

Soil pollution assignment



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SOIL POLLUTION INTRODUCTION Soil is the thin layer of organic and inorganic materials that covers the Earth's rocky surface. The organic portion, which is derived from the decayed remains of plants and animals, is concentrated in the dark uppermost topsoil. The inorganic portion made up of rock fragments, was formed over thousands of years by physical and chemical weathering of bedrock. Productive soils are necessary for agriculture to supply the world with sufficient food.

A soil pollutant is any factor which deteriorates the quality, texture and mineral content of the soil or which disturbs the biological balance of the organisms in the soil. Pollution in soil has adverse effect on plant growth. The introduction of substances, biological organisms, or energy into the soil, resulting in a change of the soil quality, which is likely to affect the normal use of the soil or endangering public health and the living environment. Soil contaminants are spilled onto the surface through many different activities.

Most of these are the result of accidents involving the vehicles that are transporting waste material from site of origin to a disposal site. Soil pollution is particularly dangerous for the environment and our health because soil, either in the mountains and in the plains, contains the largest part of the water we drink and produces all the food we need. There are many types of soil pollution, each one with its own features and preventive measures to avoid disasters. **CAUSES OF SOIL POLLUTION** Indiscriminate use of fertilizers Soil nutrients are important for plant growth and development.

Plants obtain carbon, hydrogen and oxygen from air and water. But other necessary nutrients like nitrogen, phosphorus, potassium, calcium,

magnesium, sulfur and more must be obtained from the soil. Farmers generally use fertilizers to correct soil deficiencies. Fertilizers contaminate the soil with impurities, which come from the raw materials used for their manufacture. Mixed fertilizers often contain ammonium nitrate (NH_4NO_3), phosphorus as P_2O_5 , and potassium as K_2O . For instance, As, Pb and Cd present in traces in rock phosphate mineral get transferred to super phosphate fertilizer.

Since the metals are not degradable, their accumulation in the soil above their toxic levels due to excessive use of phosphate fertilizers, becomes an indestructible poison for crops. The over use of NPK fertilizers reduce quantity of vegetables and crops grown on soil over the years. It also reduces the protein content of wheat, maize, grams, etc. , grown on that soil. The carbohydrate quality of such crops also gets degraded. Excess potassium content in soil decreases Vitamin C and carotene content in vegetables and fruits. The vegetables and fruits grown on over-fertilized soil are more prone to attacks by insects and disease.

Indiscriminate use of pesticides, insecticides and herbicides Plants on which we depend for food are under attack from insects, fungi, bacteria, viruses, rodents and other animals, and must compete with weeds for nutrients. To kill unwanted populations living in or on their crops, farmers use pesticides. The first widespread insecticide use began at the end of World War II and included DDT (dichlorodiphenyltrichloroethane) and gamma-hexachlorocyclopentadiene. Insects soon became resistant to DDT and as the chemical did not decompose readily, it persisted in the environment.

Since it was soluble in fat rather than water, it biomagnified up the food chain and disrupted calcium metabolism in birds, causing eggshells to be thin and fragile. As a result, large birds of prey such as the brown pelican, ospreys, falcons and eagles became endangered. DDT has been now been banned in most western countries. Ironically many of them including USA, still produce DDT for export to other developing nations whose needs outweigh the problems caused by it. The most important pesticides are DDT, BHC, chlorinated hydrocarbons, organophosphates, aldrin, malathion, dieldrin, furodan, etc.

The remnants of such pesticides used on pests may get adsorbed by the soil particles, which then contaminate root crops grown in that soil. The consumption of such crops causes the pesticides remnants to enter human biological systems, affecting them adversely. An infamous herbicide used as a defoliant in the Vietnam War called Agent Orange (dioxin), was eventually banned. Soldiers' cancer cases, skin conditions and infertility have been linked to exposure to Agent Orange. Pesticides not only bring toxic effect on human and animals but also decrease the fertility of the soil.

Some of the pesticides are quite stable and their bio- degradation may take weeks and even months. Pesticide problems such as resistance, resurgence, and health effects have caused scientists to seek alternatives. Pheromones and hormones to attract or repel insects and using natural enemies or sterilization by radiation have been suggested. Today, agriculture has become an industry, named intensive farming, that produces more on quantity than on quality to maximize profits. So, a huge of pesticides is used

to fight parasite insects, moulds and herbs that can destroy part of all our crops.

The problem is that the residues of these pesticides are toxic for human beings when present in the vegetable products we consume and when they remain and accumulate in the soil. Here, pesticides can be absorbed by the following crops or be carried by rains to the nearest rivers and to ground-waters. Ground-waters pollution is particularly dangerous for the water we drink, coming from wells and natural sources of the areas where pesticides are used, given that pesticides, after reaching the deep layers of the soil and the ground-waters, are protected from the oxidation by the air and are more persistent.

To give an example, in Italy one of the most developed farming Countries of Europe, the herbicides pollution in the soil has reached worrying levels: from a monitoring campaign about pesticides made by the APAT public authority in the period 2003-2005, there were 119 different pesticides detected as pollutants; 112 of them were found in superficial waters and 48 in ground-waters. The pesticides residues were found, only in 2005, in 485 monitoring sites (47% of the total sites) and the levels of pesticides were above the limits for drinking water in 27. % of sites, About underground waters, 630 monitoring sites were contaminated and were 24. 8% of the total, with 7. 7% of cases above the limits for drinking water. In addition, intensive farming tends to deplete the soil of its mineral content and against this, it uses artificial fertilizers containing phosphorus and nitrogen. Also this is pollution because the soil is exploited too much and changes its features. To remedy

against a situation like this, the only solution is a definitive and massive conversion of all cultures to organic farming.

This is not a fashion, but a sustainable cultivation system that doesn't use synthetic pesticides and fertilizers, practices natural cultivation systems that respect the equilibrium of soils and the natural environment and uses a wider variety of cultures to preserve bio-diversity and the typical regional products. This farming system is not intensive; so, it doesn't deplete and pollute the soil. Pollution from solid wastes In general, solid waste includes garbage, domestic refuse and discarded solid materials such as those from commercial, industrial and agricultural operations.

They contain increasing amounts of paper, cardboards, plastics, glass, old construction material, packaging material and toxic or otherwise hazardous substances. Since a significant amount of urban solid waste tends to be paper and food waste, the majority is recyclable or biodegradable in landfills. Similarly, most agricultural waste is recycled and mining waste is left on site. The portion of solid waste that is hazardous such as oils, battery metals, heavy metals from smelting industries and organic solvents are the ones we have to pay particular attention to.

These can in the long run, get deposited to the soils of the surrounding area and pollute them by altering their chemical and biological properties. They also contaminate drinking water aquifer sources. More than 90% of hazardous waste is produced by chemical, petroleum and metal-related industries and small businesses such as dry cleaners and gas stations

contribute as well. Solid Waste disposal was brought to the forefront of public attention by the notorious Love Canal case in USA in 1978.

Toxic chemicals leached from oozing storage drums into the soil underneath homes, causing an unusually large number of birth defects, cancers and respiratory, nervous and kidney diseases. Deforestation Soil Erosion occurs when the weathered soil particles are dislodged and carried away by wind or water. Deforestation, agricultural development, temperature extremes, precipitation including acid rain, and human activities contribute to this erosion. Humans speed up this process by construction, mining, cutting of timber, over cropping and overgrazing. It results in floods and cause soil erosion.

Forests and grasslands are an excellent binding material that keeps the soil intact and healthy. They support many habitats and ecosystems, which provide innumerable feeding pathways or food chains to all species. Their loss would threaten food chains and the survival of many species. During the past few years quite a lot of vast green land has been converted into deserts. The precious rain forest habitats of South America, tropical Asia and Africa are coming under pressure of population growth and development (especially timber, construction and agriculture).

Many scientists believe that a wealth of medicinal substances including a cure for cancer and aids, lie in these forests. Deforestation is slowly destroying the most productive flora and fauna areas in the world, which also form vast tracts of a very valuable sink for CO₂. Pollution from industrial wastes This pollution can be very massive in certain areas, where the

industries discharge their wastes and really great is the variety of pollutants: heavy metals compounds, asbestos, organic compounds of all types (oils, solvents, colorants, detergents, phenols), slurries containing residues of all types.

These wastes are released legally but, more frequently, illegally in not controlled sites of the territory, buried in very precarious manners, in containers unable to resist to corrosion, to save money. The bio-degradation of these compounds is very difficult in the soil and the liquid, solid or soluble compounds can easily reach rivers, canals and ground-waters at concentration levels, locally, much higher than those found for pesticides. These toxic substances are absorbed by spontaneous and cultivated vegetation and eaten by bred animals, whose milk and meat is eaten by man, or directly consumed by people.

The results are a higher occurrence of cancer, allergies, liver diseases, sterility and so on. The possible defence against this kind of pollution is possible with more severe laws and controls against industrial pollution. The whole chain of treatment for industrial wastes should be more strictly controlled by our sanitary and environmental authorities to impose all the useful treatments to make pollutants inert for what is possible and repress abuses. Pollution from Urban wastes

These wastes include a wet and fermentable fraction, made of food residuals from houses, restaurants and food industries, paper and plastic-ware from packages, wood, metals and so on and are still abandoned in open-air discharges in many Countries like, once again, my poor Italy. In Campania,

the plain around Naples and Caserta is full of many little and large clandestine discharges. These are owned and managed by the local mafia and collect illegally urban wastes and even the industrial ones from the factories of the North Italy, really happy for this service.

Also in the few cases in which all the preventive measures are adopted to avoid the diffusion of the pollutants, it's nearly impossible to avoid the production of a liquid matter, formed by the decomposition of these residuals, full of toxic compounds

PREVENTION OF SOIL POLLUTION Using Plants for pollution cleanup

Scientists are studying how plants can be used to bind up soil pollution found at national nuclear laboratories and nuclear power plants, where radioactive and other toxic wastes may reach groundwater.

Plants, soil, and microbes in the soil work together to determine which metals and nutrients plants take up from the soil. Some plants excrete a variety of different chemicals into the soil, some of which act as signals to soil organisms. The challenge is to find out how plants release these chemicals and how these chemicals interact with microbes and soil.

Eventually scientists may be able to induce plants to release the chemicals that immobilize wastes in the soil. Reducing chemical fertilizer and pesticide use

Applying bio-fertilizers and manures can reduce chemical fertilizer and pesticide use.

Biological methods of pest control can also reduce the use of pesticides and thereby minimize soil pollution. Reusing of materials

Materials such as glass containers, plastic bags, paper, cloth etc. can be reused at domestic levels

rather than being disposed, reducing solid waste pollution. Recycling and recovery of materials This is a reasonable solution for reducing soil pollution. Materials such as paper, some kinds of plastics and glass can and are being recycled. This decreases the volume of refuse and helps in the conservation of natural resources. For example, recovery of one tonne of paper can save 17 trees.

Reforestation Control of land loss and soil erosion can be attempted through restoring forest and grass cover to check wastelands, soil erosion and floods. Crop rotation or mixed cropping can improve the fertility of the land. Solid waste treatment Proper methods should be adopted for management of solid waste disposal. Industrial wastes can be treated physically, chemically and biologically until they are less hazardous. Acidic and alkaline wastes should be first neutralized; the insoluble material if biodegradable should be allowed to degrade under controlled conditions before being disposed.

As a last resort, new areas for storage of hazardous waste should be investigated such as deep well injection and more secure landfills. Burying the waste in locations situated away from residential areas is the simplest and most widely used technique of solid waste management. Environmental and aesthetic considerations must be taken into consideration before selecting the dumping sites. Incineration of other wastes is expensive and leaves a huge residue and adds to air pollution. Pyrolysis is a process of combustion in absence of oxygen or the material burnt under controlled atmosphere of oxygen.

It is an alternative to incineration. The gas and liquid thus obtained can be used as fuels. Pyrolysis of carbonaceous wastes like firewood, coconut, palm waste, corn combs, cashew shell, rice husk paddy straw and saw dust, yields charcoal along with products like tar, methyl alcohol, acetic acid, acetone and a fuel gas. Anaerobic/aerobic decomposition of biodegradable municipal and domestic waste is also being done and gives organic manure. Cow dung which releases methane into the atmosphere, should be processed further in 'gobar gas plants' to produce 'gobar gas' and good manure.