environment. The high level products of nuclear wastes remain in the environment for several hundred years. Other radioactive threats to the environment are the accidents connected with the activities of nuclear reactors, nuclear-powered vessels and satellites, etc.



Effects on Human Health

Radiations affect living organisms. They cause harmful changes in the body cells and at genetic level.

- (i) **Genetic Variation:** The damage caused by radiations is often seen in the offsprings and may be transmitted to many generations.
- (ii) **Somatic Variation:** Short term exposures to radiation can cause damage to organs of the body. The harm done by them includes breast cancer, thyroid cancer, lung cancer and brain cancer, sterility and defective eyesight

Example: There was a radioactive accident in 1986 in Chernobyl in the Ukraine (then a part of the former USSR). On April 26, 1986, a Reactor at the nuclear power complex at Chernobyl exploded. There was a massive steam explosion. The core of the reactor combined with water

to produce hydrogen which exploded blowing toxic radioactive gases into the air. There were numerous fires. The Chernobyl accident is considered as the most disastrous nuclear power plant accident, both in terms of cost and casualties.

Due to the accident, 237 people suffered from acute radiation sickness, of whom 31 died within the first three months. After the disaster, four square kilometres of pine forest near the reactor turned reddish-brown and died, earning the name of the "Red Forest". Some animals in the worst-hit areas died or stopped reproducing.

Effects on Animals

Radioactive substances resulting from explosion of nuclear devices or nuclear wastes penetrate the soil from where they enter into the food chain and get concentrated in the body tissue of animals and have adverse effects on them.