Review Article
Volume 5:6, 2022

Journal of Pollution

ISSN: 2684-4958 Open Access

A Review on Techniques for Soil Pollution Reduction

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Abstract

"Soil pollution" refers to a chemical or substance that is out of place, is present in greater quantities than normal in the soil, and harms any organism that is not the target. Because it is frequently difficult to measure or see, soil pollution is a hidden threat. According to the Status of the World's Soil Resources Report (SWSR), soil pollution is one of the most significant issues affecting the world's soils and the ecosystem services they provide. Concerns about soil pollution are growing in every location. The United Nations Environmental Assembly (UNEA-3) recently issued a resolution that called for quicker action and increased cooperation to address and control soil pollution. The global significance of this issue is demonstrated by this agreement, which was reached by more than 170 nations. The majority of anthropogenic sources of soil pollution are chemicals used in or made in industrial processes, household, animal, and municipal wastes (including wastewater), agrochemicals, and petroleum-derived products. The application of sewage sludge on land, irrigation with untreated wastewater, and the use of fertilizers and pesticides are all examples of intentional releases of these chemicals into the environment. Leaching from landfills and oil spills are examples of accidental releases. Smelting, transportation, pesticide spray drift, radionuclide deposition from air weapons testing, nuclear accidents, and incomplete combustion of various compounds all contribute to soil pollution.

Keywords: Soil pollution • Reduction • Patenting techniques

Introduction

Soil pollution, according to scientific research, can seriously harm soil's essential ecological functions. Soil contamination reduces crop yields and renders crops grown on contaminated soils unfit for human and animal consumption due to the presence of dangerous levels of toxins. Eutrophication is the process by which a number of contaminants, including significant nutrients like nitrogen and phosphorus, move from the soil to surface and ground waters. Eutrophication has a negative impact on the environment as well as the health of humans directly through contaminated drinking water. Additionally, pollutants directly harm larger soil-dwelling organisms and soil microorganisms, affecting their functions and biodiversity in the soil.

Soil pollution has a direct impact on human health, according to the findings of scientific studies. Human health is at risk from chemicals like polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs), organic compounds like arsenic, lead, and cadmium, and medications like antibiotics. Many people will always remember the health risks caused by the widespread soil contamination with radionuclides after the 1986 disaster at Chernobyl. Physical remediation is made up of two fundamental components: techniques for replacing soil and thermal desorption. Soil replacement is the process of using clean soil to completely or partially replace contaminated soil in order to reduce the concentration of pollutants, enhance the environmental capabilities of the soil, and eventually remediate the soil. There are three types of soil replacement: replacement of soil, spading of soil, and imports of new soil. Soil replacement refers to the process of replacing polluted soil with new soil. Small areas of contaminated soil can benefit from this method. To prevent a second pollution, the replacement soil must also be effectively managed. Spading soil is the process of deeply excavating contaminated soil with the intention of disseminating the pollutant into deep areas.

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Received: 02 November, 2022; Manuscript No. pollution-23-89589; **Editor Assigned:** 05 November, 2022; PreQC No. P-89589; **Reviewed:** 16 November, 2022; QC No. Q-89589; **Revised:** 21 November, 2022, Manuscript No. R-89589; **Published:** 30 November, 2022, DOI: 10.37421/2684-4958.2022.5.282

Description

Cleansing polluted soils is essential, and new, scientific remediation methods are constantly being developed. To determine whether pollutants from nature or man-made sources are contaminating the soil and in what quantities they pose a threat to human health and the environment, a number of steps must be taken. Worldwide, these methods for risk assessment are comparable. Physical remediation methods like chemical inactivation or sequestration in landfills are being replaced by increasingly expensive biological solutions based on science, such as phytoremediation or accelerated microbial decomposition. The goal of this book is to provide an overview of the most recent developments in the field of soil pollution, as well as a list of the most significant pollutants and their sources that have an effect on the environment and human health. It focuses especially on pollutants that enter human systems through the food chain and are present in agricultural systems. Toward the end, a few case studies talk about the best current methods for finding polluted soils and fixing them. As part of the Global Symposium on Soil Contamination (GSOP18), this publication identifies the most significant global knowledge gaps regarding soil pollution and serves as a framework for upcoming discussions.

Synthetic carbon-based molecules derived from industrial and agrochemical products are known as persistent organic pollutants (POPs), and they typically biodegrade very slowly and bioaccumulate in animal tissues. Some POPs (PAHs) include pesticides, polychlorinated biphenyls (PCBs), polychlorinated dibenzodioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), and polycyclic aromatic hydrocarbons. Soil is the top layer of Earth's crust that has changed as a result of weathering, physical, chemical, and biological processes. It consists of organic matter, mineral particles, water, and air, as well as living things arranged in genetic soil horizons (ISO, 2013). The functions of the soil ecosystem are used to describe the value of soils to people and the environment [1-5].

Soil health refers to the soil's capacity to continue functioning as a vital living system within ecological and land-use constraints, to maintain plant, animal, and human health, improve air and water quality, and maintain biological productivity. The term "soil ecosystem services" refers to the capacity of natural elements and processes to provide goods and services that either

directly or indirectly satisfy human requirements. Food security is thought to include the stability, accessibility, use, and availability of food supplies. It is known as contaminated soil (this volume) when a substance or chemical is present in a higher concentration than would normally be the case. "Soil contamination" refers to an unnatural or present chemical or material. Two additional significant types of emerging pollutants are man-made nanoparticles (MNPs) and treatment by products. MNPs are added to over a thousand products as additives, including food, paint, cosmetics, textiles, papers, and plastics. In recent decades, there has been a significant increase in the number of products that either require or contain MNPs. In addition, they are used in textiles to make clothing that resists abrasion, UV light, is self-cleaning, repels dirt and water, and is antimicrobial. Manufactured nanoparticles are used specifically for soil remediation in order to lessen the effects of both organic and inorganic contaminants. However, they are also introduced into the soil erroneously by a variety of means.

Conclusion

Thermal desorption heats the contaminated soil using steam, microwaves, and infrared radiation to make the pollutant (such as Hg, as) volatile based on the pollutant's volatility. The volatile heavy metals are then collected using a vacuum, negative pressure, or carrier gas to get rid of the heavy metals. According to the temperatures, traditional thermal desorption can be divided into low temperature desorption (90-320 °C) and high temperature desorption (320-560 °C). The straightforward procedure, mobile devices, and reuse of remedied soil are all advantages of this method. A mercury collection and service company in the United States utilized this technology for in-situ cleanup and also developed a commercial service. However, a number of factors, including expensive equipment and a lengthy desorption period, limit its application.

Acknowledgement

None.

Conflict of Interest

None.

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How to cite this article: Liu, Xi. “A Review on Techniques for Soil Pollution Reduction.” Pollution 5 (2022): 282.