What Is Air Pollution?

Air pollution refers to contaminated indoor or outdoor air. Pollution can be any atmospheric air alternations, whether physical, biological or chemical. Whenever contaminants like dust or smoke enter the atmosphere, vegetation, humans and other living beings may have trouble surviving. Air pollution also refers to a substance that hinders the atmosphere and ecosystem.

The composition of gases in the atmosphere sustains all living things on Earth, and any imbalance may cause harm to life.

Primary vs. Secondary Air Pollution

Air pollutants are typically considered either visible or invisible. Air pollutants generally are also either classified as primary or secondary:

- **Primary air pollutants:** These are pollutants that directly result from their sources. An example of this is the sulfur dioxide emitted from factories.
- **Secondary air pollutants:** Primary and secondary pollutants intermingle and react to produce these pollutants. Primary pollutants may undergo chemical reactions that produce smog, a key example of a secondary pollutant.

Types of Air Pollutants

Understanding the different air pollution types can help you determine their causes, effects and prevention methods.

The top eight air pollutants are:

1. Carbon monoxide
2. Carbon dioxide
3. Nitrogen oxides
4. Ozone
5. Chlorofluorocarbons (CFCs)
6. Particulates

7. Sulfur dioxide
8. Volatile organic compounds (VOCs)

Most Common Causes of Air Pollution

Natural and manmade pollution sources may harm human health. Natural sources include volcanic eruptions, dust carried by the wind and gases released by living beings. Manmade activities that cause air pollution include motor vehicle use, fossil fuel burning and agriculture.

Following is a list of the most common air pollution sources:

1. Fossil fuel burning: Fossil fuel burning like that which happens in factories or other industrial applications emits sulfur dioxide into the atmosphere.
2. Agriculture: Agricultural activities frequently emit ammonia, a severely hazardous atmospheric gas. Insecticides, pesticides and fertilizers cause both chemical air and water pollution. Farmers also set controlled fires to fields and old crops to clear them for the next round of sowing. However, this burning also releases harmful pollution-causing gases into the air.
3. Landfill waste: Landfills are land areas into which humans deposit or bury waste, which then generates methane. Methane is a significant greenhouse gas that is highly flammable and very hazardous.
4. Industry and factory emissions: Manufacturing industries deplete air quality by releasing hydrocarbons, carbon monoxide, organic compounds and other chemicals into the air.
5. Mining operations: During mining, large equipment extracts underground minerals. However, this process also releases dust- and chemical-based air pollutants. Nearby residents and workers often suffer health consequences as a result of mining.
6. Indoor sources: Substances like household cleaning products and painting supplies, for example, contribute to indoor air pollution.

Air Pollution Effects

Now that we know the types of air pollution and what causes them, it's essential to understand how it affects public health and the environment. Air pollution impacts human health in different ways depending on the exposure type, level and length of exposure. However, different individuals may experience various effects, such as increased respiratory conditions or age-related complications. Here are seven effects of air pollution:

1. Public health problems: Air pollution contributes to several respiratory and heart problems, including asthma, chronic bronchitis, emphysema, heart attacks, strokes and cancer. More than 4 million people each year die from air pollution-related complications.
2. Child health problems: During pregnancy, exposure to high air pollution can cause miscarriages, premature birth, autism, asthma and spectrum disorders in young children. It can also damage early brain development in a child and cause pneumonia, which kills almost a million children under five years old. Children are at a greater risk of short-term respiratory infections and pulmonary diseases in areas exposed to air pollutants.
3. Global warming: This issue is probably one of the most well-known effects of air pollutants. Increasing temperatures across the globe have led to elevated sea levels from melting icebergs, resulting in habitat loss and emphasizing the need for preservation actions.
4. Acid rain: Harmful gases like nitrogen oxides and sulfur oxides are released into the atmosphere when fossil fuels are burned. Rain mixes with air pollutants to form acid rain, damaging humans, animals, landscapes and plants. Sensitive ecosystems such as lakes and forests are especially susceptible to acid rain damage.
5. Eutrophication: Eutrophication happens when excess algae form in bodies of water due to the high nitrogen level of some pollutants. Many lakes and ponds typically have this green-colored, eutrophication-based algae. Heavy algae can negatively impact aquatic species like fish and plants.

6. Wildlife harm: Animals may change habitats due to air pollution. Further, toxic particulates can also impact aquatic animals when pollutants contaminate the water.
7. Depletion of the ozone layer: The ozone layer protects the Earth's inhabitants from the sun's damaging ultraviolet (UV) rays. However, atmospheric chlorofluorocarbons and hydrochlorofluorocarbons are contributing to ozone layer depletion. A thinning ozone layer causes increased UV rays to reach the Earth, resulting in potential skin and eye-related problems. Sensitive ecosystems like parks, forests and wilderness sanctuaries can experience harm due to elevated ozone levels.

This list is just the beginning. If air pollution continues without any attempts to reduce or prevent it, these issues will only continue to grow and worsen.

Air Pollution Solutions

So, how do we reduce air pollution to prevent the harmful and hazardous effects listed above? These are some solutions to air pollution that everybody could do to help:

1. Use public transportation: Public transportation helps reduce pollution, as people can get where they need to go with fewer pollutant-emitting vehicles. Carpooling is also an excellent option to help save energy and money. Burning less gasoline due to personal vehicles helps fight the air pollution that contributes to climate change. Use more sustainable transportation options like walking, using a bike, buying an electric car or ride-sharing whenever possible to prevent air pollutant emissions.
2. Improve household practices: Rather than using wood, utilize gas logs around the home. Try to decrease how often you use gas-powered landscaping equipment. Lighting open fires in your yard also contributes to increased air pollutants. Following environmentally friendly practices like composting, mulching organic waste or using green cleaning products reduces household emissions.

3. Be energy-conscious: You can help reduce air pollution emissions in residential applications by turning off lights and fans when leaving the house. Burning fossils fuels produces electricity. Therefore, you can decrease your fossil fuel emissions through energy-saving practices.
4. Reduce, reuse, recycle: Reduce, reuse and recycle is more than just a fun saying — it also helps save the environment. Instead of throwing things away, donate them or use them for an alternative purpose. Store cereals or other dry foods in old jars and recycle the boxes, and donate items to the needy to reduce waste.
5. Emphasize renewable resources: Energy sources like solar, geothermal and wind are more sustainable than fossil fuel alternatives. In fact, governments offer grants for eco-conscious consumers who are interested in sustainable power for their homes. If you review sustainable energy options, you may find you can easily use wind or solar electricity sources in your home.
6. Prioritize energy efficiency: Consider which devices may be more energy-efficient than high energy consuming alternatives. For example, CFL lights last longer and use less electricity, leading to lower bills and reducing air pollution.
7. Buy local groceries: Transporting food via truck or air across the country burns more fossil fuels. Therefore, shopping locally can both decrease fossil fuel use and support your local community.
8. Support eco-friendly local and national politicians and leaders: Politicians and other community leaders are crucial in the clean air and water crusade. These individuals have the potential to make a more significant impact on public health and environmentalism.
9. Avoid open burning: A significant cause of particulate matter, open burning refers to setting fire to landscaping debris, trash and other waste. Practice more sustainable ways to dispose of waste through incineration, such as converting it to biogas.

What is Water Pollution?

Water pollution is the contamination of oceans, seas, lakes, rivers, aquifers, and groundwater. This is usually caused due to human activities. Water pollution scientifically changes in the physical, chemical or biological properties of water that will have a detrimental consequence of any living organism.

Drinking water is the water that is considered safe enough for human and animal consumption. This water is generally used for drinking, cooking, washing, crop irrigation, etc. But, these days chemicals, bacteria, and other pollutants are even affecting our drinking water.

Types of Water Pollution

Surface Water Pollution

Hazardous substances when coming into contact with different sources of water, leads to surface water pollution. The harmful contaminants from various sources mix or dissolve with lakes, lagoons, oceans and lead to surface water pollution.

Ground Water Pollution

Pesticides and chemicals applied to crops and soil are washed deep into the ground during the rain. The pesticides mix with groundwater and lead to its pollution.

Suspended Matter Pollution

In this pollution, the pollutants enter into water and don't mix with the water molecules. Therefore, the suspended particles in water form silt on the waterbed. Due to this nutrient from water were removed and making it polluted.

Microbial Pollution

Microorganisms cause this type of water pollution. Although most of the microorganisms are harmless, some bacteria and viruses may cause serious health problems.

Chemical Water Pollution

Many industries and farmers use chemicals for their various purposes. It causes water pollution. Pollutants used to control weeds, insects and pests leech into the water and spreading the pollution. Also, metals and solvents from industries also lead to water pollution.

Causes of Water Pollution:

Sewage

Disposing of sewage in water is one of the major reasons for water pollution. Sewage disposed into the sea from households as well as factories can cause water pollution. Sewage disposal leads to a number of water-related illnesses such as diarrhea which is a leading cause of death among children.

Industrial Waste

Many factories pour industrial waste like toxic chemicals into the water bodies before treatment. It leads to polluting the water. Due to dumping toxic chemicals, the oxygen levels in water decreases leading to pollution.

Dumping of Solid Waste

Another major reason for water pollution is littering by humans. Dumping solid waste such as plastics, cardboards, Styrofoam contaminates water and make water unsuitable for consumption. Mass dumping of solid waste clogs the water bodies and leads to water pollution.

Radioactive Wastes

Discharging of radioactive wastes into the sea is also one of the main water pollution cause in today's world.

Effects of Water Pollution

Groundwater contamination

Pesticides and fertilizers used for the cultivation of crops are contaminating the groundwater as well as our ecosystem. If this groundwater is supplied to our home directly through bore-wells or tube-wells, it will lead to a number of health problems.

Affects Aquatic Life

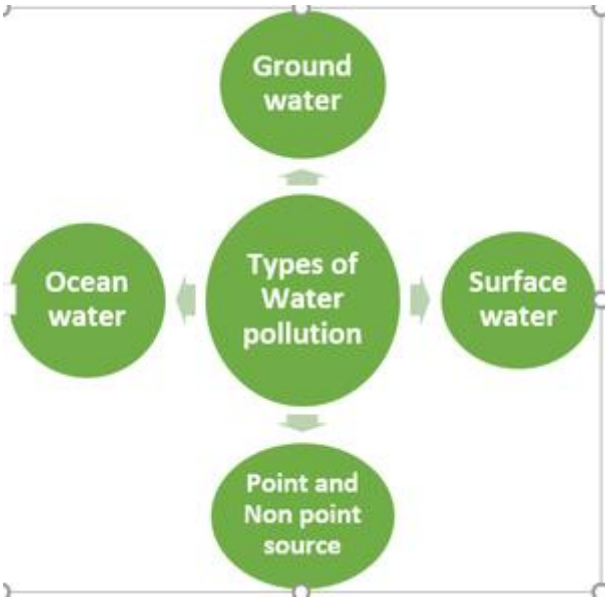
Solid wastes that we throw in the river or lakes or in the sea can have a harmful impact on the aquatic animals. Also, this disrupts the eco-system as many species of aquatic animals are in danger. People consuming seafood are also at a risk of facing health issues.

High TDS in water

Water is the best solvent that easily dissolves a variety of substances. The TDS level in drinking water needs to be less than 500 mg/liter. The presence of a high amount of TDS in water can lead to many health problems in human beings.

OR

Types of Water Pollution



Water pollution types

Groundwater
During rainfalls some of the water enters the earth, filling the breaks, cleft, and permeable spaces of a surface, it becomes groundwater. The vast

majority of them depend on groundwater, siphoned to the world's surface, for drinking water. For certain people in provincial regions, it's their main freshwater source. Groundwater gets contaminated when pollutants from pesticides and composts to squander filtered from landfills and septic frameworks, delivering it perilous for human use. Freeing groundwater of pollutants can be challenging to unimaginable, as well as exorbitant. When contaminated, spring might be unusable for a really long time, or even millennia. Groundwater can likewise spread defilement a long way from the first dirtying source as it saturates streams, lakes, and seas.

Surface water
Covering around 70% of the earth, surface water fills our seas, lakes, streams, lakes, and so on. As per the latest reviews on public water quality from the U.S. Natural Protection Agency, almost 50% of our waterways and streams and more than 33% of our lakes are contaminated and unsuitable for swimming, fishing, and drinking. Supplement contamination, which incorporates nitrates and phosphates, is the main sort of tainting in these freshwater sources. Civil and modern waste releases contribute their reasonable portion of poisons too.

Ocean water
A lot of sea contamination begins ashore, whether along the coast or far inland. Pollutants like synthetic substances, supplements, and weighty metals are conveyed from ranches, processing plants, and urban communities by streams and waterways into our narrows and estuaries from that point they head out to the ocean. In the meantime, marine material particles and floating substances especially plastic quickly passed up the breeze or washed in through storm channels and sewers. Our oceans are additionally some of the times ruined by oil spills of large and fewer leaks and are reliably absorbing carbon contamination from the air. The sea ingests as much as a fourth of man-made fossil fuel by-products.

Point and Non-point source

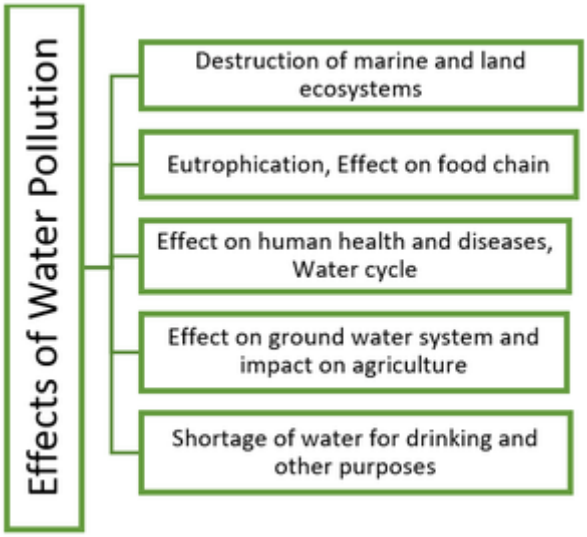
The point when contamination comes from a solitary source is called a point source. Models incorporate wastewater released lawfully or unlawfully by a producer, petroleum processing plant, or wastewater treatment office, as well as pollution from releasing septic frameworks, synthetic and oil slicks, and unlawful unloading. Nonpoint source contamination will be pollution gotten from diffuse sources. These may incorporate horticultural or running of rainwater or trash blown into streams from land.

Sources of Contamination

Human activities and their wastage account for the major cause of water pollution. Water contamination and loss of water due to overuse of growing population. Some of the major pollutant sources of contamination are as follows:

- **Industrial Waste:** Industrial exercises discharge gigantic measures of harmful chemicals like lead and mercury. It likewise influences the biodiversity of the water body.
- **Sewage Waste:** Tons of sewage squander is unloaded into water bodies. This causes contamination as well as deliveries of hazardous sickness-causing microorganisms.
- **Mining:** Mining brings out hurtful synthetic compounds that are covered profoundly under the earth's surface. At the point when this interacts with water can cause significant lake and stream contamination
- **Marine waste:** Wastes created in the ships are unloaded into the ocean. People's trash produced consistently is unloaded into the oceans and seas venturing leading to trash islands.
- **Horticultural Activities:** The utilization of substance manures, pesticides, and different overflows during water system streams into the water bodies. These synthetics make contamination water bodies with a limited capacity to focus time.
- **Radioactive Wastes:** All the radioactive materials that are utilized for atomic carts or as an energy source, are generally unloaded into water bodies or in glaciers that will promptly blend in with water when the temperature elevates.

Effects of Water Pollution



Control Measures of Water Pollution

Water pollution should be resolved as soon as possible because of the rise in the human population and their concern. Water pollution can be controlled in many ways and methods by taking proper actions and introducing new technologies.

Water treatments

Water treatment plants should be established on near water projects to treat water before directing it to commercial and household purposes. It is better to dump waste cautiously and not to dump it straightforwardly into water bodies, without appropriate waste treatment. industrial companies ought to treat their wastage cautiously prior to discarding chemical substances and different materials into water bodies straightforwardly. Treatment of sewage water and the modern effluents prior to delivering it into water bodies. High temp water ought to be cooled before discharge from the power plants.

Substances that are taken out during the most common way of drinking water treatment incorporate suspended solids, microscopic organisms, green growth, viruses, parasites, and minerals like iron and manganese. The cycles engaged with eliminating the pollutants incorporate actual cycles, for example, settling and filtration, compound cycles, for example, sanitization and coagulation, and natural cycles like slow sand filtration. Chlorine is utilized on the grounds that it is an extremely successful disinfectant. Lime is added to the filtered water to change the pH and settle the normally delicate water. Bleaching powder and alum are utilized for the evacuation of arsenic.

Chemical methods

Chemical processes such as coagulation, ion exchange method, reverse osmosis, etc. will greatly reduce the level of water pollution.

New technologies to control water pollution

- **Bioremediation**: Bioremediation is the utilization of microorganisms to debase the natural contamination into a less poisonous form. Microorganisms can be explicitly intended for bioremediation utilizing genetic engineering technologies.
- **Phytoremediation**: Phytoremediation is the utilization of plants to eliminate impurities from soil and water. Normal phytoremediation is completed by mangroves, estuarine vegetation, and other wetland vegetation. Water hyacinth an aquatic weed can decontaminate water by taking a few poisonous materials and various weighty metals from water. Oil spills in water can be cleaned with the assistance of Bregoli, a by-

product of the paper industry looking like sawdust. Eucalyptus trees should be planted around sewage lakes. These trees assimilate all overflow wastewater quickly and discharge unadulterated water fume into the climate.

- **Riparian buffers:** A riparian buffer is a vegetated region, a buffer strip close to a stream, typically forested, which helps as shade and acts as a shield to the stream from the effect of neighboring area uses.

Avoiding the usage of chemical fertilizers

Stop using excessive use of fertilizers and pesticides should be avoided. Using natural fertilizers and pesticides as substitutes for chemical ones is good for plants and water. Organic farming and the efficient use of animal residues as fertilizers can replace chemical fertilizers.

Utilization of less water

Clean and fresh water might appear to be copious, yet there is a restricted sum accessible to the environment. Use water by installing water-saving gadgets on sinks, in latrines, and in showers. Take baths rather than long showers. Try not to run the water continually while cleaning your teeth. Wash garments when you have a full heap of clothing. Possibly water your grass and plants when totally important.

Try not to dump chemical compounds

Use less chemical-containing substances and cleaners around the home. Not exclusively will you cut down on indoor air contamination, yet additionally on entering chemicals into the water system. Try to utilize biodegradable cleaners. Try not to empty oil or different chemicals into the drainages in the city.

Keeping water checks for lead contamination

Many homes have lead lines or lead-around associations on the lines which convey water to their homes. Since this lead might enter your drinking water and create clinical issues in children. Important to have water tests. On the off chance that lead is available, introducing a filter might tackle the issue.

Do not pollute open-air water sources

Try not to dirty open-air water sources: Do not empty oil or different synthetic substances into the drainages in the city. A little oil can kill many plants and creatures. Try not to litter, particularly close to water. Litter might be eaten as food by creatures and hurt them. Try not to utilize pesticides on yards, or utilize just natural ones. Utilize less manure, too. Every one of these can enter our water sources.

Use environmentally friendly products

- By using soluble products that do not go on to become pollutants, we can decrease how much water contamination is brought about by a family.
- As an individual, reusing, reducing, and recycling wherever possible will advance a long way in overcoming the impacts of water pollution.

Water pollution and Diseases

Water toxins might cause infection or go about as poison. Microbes and parasites in ineffectively treated sewage might enter drinking water supplies and lead to stomach-related issues like cholera and lose of bowels. Dangerous synthetic compounds, pesticides, and herbicides from industries, ranches, homes, and fairways can cause intense harmfulness and quick passing, or constant poisonousness that can prompt neurological issues or malignant growths. Many water poisons enter our bodies when we use water for drinking and food readiness. The poisons enter the gastrointestinal system and arrive at different organs in the body and cause different diseases. Synthetic compounds that interact with the skin from washing garments, or from swimming in contaminated water might prompt skin itchiness. Dangerous synthetics in water systems can likewise influence the environmental elements of creatures and plants that live there. In some cases, dangerous microbes will leave within the synthetics in the water system. When it is used for drinking purposes people become sick which leads to harmful side effects.

What is Soil Pollution

Soil Pollution has gradually become a major challenge that we need to overcome for establishing a healthy environment. Weathering of the earth’s crusts by different processes leads to the formation of soil

that accumulates over the centuries. The soil is the home for a large part of bacterial biodiversity and other microscopic and macroscopic living organisms.

However, let us consider our very own country India. Indian economy is largely dependent on agriculture. Thus, we Indians give very high priority to the development of agriculture, fisheries, and livestock. Therefore, for surplus production, it is very important to protect crops from any type of damage that occurs due to insects, weeds, rodents and other crop diseases.

So, how do we protect crops? The very obvious answer is pesticides and herbicides. However, do you know these pesticides and herbicides is a leading cause of soil pollution? Therefore, it is very important to judiciously use pesticides because it contains lots of different harmful chemicals. Therefore, to improve soil and prevent soil pollution it is important to limit the use of pesticides and herbicides.

Types of Soil Pollutants

- Heavy metals (such as lead and mercury, at excessively high amounts) in the soil can make it very poisonous to humans.
- PAHs (polycyclic aromatic hydrocarbons) are a class of organic chemicals where only carbon and hydrogen atoms are present.
- Coke (coal) production, automobile emissions, cigarette smoke, and shale oil extraction are all sources of PAHs in the soil.
- Industrial Waste Soil contamination can come from the dumping of industrial waste into soils.
- Pesticides are chemicals (or chemical mixes) that are used to kill or prevent pests from reproducing.

However, unintended pesticide dispersion into the environment (often referred to as “pesticide drift”) raises a number of environmental issues, including water and soil degradation.

Definition of Soil Pollution

Soil pollution refers to anything that causes contamination of soil and degrades the soil quality. It occurs when the pollutants causing the pollution reduce the quality of the soil and convert the soil inhabitable for microorganisms and macro organisms living in the soil.

Soil contamination or soil pollution can occur either because of human activities or because of natural processes. However, mostly it is due to human activities. The soil contamination can occur due to the presence of chemicals such as pesticides, herbicides, ammonia, petroleum hydrocarbons, lead, nitrate, mercury, naphthalene, etc. in an excess amount.

The primary cause of soil pollution is a lack of awareness in general people. Thus, due to many different human activities such as overuse of pesticides the soil will lose its fertility. Moreover, the presence of excess chemicals will increase the alkalinity or acidity of soil thus degrading the soil quality. This will in turn cause soil erosion. This soil erosion refers to soil pollution.

Causes of Soil Pollution

Soil pollution can be natural or due to human activity. However, it mostly boils down to the activities of the human that causes the majority of soil pollution such as heavy industries, or pesticides in agriculture.

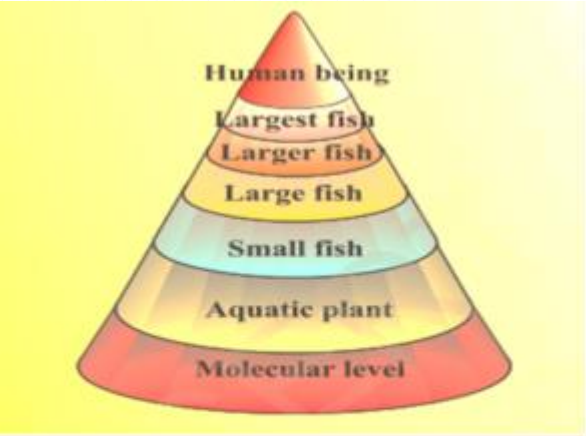
Pesticides

Before World War II, the chemical nicotine chemical present in the tobacco plants was used as the pest controlling substance in agricultural practices. However, DDT was found to be extremely useful for malaria control and as pest control of many insects during World War II. Therefore, it was used for controlling many diseases.

Hence, post-war, people started using it as pest control in agriculture for killing rodents, weeds, insects, etc. and avoiding the damages due to these pests. However, everyone gradually the adverse effects of this chemical which led to the ban of this chemical in many parts of the world including India.

Moreover, pests became resistance to DDT due to the chemicals regular use. Hence this led to the introduction of other harmful chemicals such as Aldrin and Dieldrin. Pesticides are synthetic toxic chemicals that definitely kill different types of pests and insects causing damage to agriculture but it has many ecological repercussions.

They are generally insoluble in water and non-biodegradable. Therefore, these chemicals will not gradually decompose and keep on accumulating in the soil. Therefore, the concentration of these chemicals will increase when the transfer of these chemicals take place from lower to higher trophic level via the food chain. Hence, it will cause many metabolic and physiological disorders in humans.



Trophic Level
Concentration of Pollutants Increases 10 Fold at Each Trophic Level

Chlorinated Organic toxins

The harmful effect of DDT and other chemicals led to the introduction of less persistent organic and more-biodegradable substance such as carbonates and organophosphates. However, these chemicals act as harmful toxins for nerves, hence they are more dangerous to humans. It led to pesticides related to the death of field workers in some agricultural fields.

Effects of Soil Pollution

Soil pollution is not only the problem in India but it is a global problem. It causes harmful effect on the soil and the environment at large. Contamination of soil will decrease the agricultural output of a land. Major soil pollution after effects are:

Inferior Crop Quality

It can decrease the quality of the crop. Regular use of chemical fertilizers, inorganic fertilizers, pesticides will decrease the fertility of the soil at a rapid rate and alter the structure of the soil. This will lead to decrease in soil quality and poor quality of crops. Over the time the

soil will become less productive due to the accumulation of toxic chemicals in large quantity.

Harmful Effect on Human Health

It will increase the exposure to toxic and harmful chemicals thus increasing health threats to people living nearby and on the degraded land. Living, working or playing in the contaminated soil can lead to respiratory diseases, skin diseases, and other diseases. Moreover, it can cause other health problems.

Water Sources Contamination

The surface run-off after raining will carry the polluted soil and enter into different water resource. Thus, it can cause underground water contamination thereby causing water pollution. This water after contamination is not fit for human as well as animal use due to the presence of toxic chemicals.

Negative Impact on Ecosystem and Biodiversity

Soil pollution can cause an imbalance of the ecosystem of the soil. The soil is an important habitat and is the house of different type of microorganisms, animals, reptiles, mammals, birds, and insects. Thus, soil pollution can negatively impact the lives of the living organisms and can result in the gradual death of many organisms. It can cause health threats to animals grazing in the contaminated soil or microorganisms residing in the soil.

Therefore, human activities are responsible for the majority of the soil pollution. We as humans buy things that are harmful and not necessary, use agricultural chemicals (fertilizers, pesticides, herbicides, etc.), drop waste here and there. Without being aware we harm our own environment.

Therefore, it is very important to educate people around you the importance of environment if they are not aware. Prevention of soil erosion will help to cease soil pollution. Thus, it is our small steps and activities that can help us to achieve a healthier planet for us. Therefore, it is essential for industries, individuals and businesses to understand the importance of soil and prevent soil pollution and stop the devastation caused to plant and animal life.

The solution to reduce the soil pollution

- Use of correct farming techniques
- Recycling of Waste before disposal, Recycle and Reuse Products
- Use of organic fertilizers instead of chemical fertilizers and pesticides
- Community education and awareness, Get the Locals Involved
- Proper maintenance of sewage system, Proper disposal method of household and industrial waste
- Reforestation and Afforestation Should be Promoted
- Planting new trees and plants is afforestation. We live because plants live. If the plants die, all living things will also die. Thus, whenever trees are cut down new trees should be planted. Planting trees in hilly areas are most effective for conservation.

How are people exposed to soil contaminants?

Contaminants in the soil can be present in all three periods (solid, liquid, and gaseous). As a result, these pollutants can enter the human body through a variety of routes, including direct skin contact or inhalation of contaminated soil dust.