SOIL POLLUTION

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CU ROLL NO - 202115-11-0084
CU REG NO - 115-1211-0288-20
COLLEGE ROLL - 321
SESSION- 2020-2021

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Definition of Soil Pollution

Soil pollution as part of land degradation is caused by the presence of xenobiotics (humanmade) chemicals or other alteration in the natural soil environment. It is typically caused by industrial activity, agricultural chemicals or improper disposal of waste. The most common chemicals involved are petroleum hydrocarbons, polynuclear aromatic hydrocarbons (such as naphthalene and benzo(a)pyrene), solvents, pesticides, lead, and other heavy metals. Contamination is correlated with the degree of industrialization and intensity of chemical substance. The concern over soil contamination stems primarily from health risks, from direct contact with the contaminated soil, vapour from the contaminants, or from secondary contamination of water supplies within and underlying the soil.

Excavation showing soil contamination at a disused gasworks in England

In North America and Western Europe, the extent of contaminated land is best known, with many of countries in these areas having a legal framework to identify and deal with this environmental problem. Developing countries tend to be less tightly regulated despite some of them having undergone significant industrialization. Soil pollution is the removal of useful substances from the soil or the addition of harmful substances to it. Garbage, cotton clothes, newspapers, trees waste, are the causes of soil pollution. Plastic, glasses and metal objects may also cause soil pollution.

Causes of Soil Pollution

1) Microplastics

Microplastics are emerging persistent contaminants of increasing concern. Although microplastics have been extensively detected in aquatic environments, their occurrence in soil ecosystems remains largely unexplored. This review focused on recent progress in analytical methods, pollution characteristics and ecological effects of microplastics in soils. In spite of the presence of microplastics in soils, no standardized methods are available for the quantification.

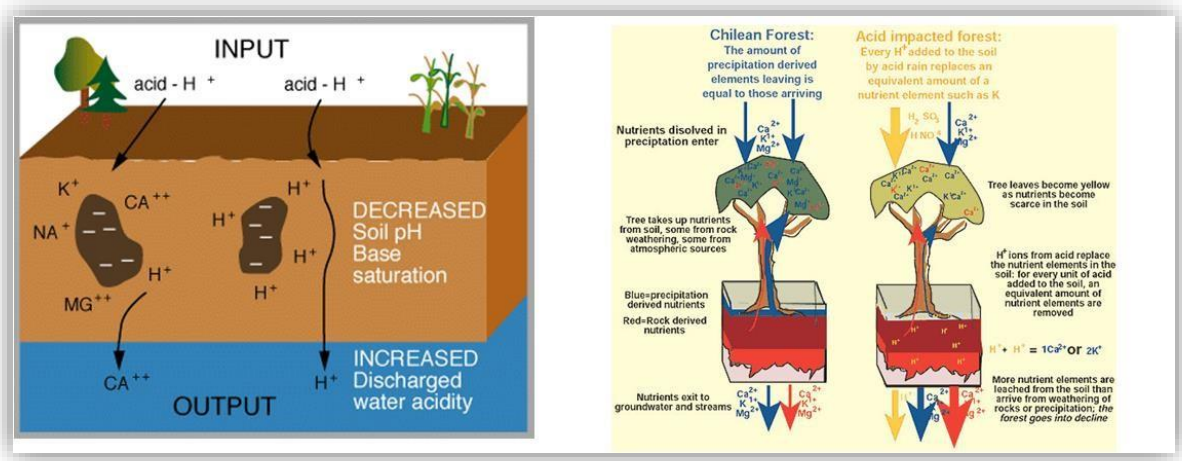
Uniform protocols including microplastic extraction and identification are urgently needed to develop. In soil environments, main sources of microplastics include mulching film, sludge, wastewater irrigation and atmospheric deposition. The fate of microplastics is closely related to soil physio-chemistry and biota. Existing evidence shows that microplastics can influence soil biota at different trophic levels, and even threaten human health through food chains. Therefore, further research is needed to fully reveal the fate and ecological risks of microplastics in soils; and necessary action is required to control microplastic pollution in terrestrial ecosystems.

2) Oil spills

While extracting mineral oil from the oil fields, an oil spill can occur and that crude oil can get mixed with the soil causing **soil pollution**. The chemicals in the mineral oil increase the soil Ph level and reduce the phosphorous concentration of the soil. The basic composition of the soil hence gets changed and the overall temperature rises.

3) Acid rain

Another contributor to soil pollution is acid rain. Acid rain is mainly caused by air pollution. When it rains, the contaminated air will add chemicals to the rain which increases the level of acidity. An increase in acidity will lead to soil pollution and affect the vegetation in an adverse way.



Effects of Acid rain on Soil

4) Intensive farming

Soil fertility is decreased because of **intensive farming** techniques. **Soil** invertebrates are fewer where inorganic fertilizers are used and crop residues are burned. Weed control is more efficient further limiting the range of species of plants and animals. **Intensive farming causes** more nitrate and phosphate **pollution** of surface waters.

5) Waste disposal

Soil pollution occurs due to untreated **disposal** of industrial **wastes** into soil; it has high toxic contaminants, which leads to **soil pollution.**

a) ***Oil and fuel dumping***

Soil contamination can also happen as a result of underground storage tanks rupturing or the leaching of waste from landfills. Mining, fertilizer application, **oil** and **fuel dumping** and a multitude of other environmental issues can also cause **pollution** of the **soil**.

b) *<u>Discharge of sewage</u>*

Excessive and inefficient use of chemical pesticides can result in severe **soil pollution**. **Sewage** produced in urbanized areas can also contaminate **soil** (if not disposed of correctly). These wastes may also contain several carcinogenic substances. Other forms of waste that can **pollute soil** include nuclear waste, e-waste, and coal ash.

c) *<u>Landfill & illegal dumping</u>*

The end products of the sewer also end up in **landfills**. Also, cases of **illegal dumping** of chemicals have witnessed disposal of highly poisonous materials in **landfills**. Because these wastes contain toxins and a mix of chemicals, they majorly seep into the land and causes **soil pollution**.

d) *Electronic Waste*

The **pollution** of **soil**, water, and air by **e-waste** also pose a threat to human beings. **Soil** and water **pollution** can compromise the food chain, leading to a variety of neurological and organ problems. The dioxins released by burning **e-waste** can contribute to numerous health issues.

e) *Nuclear wastes*

Improper disposal of **radioactive/nuclear waste** can severely contaminate the soil and result in soil pollution. The **radioactive** matter present in this type of **waste** may mix with the components of the **soil**, rendering it highly toxic and infertile. Furthermore, any plants grown in such soils may absorb the **radiation** present in the soil and accumulate it within the bodies. This **radiation** may make its way up the food chain when herbivores consume these plants and carnivores consume those herbivores.

Effects of Soil Pollution

1) Health Effects

Contaminated or polluted soil directly affects human health through direct contact with soil or via inhalation of soil contaminants which have vaporized; potentially greater threats are posed by the infiltration of soil contamination into groundwater aquifers used for human consumption, sometimes in areas apparently far removed from any apparent source of above ground contamination. This tends to result in the development of pollution-related diseases. Health consequences from exposure to soil contamination vary greatly depending on pollutant type, pathway of attack and vulnerability of the exposed population. Chronic exposure to chromium, lead and other metals, petroleum, solvents, and many pesticide and herbicide formulations can be carcinogenic, can cause congenital disorders, or can cause other chronic Health effects health conditions. Industrial or man-made concentrations of naturally occurring substances, such as nitrate and ammonia associated with livestock manure from agricultural operations, have also been identified as health hazards in soil and groundwater.

2) Ecosystem Effects

Effects of soil pollution on Eco System

Effects on the **Ecosystem** Since the volatile contaminants in the **soil** can be carried away into the atmosphere by winds or can seep into underground water reserves, **soil pollution** can be a direct contributor to air and water pollution. It can also contribute towards acid rain (by releasing huge quantities of ammonia into the atmosphere).

Prevention of Soil Pollution

1) Get a better understanding of the soil environment quality baseline

In order to properly control and prevent soil erosion, it is paramount that every stakeholder understands the baseline of soil environment quality, which can be done by carrying out sensitizations and surveys on soil pollution. However, to ensure consistent results, the technical requirements for the survey should be formulated including the frequency of when the survey should be conducted.

2) Proper management of agricultural land and the practice of organic farming

Poor utilization of land is a major concern in the prevention and control of soil pollution. Agricultural land pollution usually causes the loss of soil fertility as it involves the loss of organic matter, topsoil and nutrients, and the soil's ability to retain water. In agricultural land management, ideal soil conservation methods include mechanical and biological control techniques.

Developing forests in new areas can help reduce erosion caused by rainwater and air thus ensuring increased soil fertility and formation. In areas with excessive pollution or surface degradation, reforestation should be done. The mechanical method of soil pollution control includes the use of contour holding system, gully control, and making bunds. In excessive sloping areas, making bunds across the slope helps to prevent erosion.

3) Proper Solid Waste Treatment

It is important to dispose of solid waste properly by treated it before it's released into the environment. Acidic and alkaline waste, for example, can be neutralized before they are disposed of to avoid soil contamination. Biodegradable waste should also be broken down in a controlled environment before it is released into the environment. A great example is the proper treatment of sewage sludge.

The waste materials should also be categorized based on the degree of contamination. Materials that are mildly or moderately contaminated should be treated in controlled environments before release into the natural environments while those that are heavily contaminated should be put under strict management, treatment, and control.

4) Strengthen policies that manage pollution sources

The best way to control soil pollution is to strictly control the mining and industrial pollutants. In addition to controlling the pollutants, daily environment supervision should be enhanced. This should be implemented by making a layout plan that should include close supervision on the soil environment including regular information updates. To ensure accountability, the companies in the specified area should conduct soil research at least once annually and release the information to the public.

Surrounding soil should also be monitored on a regular basis to ensure the soil is not contaminated. The relevant authorities should also proactively look for potential risks and point out the alternatives for minimizing the risks. The government should also put in place measures to ensure electronic wastes and heavy metals do not contaminate the soil. At the same time, the government should take stronger measures against people, businesses, and companies that breach the policies.

5) Promote objective assessment and accountability among all stakeholders

To ensure long term success in the prevention and control of soil pollution, all stakeholders role in the implementation of the soil pollution control should be clear. All tasks should be defined and inter-departmental cooperation and coordination should be strengthened to ensure seamless implementation and immediate resolutions focused towards correct disposal of garbage, proper treatment of sewage sludge, minimized the use of agro-chemicals, reforestation, construction of drainage systems, and strengthening chemical use related laws.

Soil Pollution & INDIA

Industrial sector in India is witnessing rapid growth since the last decade of twentieth century with reforms in economic laws and with establishment of special economic zones (SEZ). Such rapid industrial growth has also increased threat to the environment. In spite of great difficulty in its remediation in comparison with polluted air and water, soil pollution as a threat to human life is by and large ignored at national level in India due to lack of comprehensive information on the subject. Though coordinated effort on assessment of soil pollution is absent at national level, sporadic information has been generated by several researchers on various aspects of pollution affecting soil quality. This chapter analyses this information and attempts to assess the quantum of threat being faced by agroecosystem in the country. It indicates that soil resources are facing threats from deliberate use of contaminated organics, amendment materials and irrigation water or from atmospheric depositions, spillage of effluents etc. Nature pollutants varies from salts, toxic metals, metalloids, persistent organics with varying degree of toxicity and may be of both industrial and geogenic origins.

Conclusion

Soil pollution is one the major type of the pollution this pollution is actually present due to the activities of human like the human made chemical. The major cause involves the industrial activity which leaves the harmful substances in soil causing its pollution/contamination. Also, the agricultural chemicals are also playing the part to make the soil dirty. Moreover, human waste material improper disposal also one of the major causes for this. This type of pollution is actually not only disturbing the fertility of the lands but also cause the contamination/pollution of underground water sources also it causes the spread of diseases very rapidly. These steps should be taken to stop it in order to prevent the harmful effect of this pollution.

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