Soil Studies 11(1), 35-42
http://doi.org/10.21657/soilst.1072005

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Contaminant removal processes from soil

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How to Cite

Abubaker, S. R., & Atasoy, A. D. (2022). Contaminant removal processes from soil. *Soil Studies 11*(1), 35-42. http://doi.org/10.21657/soilst.1072005

Article History
Received 11 February 2022
Accepted 26 May 2022
First Online 1 July 2022

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Keywords
Pollutant
Heavy metal
Health risk
Phytoremediation
Adsorption

Abstract

Soil pollution of numerous inorganic and organic chemicals has resulted to the destruction of vast amounts of arable and urban land around the world. Toxic pollutants pose a serious health danger to individuals as well as other biological processes. Dispersed literature is used to scientifically examine the numerous physical and anthropogenic causes and probable risks to determine the remediation solutions for a variety of toxins and heavy metals. This review discusses the remediation approaches such as phytoremediation as well as the chemical strategies. Chemical remediation methods like soil cleaning or verification are comparatively extensive and environmentally harmful, making them unsuitable for big-scale soil remediation operations. Phytoremediation, on the other hand, has arisen as an environmentally sustainable and viable technique for restoring the polluted soils, but relatively little attempts have been made to demonstrate this technique in the region. Heavy metal-polluted soil remediation is needed to decrease the related dangers, increase the land requirements for agricultural cultivation, improve food security, as well as reduce land tenure issues caused by changing land-use patterns.

Introduction

A contaminant is a substance that doesn't occur naturally in the environment but is incorporated into the earth by physical activities as well as anthropogenic actions and changes the structure of the soil. It could be classified as physical, biological, chemical, or radiological substances that, in high enough quantities and harm living organisms through air, soil, food, and water. A pollutant causes damage to people or animals (Verma et al., 2022). For example, in the environment chlorine gas does not naturally exist, so it is a pollutant; but, once it is introduced into the air as a result of human-induced action, it will be a pollutant due to its adverse impacts on homo sapiens as well as wildlife. Pollutants enter soils from both natural phenomenon and human activities, which are discussed further below.

Contaminants are naturally introduced into soils by volcanic activity and breaking down of soil parent material. Large amount of aerosol from mineral dust, is a natural source of metals. Cadmium (Cd), mercury (Hg), cobalt (Co), vanadium (V), chromium (Cr), nickel (Ni), copper (Cu), Iron (Fe), manganese (Mn), zinc (Zn), and lead (Pb) are the main trace elements in crustal dust in order of concentration, but their amounts differ widely across the earth's surface. Metal concentrations also has been discovered to improve with diminishing constituent portion, particularly in wind-eroded as well as highly weathered soil (Dardouri & Sghaier, 2018).

Anthropogenic processes are the most significant cause of toxins in soils and liquids. Fertilizers, herbicides, and pesticides are major agricultural contaminants as other pollutants from heavy mechanical industries, mining and smelting practices, and leather tanning firms. These practices introduce a variety of organic and inorganic toxins into the soil, making it unhealthy for microorganisms, wildlife, humans, and plants (Jones et al., 2011).

On the grounds of their source and types of pollution, each of these origins could be classified into two types: point sources and nonpoint sources. Each noticeable, restricted, as well as separate transmission, together with but not confined to any drain, trench, canal, rolling stock, container, fissure, discrete, well, conduit, tunnel, other floating craft, vessel, or concentrated animal feeding activity, from which pollutants are or may be released, is referred to as a “point source” (Kalbitz et al., 2000). This definition excludes agricultural rainwater outflows and irrigated irrigation return flows. Unprocessed company waste, sanitation facilities, waste treatment plants, wastes from agronomic ranch house, solid waste collection places, plant growth regulator application sites, and pesticide processing sites are the main point origins of pollutants emitted into soils (Ahmad and Rahman, 2009).

The chief water pollution which causes in waterways is polluted runoff (also known as nonpoint source of pollution) from wetlands operations, hydromodification, marinas, forestry and recreational boating, urban development, and agriculture.

The aim of the study is to describe the contaminant removal methods from the soil and to present comparative discussions between each other. In this context, contaminant classification and remediation methods were emphasized. Some comments were also made in terms of future perspectives.

Classification of Contaminants

Organic Contaminants

The main chemicals cluster consists of aromatic hydrocarbons such as grease, tar and phthalate esters, polychlorinated biphenyles (PCBs), halogenated aliphatic, polynuclear hydrocarbons (PAHs), petroleum hydrocarbons, benzenes, and organochlorine pesticides, which come from a variation of nonpoint as well as point o-rigins (Borja et al., 2005). Organic contaminant penetration into plant parts is usually poor, with volatilization from the surface of the ground serving as the primary pathway, supplemented by aboveground vegetation uptake of infected air.

Inorganic Contaminants

This category includes a wide range of contaminants from both point and nonpoint origins, such as products formed as a result of contacts with other components in soil, toxic gases, heavy metal (loid)s, and ion pair or ion complexes in the form of compounds. Strong metalloids / metals (e.g., As, Cr, Pb, Ni, Cd, Zn, Cu) are the most common inorganic pollutants, originating mostly from industrial discharges and domestic grey water, as well as leakage from Pb also Cu tubing also Zn from household items (deodorants, skin creams, etc.) (Alvarez et al., 2009).

Innovations for Remediation of Contaminated Soils

Adsorption/Biosorption

Addition of such materials to soils are likely to make soil-applied contaminants less bio-available due to increased adsorption. This could reduce their leaching. Adsorption is a quick and changeable mechanism that mimics in some situations ion exchange for the removal of harmful anions or cations from wastewater by effective adsorbents. Adsorption provides a solution to industrial effluent treatment as well as soil remediation. Using organic amendments to remediate soil will increase adsorption of pesticides, reducing their bio-availability and efficacy, but also reducing their tendency to leach into root zones of deep-rooted crops and into groundwater (James et al., 2019).

Biosorbents are made from physically abundant biomass and/or waste biomass. Biosorption is a step forward to a prospective process owing to its large absorption capability and low cost of raw material. It has been shown that both living and non-living biomass should be used in biosorptive processes because they also have a high tolerance for metals and other harmful conditions. Based on the bacterial strain and environmental factors, metal ions may attach to cells through various physiochemical pathways. Because of this heterogeneity, current understanding of these processes is limited.

Bacterial cell walls, in particular, are polyelectrolytes that bind with ions in solution to preserve electroneutrality. Extracellular precipitation, redox interactions, covalent bonding, van der Waals forces, and electrostatic interactions are possibly pathways by which metal ions attach to the cell surface, or a mixture of these processes since it uses algal biomass, which is often called waste from certain biotechnological activities or merely because of its high abundance in coastal areas, biosorption of heavy metals by algal biomass is an advantageous option, an effective and commercially viable approach used for drainage and waste cleanup.

Immobilization

Immobilization systems are intended to reduce contaminant volatility by altering the physical or leaching properties of the polluted system. Movement is typically reduced by either physically limiting interaction between the pollutant and the ambient groundwater or chemically changing the pollutant to render it more suitable for groundwater dissolution. Metals' solid-phase as well as aqueous chemistry lends itself to immobilization through these strategies. Metal pollutants can be immobilized using a number of approaches, comprising those that utilize thermal therapy and/or chemical reagents to directly attach the polluted soil or slurry. The majority of immobilization approaches could be done either in situ or ex situ. In situ methods are favored because they require less manpower and resources, but their execution would be dependent on complex site situations.

Stabilization / Solidification

Stabilization/solidification, also known as waste fixation, is a process that limits the movement of toxic compounds and chemicals in the atmosphere by using both physical and chemical means (Fu et al., 2021). Stabilization is the process of transforming a pollutant into an immobile or low soluble state in order to reduce the danger presented by the waste (Fu et al., 2021). The in-situ solidification as well as stabilization process consists of three constituents: (1) a method for mixing the polluted soil in place, (2) a collection of reagents, groundwork, as well as system feed, and (3) a method for delivering to the soil-mixing zone reagent. In most cases, ex situ as well as in situ solidification/stabilization techniques are used on soils polluted with other inorganic compounds as well as heavy metals. That being said, also for reactive organics, stability of soils with low amounts of organic components is possible. Most solidification/stabilization methods have minimal effectiveness against organics and pesticides, with the exception of asphalt batching and confirmation, which remove most organic pollutants (Gao et al., 2021).

Tarmac Batching

Tarmac batching is a hydrocarbon-contaminated soil solidification/stabilization technique that integrates petroleum-laden soils into steamy tarmac combinations as a fractional replacement for pebble collective; the blend could be used for paving. Diggings of polluted soils is supplemented by injection of the treated and an initial thermal treatment soil into asphalt collective. Heating the blend all through the amalgamation progression causes the more toxic hydrocarbon components to volatilize. During cooling, the leftover substances are integrated into an asphalt matrix, reducing contingent migration. Since ample time has passed for it to fix as well as recover, the ensuing tarmac solid has the waste evenly spread in it and is insoluble in water (Jiang et al., 2018).

Vitrification

Vitrification, also known as liquefied glass utilization, is a solidification/ stabilization process that utilizes a formidable energy source to dissolve earthen or other soil components at incredibly great temperatures (1,600–2,000°C), removing organic and immobilizing most inorganics pollutants by heating (Lin et al., 2021). The bulk of chemicals subsequently found in the earth are volatilized during this phase, whereas the remnants are processed into crystalline products, solid glass, and chemically inert materials (Navia et al., 2005). Since the high temperatures destroy any organic components, there are several by-products. Radionuclides and heavy metals, for example, are built into a goblet matrix that is typically solid, stable, and resistant to leaching (Shi et al., 2018).

Chemical Oxidation

For at least 20 years, chemical oxidation innovation has been used as a in situ remediation method of groundwater and soil. Chemical oxidation has been utilized extensively to strip large amounts of pollutant mass from soils and streams at a number of locations (Smaranda et al., 2017). The bulk of the chemicals of concern have been successfully removed utilizing a combination of oxidants such as permanganate, ozone (COCs), percarbonate, hydrogen peroxide, and persulfate.

Soil Cleansing

Soil cleansing in in situ is a novel remediation technique that involves flooding polluted soils with a solution that carries the pollutants to a safe location (Terbouche et al., 2011). The method of soil flushing is achieved by injecting or infiltrating an extraction solvent into the soil. Using normal groundwater storage wells, polluted extraction fluids as well as groundwater are collected and drained to the surface. Until being discharged or recycled to state, openly maintained receiving streams or wastewater treatment works, adsorbed pollutants in recovered groundwater and extraction fluids can require treatment to meet sufficient discharge requirements (Wang et al., 2021a).

Phytoremediation

Plants are used in phytoremediation to clear up polluted soils (Cabral et al., 2015). The capability of vegetation to amass, degrades, or/and remove pollutants found in soil and water ecosystems is included in this process. Both plants derive necessary elements from polluted soil, along with heavy metals and nutrients (Appenroth, 2010). Hyperaccumulators are plants that have the capacity to accumulate vast quantities of heavy metals that they cannot need in their digestive processes. Crops have also been observed to absorb different organics and reduce or refine them for utilization in physical processes (Wang et al., 2021b; Xie et al., 2011) provided an excellent description of polluted soils phytoremediation. It primarily covers the six fundamental strategies of phytoremediation: Phytostabilization, phytotransformation, phytostimulation, phytoextraction, phytovolatilization and rhizofiltration.

Phytostabilization

Perhaps metal-polluted areas are not crucial for cleaning up, also because the liable organizations no longer operate or because the locations are not on the remediation agenda's high list of priorities. Metal toxicity can be reduce by in situ inactivation in a conventional way, a mitigation procedure that utilizes the use of soil additives to stabilize or immobilize soils that has metals in it. While movement of metal from soil to plants is reduced, soils are still prone to wearing away also create a danger to other animals as well as humans. Phytorestoration also identified as phytostabilization, is a plant-based mitigation innovation that equalizes pollutants as well as avoids revealing trails through water as well as wind removing top soil; gives hydraulic power, preventing contaminants from migrating vertically into water in the ground; also, chemically as well as physically immobilizes pollutants via adsorption to complexation or stems with exudates of stems (Zhang et al., 2021). This approach is an updated form of in situ inactivation, in which crops primary role is to modify soils. Not like phytoextraction, the aim of phytostabilization is to normalize metals in soils and reduce risk to human health as well as the environment.

Dardouri & Sghaier, (2018) described the phytostabilization mechanism in depth. The polluted soil is rammed before planting to add lime as well as to make a seed bed, other amendments, or fertilizer to inactivate metal pollutants. Metals must be fixed quickly after integration and chemical modification in soil amendments, ideally for a long time if not permanently. The most promising fertilizers are manganese oxyhydroxides or iron, artificial clay or natural minerals, biosolids, phosphate fertilizers, organic matter (OM), or a combination of these modifications. Crops selected for phytostabilization may be destitute emissors of metal pollutants into plant tissues aboveground that humans and animals may consume. Since there are no measurable metals in shoots, there is no need to evaluate harvested shoot residue as toxic waste. The plants chosen must be simple to develop as well grow rapidly as, thought for, have thick domes as well as stem systems, and be resistant to metal pollutants and other site circumstances that might restrict crop development. The study of Dardouri & Sghaier, (2018) contributed to the production of one of Festuca rubra L as well as two cultivars of Agrostis tenuis Sibth which are now commercially viable for Zn, Cu, and Pb phytostabilization of polluted soils.

Phytostabilization works well in fine-coarse soils with astronomical OM content, but it can be used to treat a variety of soils in degraded areas (Fu et al., 2021). Plant performance and survival are not feasible in certain heavily polluted sites, so phytostabilization is not an option (Fu et al., 2021). At plant growth sites, battle managers must be vigilant about the movement of infected plant filtrates off-site, as well as insect issues and malady that bounds plant lifespan. Price, environmental effects, ease of application, and aesthetic appeal are only a few of the advantages of phytostabilization over other soil treatment methods (Fu et al., 2021). When disinfection methods are used regardless of the proportions of the polluted zone or a shortage of funding, phytostabilization has benefits. It might also be used as a stopgap solution to minimize danger in situations where using the right solution for the job isn't possible.

Phytotransformation

A few organic and inorganic pollutants in nature might be biochemically attached to tissues cellular (biotran-sformed) less active or indolent forms until absorbed within the root (Shi et al., 2018). Phytotransformation is metabolization organic toxins in crops and recombination reactions, accompanied by product inculcation in their tissues. Trichloroethylene is transformed in soil and groundwater by poplar trees (Populus species).

Plants have the requisite device to decontaminate cyanides found in wastes from silver (Ag) and gold (Au) mining. The leach component of selection for Ag as well as Au removal is cyanide (ammonium thiocyanate) (Shi et al., 2018). Plants are exposed to cyanide as a by-product of breakdown throughout certain biochemical processes. This happens most often throughout the formation of "ethylene" in fully grown tissues, when "hydrogen cyanide" (HCN) is generated as a by-product. As a result, vascular plants have developed efficient enzyme-based detoxification mechanisms for the toxic cyanide. Salix spp. and Sorghum spp. have been linked to cyanide detoxification. Plants could only withstand cyanide toxicity to the extent that they can remove it. The “beta-cyano-alanine synthase” enzyme pathway detoxifies cyanide by connecting free cysteine to cyanoalanine and cyanide. Asparagines, a harmless basic amino acid in crops, are the last metabolic product (Smaranda et al., 2017).

Phytostimulation

Soil microorganisms have been shown to be useful in enhancing the bioavailability of metals for phytoextraction and increasing plant phytoremediation capacity in a variety of ways. Chemical pollutants may be degraded by soil microbes into simpler organic compounds, which plants may use as a fertilizer for improved phytoremediation of polluted sites. In the production of microbial, rhizosphere of plants is many times greater than the bulk soil. In the rhizosphere, the inhabitants of microflora are significantly larger than in soil with less vegetation. This is because the presence of nutrients from plant root exudates. Bacteria, actinomycetes, and fungi make up the average microbial community found in the rhizosphere per gram of air-dried soil. The inner rhizosphere at the root surface and the outer rhizosphere directly next to soil are the two main regions of the rhizosphere in plants. In the inner region, where root exudates are localized, the microbial population is greater. Exudates in the kind of basic vitamins, sugars, as well as amino acids are secreted from roots in a wide number of forms.

Benzene, esters, Acetates and derivatives can also be found in root exudates. In the rhizosphere enzymes are also found, also could serve as food for the contagious community. Esterases and various oxidoreductases are among the secreted enzymes by microbial population or root system in the rhizosphere (phenoloxidases and peroxidases). Any members of the Solanaceae, Fabaceae, and Gramineae families secrete plant peroxidases. “Peroxidase” is secreted by horseradish (Armoracia rusticana) and white radish (Raphanus sativus), whereas “laccase” is secreted by the marine green algae Nitella and Chara. (Lin et al., 2021).

Metal abundance has been shown to be improved by chemolithotrophic bacteria. So many Pseudomonas and Bacillus strains have been shown to improve B. juncea's Cd aggregation. Rhizobacteria present in wetlands have been set up to induce Hg as well as Se crops bioaccumulation. When organic composts are introduced to the soil, these bacteria thrive. Bio-degradations of principal microbial in the rhizosphere may aid in the accumulation of larger hydrophobic xenobiotics. 2,3,7,8-tetrachlorodibenzo-pdioxin (TCDD) and PCDD/Fs, both hydrophobic recurrent organic pollutants with current log Kow values beyond 4, have been confirmed to be picked up by stems also transferred to sprouts in Cucurbita pepo (Navia et al., 2005; Cajthaml et al., 2006).

Exudates from the roots, which are chemically identical to the chemicals used by microorganisms, will increase bacterial development in the rhizosphere, speeding up the breaking down phase. Some phenolic compounds found in root exudates have been shown to aid the growth of PCB-degrading bacteria and serve as structural analogs for PCB degradation (Navia et al., 2005). The phyto-degradation of organic contaminants in the soil can also be improved by inoculating plant soil with microbes. After being inoculated with Pseudomonas strain SR 3 in the soil where it was growing, the prosomillet accelerated the deterioration of "pentachlorophenol" (PCP).

Phytoextraction

Phytoextraction is the furthermost well-known of all methods of phytoremediation. The method of phytoextraction employs plants to aid in the separation of metals from polluted soils. Metals from the soil and transported to the shoots through plant roots accumulation. If soil metal supply is insufficient for adequate plant absorption, mineral nutrients (such as phosphate to increase arsenate obtainability), chelates, or acidifying agents could be utilized to extract them into soil solution. After adequate crop development as well as deposition of metal, the aboveground part of the seedling is processed, removing metals from the site completely. The processed metal-containing plant biomass poses a secondary pollution risk. According to some researchers, gasification of processed plant material significantly reduces the amount of plant material that must be disposed of at a landfill site. In certain situations, precious metals may be mined from metal-rich ash and used to generate income, offsetting the cost of remediation. Furthermore, the big proportion of biomass obtained could be utilize as a raw material for the manufacture of biofuel to generate energy from bio. Phytoextraction can be treated as a lengthy-tenure mitigation exertion that would necessitate multiple harvesting phases to lower metal concentrations to sufficient heights (Yang et al., 2020).

Phytovolatilization

Some metal pollutants, such as Se, As, and Hg, occur in the atmosphere as gaseous species. Researchers have recently been looking for genetically engineered plants or innately arising able to absorb rudimentary sources of certain metals from soils, biologically turning them to steamy classes within the crop, also then introducing them into the environment. This procedure is known as phytovolatilization, and it is the greatest contentious of all the phytoremediation methods. Se, CN, As, Cr, as well as Mercury are poisonous and it is unclear if volatilization of these components into the environment is healthy (Cabrejo & Philips, 2010). Because selenium phytovolatilization is a significant issue in several parts of the globe, it has received the most attention. Nevertheless, extensive attempts have been made to introduce bacterial Hg ion reductase genes into plants for the intent of Hg phytovolatilization. While no attempts to genetically modify plants that volatilize As have been made, it is likely that scientists will explore this option in the coming years. According to (Gao et al., 2021; Lewis et al., 1966) became the first to announce the launch of volatile Se compounds from higher plants. Representatives of the Brassicaceae family will release up to Se of 40 g/ha/day as differing gaseous compounds, according to (Gao et al., 2021). Cattails and other aquatic plants may help with Se phytovolatilization (Jiang et al., 2018). Plants that volatilize Hg, in contrast to those that volatilize Se, are genetically modified organisms.

The bacterial mercuric reductase (Mer A) and organomercurial lyase (Mer B) genes have been inserted into Arabidopsis thaliana L. and tobacco. These plants captivate elemental mercury (II) and methylmercury from the soil and emit reactive mercury (O) into the environment through their leaves. The inorganic type of Se present in soil is 1/600 to 1/500 as toxic as volatile Se compounds including dimethylselenide. The elimination of inorganic components of these elements as well as gases are unable to redeposit at or close the surface, volatilization of Hg and Se is also a stable spot solution. Furthermore, after the initial planting, sites that use this innovation might not even need much monitoring. This form of mitigation has the additional advantages of causing minimum site disruption, reducing erosion, and eliminating the need to dispose of polluted plant material. According to (Zhang et al., 2021), adding HgO to the atmosphere would have no major impact on the atmospheric pole. Those that favor the procedure, though, accepted that it would not be appropriate to use phytovolatilization near population centers or in areas with special metrological circumstances that encourage the fast deposition of unstable composites (Jiang et al., 2018).

Rhizofiltration

Rhizofiltration is the adsorption or precipitation of dissolved compounds onto plant roots. Plants are grown hydroponically before being transplanted into metal-polluted water, where they ingest and accumulate metals in their roots and shoots. Metals precipitated onto the root surface as a result of root exudates and variations in rhizosphere pH. Roots or entire plants are collected for recycling when they become contaminated with metal toxins. The majority of scientists agree that plants used for phytoremediation can only absorb metals in their roots (Terbouche et al., 2011). According to (Wang et al., 2021a), metal transmission to shoots reduces the effectiveness of rhizofiltration by increasing the volume of polluted plant debris that must be disposed of (Wang et al., 2021b), on the other hand, proposed that the efficiency of this procedure could be improved by using plants that can consume and migrate metals inside the plant. Despite these disparities, it is clear that proper plant evaluation is critical to rhizofiltration's effectiveness as a water cleanup strategy.

The attributes of a suitable plant for rhizofiltration were identified by (Wang et al., 2021a). Crops ought to be able to absorb as well as withstand a massive proportion of bull's eye metal(s) while still being stress-free to handle, minimal repairs, and producing minimal secondary waste. It's also a plus whether plants can grow a lot of root biomass or root surface area. Water hyacinth, pennwort, and duckweed are among the marine plants that can extract metals from water (Xie et al., 2011). Nevertheless, because of their minor and slow-growing roots, these plants have little capacity for rhizofiltration because they are ineffective at metal removal (Xie et al., 2011). These writers also point out that aquatic plants' high-water content makes drying, composting, and incineration more difficult. Despite these drawbacks, (Yang et al., 2020) found that trace elements from wastewater could be removed by water hyacinth. Earthly crops are considered to be more suited to rhizofiltration because they create a larger, fibrous root system with a greater surface area for metal adsorption. The greatest viable earthly contenders for metal elimination from water are sunflower and Indian mustard. The roots of Indian sunflower extract lead from hydroponic solutions.

Rhizofiltration is a price-effective innovation for treating surface water or groundwater having small but important amounts of metals such as Zn, Cr, and Pb. The commercialization of this innovation is being motivated by finances and technological advantages such as appropriateness to numerous issue metals, capability to handle large quantities, less need for hazardous materials, recycling opportunity, lower amount of secondary leftover, as well as probability of legislative also community approval (Zhang et al., 2021). Nevertheless, the deployment of this plant-based innovation could be more difficult and prone to errors than other technologies or at a comparable expense. The processing of hydroponically grown transfusions and the upkeep of a viable hydroponic system in a field would necessitate the expertise of trained staff, and the conveniences and specialist equipment needed will raise overhead costs. Possibly the most significant advantage of this remediation approach is attributable to positive public understanding. The utilization of the plants in a contaminated area conveys ideals of cleanliness and improvement to a population who would otherwise view the area as contaminated.

Conclusions

To choose appropriate remedial alternatives, a thorough understanding of the source, chemistry, and potential health as well as ecological effects of pollutants from contaminated soils is needed. To minimize the associated health risk, make land resources available for agricultural production, increase food security, and reduce land tenancy problems, contaminated soils must be remedied. Chemical mitigation processes, as mentioned earlier in this chapter, are comparatively extensive as well as environmentally dangerous. Phytoremediation utilizing toxic element amassing crops organisms, on the other hand, has arisen as an ecologically sustainable and viable innovation for washing up polluted soils, but has yet to be tested technically in the region, with the exclusion of insufficient field trials. Researchers and commercial/government organizations must pay attention to the request of phytoremediation (predominantly phytostabilization as well as phytoextraction) to the field scale, so novel crop class will be investigated for their phytoremediation capability. While the biggest barrier to phytoremediation adoption is the long mitigation period, future studies on approaches and strategies to improve crop biomass productivity as well as pollutant elimination capacity of crops from polluted soils is urgently needed.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial reletionship that could be construed as a potential conflict of interest.

Author Contributions

SR: conceived and designed the review. **ADA** and **SR:** wrote and edit the review. All authors contributed to the article and approved the submitted version.

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