

# Thermal pollution

When there is an increase in the temperature of water bodies by industrial processes or activity of thermal power stations it is referred to as thermal pollution.

The heated water causes a lowering of dissolved oxygen (DO) level in the body of water. As the DO content decreases the demand of oxygen increases in the water body, creating anaerobic conditions thereby disrupting the ecological balance.

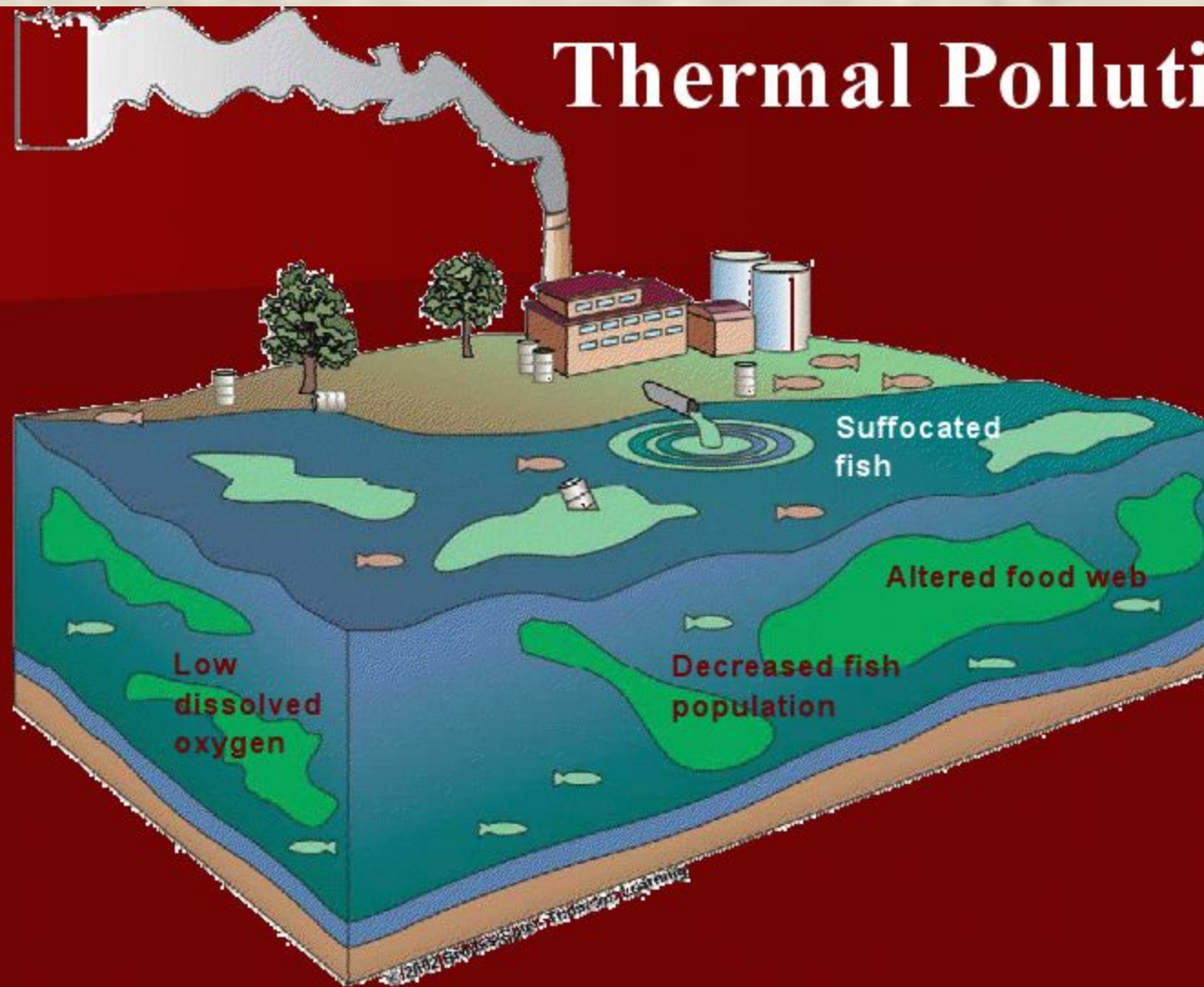
# Causes/Sources of thermal pollution:

- **Industrial Effluents-** Industries require cooling water for heat removal and cooling purposes. This heated water when discharged into the water system increases the temperature of water body.
- **Nuclear Power plants-** Nuclear power plants emit large quantity of heat and traces of radioactive substances which increases the temperature of water bodies.
- **Coal- fired power plants-** It is one of the major source of thermal pollution.
- **Domestic sewage-** When the domestic sewage is disposed off into water bodies like river, lakes etc it increases the temperature of receiving water.
- **Radioactive waste-** Dumping of radioactive waste in marine system increases the temperature when these substances radiate energy.

# Effects of Thermal pollution:

- There are two types of effects of thermal pollution
- **Thermal shock:** Due to decrease in DO levels there is suffocation of plants and animal species which creates anaerobic conditions .The sudden change in the temperature causes harm to the aquatic organisms.
- **Thermal enrichment:** The heated water is used for irrigation purposes to extend plant growing seasons. The warmer water also increases the metabolic rate of aquatic organisms (which in turn decreases the life expectancy of these organisms). The speedy growth is beneficial for commercial purposes.

# Thermal Pollution





# Radioactive pollution

- **Radioactive pollution** can be defined as the emission of high energy particles or radioactive substance into air, water or land due to human activities in the form of radioactive waste.
- **Radioactive waste** is usually the product of a nuclear process such as nuclear fission, which is extensively used in nuclear reactors, nuclear weapons and other nuclear fuel-cycles

- Radioactive pollution that is spread through the earth's atmosphere is called "**Fallout**". The atmospheric nuclear pollution become prominent during the world war 2 period when United States, Britain and Soviet Union started conducting nuclear tests in the atmosphere.
- The best example of fallout is the nuclear bomb attack on **Hiroshima and Nagasaki, Japan** in 1945 by United States of America during world war 2.



# Sources of radioactive contaminants:

- Following are the major sources where most of the radioactive waste is generated and is responsible for causing radioactive pollution:
- Production of nuclear fuel
- Nuclear power reactors
- Use of Radionuclides in industries for various applications
- Nuclear tests carried out by Defense Personnel
- Disposal of nuclear waste
- Uranium Mining



# Effects of Radioactive pollution

- **On the Environment**
- When soil is contaminated by radioactive substances, the harmful substances are transferred into the plants growing on it. It leads to genetic mutation and affects the plant's normal functioning. Some plants may die after such exposure, while others may develop weak seeds.
- Eating any part of the contaminated plant, primarily fruits, poses serious health risks. Since plants are the base of all food chains, their contamination can lead to radioactive deposition all along the food web. Similarly, when radioactive waste is washed up in a water source, it can affect the entire aquatic food web.
- Both terrestrial and aquatic radioactive contamination can culminate in human consumption. Since humans are apex predators, the accumulation of radioactive materials on the last rung of the food chain would be maximum.

- **On Human Beings**

- The impact of radioactive pollution on human beings can vary from mild to fatal; the magnitude of the adverse effects largely depends on the level and duration of exposure to radioactivity. Low levels of localized exposure may only have a superficial effect and cause mild skin irritation. Effects of long, but low-intensity exposures include nausea, vomiting, diarrhea, loss of hair, bruises due to subcutaneous bleeding etc.
- Long-term exposure or exposure to high amounts of radiation can have far more serious health effects. Radioactive rays can cause irreparable damage to DNA molecules and can lead to a life-threatening condition. Prolonged exposure leads to a large number of molecules in the body being ionized into free radicals. Free radicals promote the growth of cancerous cells, i.e. tumors, in the body. People with heavy radiation exposure are at a very high risk for cancers.

- The rapidly growing/dividing cells, like those of the skin, bone marrow, intestines, and gonads are more sensitive towards radioactive emissions. On the other hand, cells that do not undergo rapid cell division, such as bone cells and nervous cells, aren't damaged so easily.
- Skin cancer, lung cancer and thyroid cancer are some of the common types of cancers caused by radiation.
- The effects of genetic mutation are passed on to the future generations as well. In other words, if the parents are exposed to nuclear radiation, their child could have severe congenital birth defects, both physical and mental. This is tragically illustrated in the case of Hiroshima and Nagasaki, where the aftereffects of nuclear radiation were carried on for generations, and thousands of children were born with physical abnormalities and mental retardation. The radiation also brought about a spike in cancer; the region still (after more than 65 years) has a much higher rate of cancer and congenital abnormalities than the rest of Japan.

# Land Pollution

- Land pollution, in other words, means degradation or destruction of earth's surface and soil, directly or indirectly as a result of human activities. Anthropogenic activities are conducted citing development, and the same affects the land drastically. The degradation of land that could be used constructively in other words is land pollution.



# *Causes/Sources of Land Pollution*

- **Deforestation and soil erosion:** Deforestation carried out to create dry lands is one of the major concerns. Land that is once converted into a dry or barren land, can never be made fertile again, whatever the magnitude of measures to redeem it are. Land conversion, meaning the alteration or modification of the original properties of the land to make it use-worthy for a specific purpose is another major cause.
- **Agricultural activities:** With growing human population, demand for food has increased considerably. Farmers often use highly toxic fertilizers and pesticides to get rid off insects, fungi and bacteria from their crops. However with the overuse of these chemicals, they result in contamination and poisoning of soil.
- **Mining activities:** During extraction and mining activities, several land spaces are created beneath the surface. We constant hear about land caving in; this is nothing but nature's way of filling the spaces left out after mining or extraction activity.



- **Overcrowded landfills:** Each household produces tonnes of garbage each year. Garbage like aluminum, plastic, paper, cloth, wood is collected and sent to the local recycling unit. Items that can not be recycled become a part of the landfills that hampers the beauty of the city and cause land pollution.
- **Industrialization:** Due to increase in demand for food, shelter and house, more goods are produced. This resulted in creation of more waste that needs to be disposed of. To meet the demand of the growing population, more industries were developed which led to deforestation.
- **Construction activities:** Due to urbanization, large amount of construction activities are taking place which has resulted in large waste articles like wood, metal, bricks, plastic that can be seen by naked eyes outside any building or office which is under construction.
- **Nuclear waste:** Nuclear plants can produce huge amount of energy through nuclear fission and fusion. The left over radioactive material contains harmful and toxic chemicals that can affect human health. They are dumped beneath the earth to avoid any casualty.
- 8. **Sewage treatment:** Large amount of solid waste is leftover once the sewage has been treated. The leftover material is sent to landfill site which end up in polluting the environment.

# Effects of Land Pollution

- **Soil pollution:** Soil pollution is another form of land pollution, where the upper layer of the soil is damaged. This is caused by the overuse of chemical fertilizers, soil erosion caused by running water and other pest control measures; this leads to loss of fertile land for agriculture, forest cover, fodder patches for grazing etc.
- **Change in climate patterns:** The effects of land pollution are very hazardous and can lead to the loss of ecosystems. When land is polluted, it directly or indirectly affects the climate patterns.
- **Environmental Impact:** When deforestation is committed, the tree cover is compromised on. This leads to a steep imbalance in the rain cycle. A disturbed rain cycle affects a lot of factors. To begin with, the green cover is reduced. Trees and plants help balance the atmosphere, without them we are subjected to various concerns like Global warming, the green house effect, irregular rainfall and flash floods among other imbalances.

- **Effect on human health:** The land when contaminated with toxic chemicals and pesticides lead to problem of skin cancer and human respiratory system. The toxic chemicals can reach our body through foods and vegetables that we eat as they are grown in polluted soil.
- **Cause Air pollution:** Landfills across the city keep on growing due to increase in waste and are later burned which leads to air pollution. They become home for rodents, mice etc which in turn transmit diseases.
- **Distraction for Tourist:** The city loses its attraction as tourist destination as landfills do not look good when you move around the city. It leads to loss of revenue for the state government.
- **Effect on wildlife:** The animal kingdom has suffered mostly in the past decades. They face a serious threat with regards to loss of habitat and natural environment. The constant human activity on land, is leaving it polluted; forcing these species to move further away and adapt to new regions or die trying to adjust. Several species are pushed to the verge of extinction, due to no homeland.

# *Solutions for Land Pollution*

- Make people aware about the concept of Reduce, Recycle and Reuse.
- Reduce the use of pesticides and fertilizers in agricultural activities.
- Avoid buying packages items as they will lead to garbage and end up in landfill site.
- Ensure that you do not litter on the ground and do proper disposal of garbage.
- Buy biodegradable products.
- Do organic gardening and eat organic food that will be grown without the use of pesticides.
- Create dumping ground away from residential areas.