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Knowledge Explosion in Environmental Remediation Techniques and Strategies

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Bioremediation is an emerging and effective innovative technology for treatment of a wide variety of contaminants. This technology includes phytoremediation (plants) and rhizoremediation (plant and microbe interaction). Rhizoremediation, which is the most evolved process of bioremediation, involves the removal of specific contaminants from contaminated sites by mutual interaction of plant roots and suitable microbial flora. This discussion paper presents an exhaustive evaluation with respect to developments, current practices and perspectives of a variety of approaches of bioremediation. Bioremediation approach is currently applied to contain contaminants in soil, groundwater, surface water, or sediments including air. These technologies have become attractive alternatives to conventional cleanup technologies due to relatively low capital costs and the inherently aesthetic nature. This lecture would deal with bioremediation mechanisms such as phytosequestration, rhizodegradation, phytohydraulics, phytoextraction, phytodegradation, and phytovolatilization. Arsenic, Mercury, Chromium, Fluoride, Cyanide, abandoned mines, fly ash disposed sites, engineered phytotreatment technologies, biological permeable barriers; and Organics viz., petroleum hydrocarbons, pesticides explosives are some of the examples chosen for this presentation. Quite a variety of plants, natural, transgenic, and/or associated with rhizosphere micro-organisms are extraordinarily active in these biological interventions and cleaning up pollutants by removing or immobilizing. While diverse microbes are the most active agents, fungi and their strong oxidative enzymes are key players as well in recycling recalcitrant polymers and xenobiotic chemicals as well. The proactive role of MoEF and industries for implementing bioremediation and envisaged action plan are also discussed. Institutions involved in bioremediation research, frequently asked questions covered in power point presentation.