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Current Scenario of Pollutants in the Environment

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INTRODUCTION

The globe has seen the negative outcomes of uncontrolled development of many human activities, such as industry, transportation, agriculture, and urbanisation, in recent decades. Increased living standards and higher consumer demand have increased pollution of the air, including CO_2 and other greenhouse gases, NO_x, SO_2, and particulate matter, of water, including a variety of chemicals, nutrients, leachates, and oil spills, and of the soil, including hazardous waste disposal, pesticide spread, sludge, and the use of disposable goods or no disposable goods. Pesticides, cosmetics, personal and household care products, pharmaceuticals, and other man-made chemicals (such as pesticides, cosmetics, personal and household care products, and medications, among others) are examples of emerging pollutants. According to statistics published by EUROSTAT in 2013, environmentally hazardous compounds accounted for more than half of total chemical production between 2002 and 2011. More than 70% of these compounds have a major environmental impact.

Furthermore, human activities have caused biological micro-pollutants such as viruses and bacteria to contaminate water resources. Emerging or re-emerging pathogens are agents that have sparked renewed interest because of their potential pathogenicity. Many waterborne diseases are caused by biological micro-pollutants such as enteric bacteria, mycoplasmas, viruses, and protozoa, which are still a major cause of death globally. Pesticides are still found in surface and groundwater, despite the fact that some of them have been phased out and replaced with more environmentally friendly alternatives. Pesticide metabolites, which are frequently identified in higher amounts in water sources and wastewater effluents and are both biologically active and hazardous, are currently the focus of research. As a result, several environmental pollutants with specific chemical structures and features that interfere with endogenous hormone systems have piqued researchers' interest. Endocrine disruptors are contaminants that are poorly inventoried and regulated, and there is limited information about their presence, fate, and influence in the environment. Furthermore, because many are used in pharmaceuticals, personal care products, and household cleaners (hormones, glucocorticoids, analgesics, drug and cosmetic additives like paraben, and household cleansers), more information about their eco-toxicological effects is required for their analysis and removal. Other than above mentioned substances, fire retardants, heavy metals (cadmium, lead, or mercury), commonly used industrial chemicals and several pesticides, have been proven to damage natural endocrine systems. As a result, endocrine disruptors and their degradation intermediates are a hot topic in science. According to relevant research, toxicity data for these chemicals, which come from a variety of sources, the most important of which are direct emissions into waters, wastewater treatment plants (effluent and sludge), seepage from septic tanks, landfilling regions, and surface water run-off. For example, pharmaceuticals are more concentrated in wastewater discharged from hospitals, long-term care homes, and other medical facilities.

Various biotechnology applications can be used to decrease or remove environmental dangers and risks that arise as a result of accumulated toxic chemicals or biological micro-pollutants. Treatment/remediation of historic pollution, disinfection of water resources addressing chemical and biological agents as a result of changed human demographic behaviour, breakdown of public health measures, and current industrial/agricultural practises through pollution prevention and control are examples of these. Some of these contaminants can be easily reduced or eliminated due to biotechnological treatments. Microbes, plants, and animals work together under precise conditions that address both abiotic and biotic variables to achieve pollutant mineralisation, transformation, or immobilisation, according to studies. For example, combining biological processes with adsorption on particles in wastewater treatment can remove EDCs (Endocrine Disrupting Chemicals) from influent with 45–99% effectiveness. Emerging pollutants continue to pose new and substantial threats to water, air, soil, natural resources, ecosystems, and human health, according to research. It's also clear that the development of new chemicals pushes the limits of present safety monitoring and risk assessment methods, as well as existing preventative and remedial technology. Some issues should be addressed in order to create a synergistic effect between environmental influences on chemical (organic and inorganic) contaminants' fate and (bio)availability,

as well as the selection and performance of the most appropriate bioremediation processes, as well as complementary techniques that support the effective operation and monitoring of a bioremediation approach. In light of the current situation and research, it is clear that several interconnected factors must be considered: contaminant concentration; contaminant/contamination characteristics and category; scale and level of contamination; the risk intensity generated for health or the environment; the ability to be applied in situ or ex situ; the site's later use; and available resources. Furthermore, using multidisciplinary methodologies would make the clearance of contaminants from any given environment more predictable.