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Pollution Plastic Pollution Microplastic in the Environment: Pattern and Process Marine Anthropogenic Litter Plastic Waste and Recycling Air Pollution and Global Warming Management of Marine Plastic Debris Bioremediation and Green Technologies Microplastic Pollution Sol-Gel Methods for Materials Processing Sustainable Water Treatment Sustainable Transportation Plastics and the Environment Solutions to Environmental Problems Involving Nanotechnology and Enzyme Technology Global Environmental Challenges of the Twenty-first Century Marine Plastic Debris and Microplastics Effective Solutions to Pollution Mitigation for Public Welfare Extended Producer Responsibility A Guidance Manual for Governments Plastic Soup Climate Change, Intercropping, Pest Control and Beneficial Microorganisms Smart Cities as a Solution for Reducing Urban Waste and Pollution A Research Agenda for Global Environmental Politics Environmental and Pollution Science Agricultural Pollution Geobiotechnological Solutions to Anthropogenic Disturbances Environmental Impact of Aviation and Sustainable Solutions Air Pollution; Articles ... Sustainable Agriculture Reviews 27 Freshwater Microplastics Society and the Environment Environmental Micropollutants Plastic-Free International Law and Ocean Use Management Environmental Pollutants and their Bioremediation Approaches Wetland Systems to Control Urban Runoff Sustainable Environmental Solutions Guidelines for the Implementation of MARPOL Microbe-Assisted

Phytoremediation of Environmental Pollutants Environmental Technology Handbook 100% Clean, Renewable Energy and Storage for Everything

New edition of introductory textbook, ideal for students taking a course on air pollution and global warming, whatever their background. Comprehensive introduction to the history and science of the major air pollution and climate problems facing the world today, as well as energy and policy solutions to those problems. This comprehensive text provides a concise overview of environmental problems caused by agriculture, (such as pesticide pollution and increased nitrate levels) and offers practical solutions to them. It is well illustrated and contains a fully-referenced introduction to the main contemporary agricultural pollution issues in the UK. It will help provide clear, scientific and technical understanding of the most important sources of agricultural pollution. This guidance manual presents the potential benefits and costs associated with Extended Producer Responsibility. The use of certain deterrent measures and supporting mechanisms of macroeconomic environmental policies is greatly important. As the environment continues to falter, it is increasingly imperative to develop new technologies and methodologies that have the potential to improve sustainability and cleanliness. Effective Solutions to Pollution Mitigation for Public Welfare is a critical scholarly resource that examines alternative solution methods to mitigate the pollution generated by industrial sources. Featuring coverage on a broad range of topics such as renewable energy, climate change, and water security, this book is geared towards graduate students, managers, researchers, academics, engineers, and government officials seeking current research on solutions that are convenient and practicable for manufacturers to implement. This book addresses the emergent need to act on reducing or getting rid of micro plastic pollution, to achieve a sustainable environment. Microplastics are small plastic pieces, which are less than five millimeters long which can be harmful to our oceans and aquatic life. These predominantly include microfibers from clothing, microbeads, and plastic pellets. Microplastics impact aquatic creatures, turtles and

birds. According to the first study on estimation of human ingestion of microplastic, on average a person consumes at least 50,000 particles of microplastic a year and breathes a similar quantity. Ingested microplastic particles can physically damage organs and also compromise immune function and stymie growth and reproduction. This book presents six informative chapters in order to alleviate the above mentioned issues?. Plastic has become a ubiquitous part of modern life. A cheap, lightweight material, it is used in everything from food packaging to consumer electronics and microbeads in cosmetic products. However, we are becoming increasingly aware of the problems our reliance on plastic is causing in the environment. For example, recent campaigns have highlighted the build-up of microbeads in the marine environment and the damage this is doing to wildlife, and the problem of marine litter, often in very remote locations. There are also concerns over exposure to plasticisers and their possible consequences for health. The plastics industry is under increasing pressure, not only from the government and environmental groups, but also from consumers, to improve the environmental impact of their products. This book presents an introduction to the uses of plastics and an overview of how they interact with the environment. It is a valuable resource for students studying environmental science as well as researchers working in the plastics industry, and policy makers and regulators concerned with waste disposal and environmental planning and conservation. Environmental Micropollutants, the latest volume in the Advances in Environmental Pollution Research series, presents the latest research on various environmental micropollutants, as well as their impacts on health and the economy, also addressing the best possible solutions to address the risks presented by these pollutants. The book covers solutions for dusts, infectious particles, heavy metals, organophosphates, atmospheric toxic organic micropollutants, fungal spores, pollutants from E-waste, and antibiotics threats, providing researchers working in environmental science and management with key knowledge to address this increasingly important concern. These types of micropollutants can be present in

water, air and soil and can harm health even in low quantities, hence this book covers the challenges these pollutants pose to the environment and human health, presenting practical solutions. Identifies key micropollutants in the environment and examines their impacts on human health and the economy Presents methods and treatment technologies for addressing the problem of micropollutants Offers the latest research on a variety of micropollutants and the best solutions for each This book deals with a rapidly growing field aiming at producing food and energy in a sustainable way for humans and their children. It is a discipline that addresses current issues: climate change, increasing food and fuel prices, poor-nation starvation, rich-nation obesity, water pollution, soil erosion, fertility loss, pest control and biodiversity depletion. This series gathers review articles that analyze current agricultural issues and knowledge, then proposes alternative solutions. Management of Marine Plastic Debris gives a thorough and detailed presentation of the global problem of marine plastics debris, covering every aspect of its management from tracking, collecting, treating and commercial exploitation for handing this anthropogenic waste. The book is a unique, essential source of information on current and future technologies aimed at reducing the impact of plastics waste in the oceans. This is a practical book designed to enable engineers to tackle this problem—both in stopping plastics from getting into the ocean in the first place, as well as providing viable options for the reuse and recycling of plastics debris once it has been recovered. The book is essential reading not only for materials scientists and engineers, but also other scientists involved in this area seeking to know more about the impact of marine plastics debris on the environment, the mechanisms by which plastics degrade in water and potential solutions. While much research has been undertaken into the different approaches to the increasing problem of plastics marine debris, this is the first book to present, evaluate and compare all of the available techniques and practices, and then make suggestions for future developments. The book also includes a detailed discussion of the regulatory environment, including international conventions and standards and national

policies. Reviews all available processes and techniques for recovering, cleaning and recycling marine plastic debris Presents and evaluates viable options for engineers to tackle this growing problem, including the use of alternative polymers Investigates a wide range of possible applications of marine plastics debris and opportunities for businesses to make a positive environmental impact Includes a detailed discussion of the regulatory environment, including international conventions and standards and national policies This book offers insights into the recent research focusing on green solutions to address environmental pollution and its impacts. Bioremediation is a vast area that encompasses numerous innovative and cost-effective experimental and research methods involving numerous technologies, such as biotechnological, biochemical, microbial, marine, chemical and engineering approaches. Featuring original research and review articles by leading experts, the book explores potential solutions to the growing issues of waste management and environmental pollution and their impacts, and suggests future research directions. As such, it is a valuable resource for professionals and general readers alike. Environmental Impact of Aviation and Sustainable Solutions is a compilation of review and research articles in the broad field of aviation and the environment. Over three sections and thirteen chapters, this book covers topics such as aircraft design and materials, combustor modeling, atomization, airport pollution, sonic boom and street noise pollution, emission mitigation strategies, and environmentally friendly contributions from a Russian aviation pioneer. This volume is a useful reference for both researchers and students interested in learning about various aspects of aviation and the environment The exponential growth of urban settings has led to an increase in pollutants and waste management issues around the world. As the environment continues to falter under the weight of these pressing issues, it has become increasingly imperative to develop new technologies and methodologies that have the potential to improve the overall sustainability and cleanliness of these cities. Smart Cities as a Solution for Reducing Urban Waste and Pollution examines emergent research on smart innovations within

built urban environments. Featuring best practices and theoretical frameworks, as well as potential issues in the implementation of smart and green technology in urban settings, this publication is a vital reference source for graduate students, researchers, academics, engineers, architects, facility managers, and government officials. The Marine Environment Protection Committee (MEPC) of IMO, at its sixty-second session in July 2011, adopted the Revised MARPOL Annex V, concerning Regulations for the prevention of pollution by garbage from ships, which enters into force on 1 January 2013. The associated guidelines which assist States and industry in the implementation of MARPOL Annex V have been reviewed and updated and two Guidelines were adopted in March 2012 at MEPC's sixty-third session. The 2012 edition of this publication contains: the 2012 Guidelines for the implementation of MARPOL Annex V (resolution MEPC.219(63)); the 2012 Guidelines for the development of garbage management plans (resolution MEPC.220(63)); and the Revised MARPOL Annex V (resolution MEPC.201(62)). The most serious environmental problems of the twenty-first century have the potential to alter the course of life on this planet. Global warming, toxic waste, water and air pollution, acid rain, and shrinking energy supplies are frightening challenges that may threaten our future if we do not face up to them. *Global Environmental Challenges* provides important information and gives us hope about the environment. This book first helps us to grasp these difficulties, then shows us the choices we can make. How long to leave a light on, whether to take the car, the train, or bicycle to work, whether to recycle or throw away, whether to vote to curb continued suburban sprawl—all of these decisions can make a difference. This collection of some of the best essays and articles on the environment comes from a variety of sources, including journals, magazines, websites of ecological/conservation organizations, and other publications. Five major sections investigate the interaction of population growth, consumption, and environment; the emerging crisis in freshwater around the globe; global climate and atmosphere (including global warming); biodiversity loss; and the concept of

sustainable development-using natural resources to place future human development on a sustainable path. The final section on sustainable development reveals how we can take action. As individuals, we can make a difference readily and easily without making huge personal sacrifices. As societies, we can work together in a global community of interest to sustain the earth.p This valuable resource offers readers a better understanding of our environmental problems and presents solutions to improving the health of theplanet.p Textbook on the science and methods behind a global transition to 100% clean, renewable energy for science, engineering, and social science students. Wetlands for Water Pollution Control, Second Edition, covers the fundamental science and engineering principles relevant to the drainage and treatment of both storm and wastewater. Standard and novel design recommendations for predominantly constructed wetlands and related sustainable drainage systems are also provided to account for the interests of professional engineers and environmental scientists. This revised edition deals with the design, operation, maintenance, and water quality monitoring of traditional and novel wetland systems, but also provides information on the analysis of asset performance and modeling of treatment processes, along with performances of existing infrastructures in predominantly developed, but also developing countries, and the sustainability and economic issues involved. This new edition contains 10 new chapters, along with multidisciplinary, experimental, and modeling-orientated case study topics that include natural wetlands, constructed treatment wetlands for pollution control, sustainable drainage systems, and specific applications, such as wetlands treating hydrocarbon and ammonia, as well as ecological sanitation systems recycling treated. Contains a broad overview of water and environmental engineering aspects relevant for the drainage and treatment of storm water and wastewater, respectively Includes standard and novel design, operation, monitoring and maintenance recommendations for predominantly constructed wetlands and related sustainable drainage systems Provides detailed solutions to pressing water quality challenges associated with constructed

treatment wetlands, integrated constructed wetlands, sustainable flood retention basins, farm constructed wetlands and storm water ponds, and other sustainable biological filtration and treatment technologies linked to public health engineering. During the last two decades, sustainability has become the dominant concern of transportation planners and policymakers. This timely text provides a framework for developing systems that move people and products efficiently while minimizing damage to the local and global environment. The book offers a uniquely comprehensive perspective on the problems surrounding current transportation systems: climate change, urban air pollution, diminishing petroleum reserves, safety issues, and congestion. It explores the full range of possible solutions, including applications of pricing, planning, policy, education, and technology. Numerous figures, tables, and examples are featured, with a primary focus on North America. This book places contemporary problems of ocean use management in historical context beginning with the time of Hugo Grotius, whose seminal 1609 work *The Freedom of the Seas* was the basis of ocean law for the next three centuries. Individual use problems are dealt with in detail and include overfishing, migrating fish stocks and fish wars, oil drilling, deep sea mining and marine pollution. Throughout the author notes the need to seek solutions in ocean management from a more integrated perspective. Emphasis is placed on the United Nations Conference on the Law of the Sea and the resulting agreements. This book therefore presents a unique breadth of view which will make it salient to policy makers, diplomats, scholars and ocean users. This book offers a problem-and-solution approach to environmental remediation in mining, including the environmentally sustainable utilization of waste materials from the mining industry. It largely comprises articles published in Springer journals, which have been thoroughly revised and expanded. With supplementary data and illustrations, it discusses specific problem areas in relevant Caribbean locations and provides an overview of geotechnical and microbial solutions to prevent post-mining deterioration in this area. Plastics have transformed every aspect of our lives. Yet the very properties that make them attractive--

they are cheap to make, light, and durable--spell disaster when trash makes its way into the environment. *Plastic Soup: An Atlas of Ocean Pollution* is a beautifully-illustrated survey of the plastics clogging our seas, their impacts on wildlife and people around the world, and inspirational initiatives designed to tackle the problem. With striking photography and graphics, *Plastic Soup* brings plastic pollution to brilliant life for readers. According to some estimates, if we continue on our current path, the oceans will contain more plastic than fish by the year 2050. Created to inform and inspire readers, *Plastic Soup* is a critical tool in the fight to reverse this trend. *Environmental and Pollution Science, Third Edition*, continues its tradition on providing readers with the scientific basis to understand, manage, mitigate, and prevent pollution across the environment, be it air, land, or water. Pollution originates from a wide variety of sources, both natural and man-made, and occurs in a wide variety of forms including, biological, chemical, particulate or even energy, making a multivariate approach to assessment and mitigation essential for success. This third edition has been updated and revised to include topics that are critical to addressing pollution issues, from human-health impacts to environmental justice to developing sustainable solutions. *Environmental and Pollution Science, Third Edition* is designed to give readers the tools to be able to understand and implement multi-disciplinary approaches to help solve current and future environmental pollution problems. Emphasizes conceptual understanding of environmental systems and can be used by students and professionals from a diversity of backgrounds focusing on the environment Covers many aspects critical to assessing and managing environmental pollution including characterization, risk assessment, regulation, transport and fate, and remediation or restoration New topics to this edition include Ecosystems and Ecosystem Services, Pollution in the Global System, Human Health Impacts, the interrelation between Soil and Human Health, Environmental Justice and Community Engagement, and Sustainability and Sustainable Solutions Includes color photos and diagrams, chapter questions and problems, and highlighted key words This book collects

research activities focused on the development of new processes to replace obsolete practices that are often highly invasive, unsustainable, and socially unacceptable. Taking inspiration from real problems and the need to face real cases of contamination or prevent potentially harmful situations, the development and optimization of 'smart' solutions, i.e., sustainable not only from an environmental point of view but also economically, are discussed in order to encourage, as much as possible, their actual implementation. This report presents both short- and long-term approaches to the problem of marine plastic debris and microplastics. It provides an overview of the latest science and experiences, identifies priority areas of action, and points out areas requiring more research. Improved waste management is urgently needed to reduce the flow of plastic into our oceans. This open access book examines global plastic pollution, an issue that has become a critical societal challenge with implications for environmental and public health. This volume provides a comprehensive, holistic analysis on the plastic cycle and its subsequent effects on biota, food security, and human exposure. Importantly, global environmental change and its associated, systems-level processes, including atmospheric deposition, ecosystem complexity, UV exposure, wind patterns, water stratification, ocean circulation, etc., are all important direct and indirect factors governing the fate, transport and biotic and abiotic processing of plastic particles across ecosystem types. Furthermore, the distribution of plastic in the ocean is not independent of terrestrial ecosystem dynamics, since much of the plastic in marine ecosystems originates from land and should therefore be evaluated in the context of the larger plastic cycle. Changes in species size, distribution, habitat, and food web complexity, due to global environmental change, will likely alter trophic transfer dynamics and the ecological effects of nano- and microplastics. The fate and transport dynamics of plastic particles are influenced by their size, form, shape, polymer type, additives, and overall ecosystem conditions. In addition to the risks that plastics pose to the total environment, the potential impacts on human health and exposure routes, including seafood consumption, and air and drinking water need to be

assessed in a comprehensive and quantitative manner. Here I present a holistic and interdisciplinary book volume designed to advance the understanding of plastic cycling in the environment with an emphasis on sources, fate and transport, ecotoxicology, climate change effects, food security, microbiology, sustainability, human exposure and public policy. Sustainable Water Treatment: Engineering Solutions for a Variable Climate covers sustainable water and environmental engineering aspects relevant for the drainage and treatment of storm water and wastewater. The book explains the fundamental science and engineering principles for the student and professional market. Standard and novel design recommendations for sustainable technologies, such as constructed wetlands, sustainable drainage systems and sustainable flood retention basins are provided to account for the interests of professional engineers and environmental scientists. The book presents the latest research findings in wastewater treatment and runoff control that are ideal for academics and senior consultants. The book offers a challenging, diverse, holistic, multidisciplinary, experimental and modelling-orientated case study, covering topics such as natural wetlands, constructed treatment wetlands for pollution control, sustainable drainage systems managing diffuse pollution, specific applications, such as wetlands treating dye wastewater and ecological sanitation systems recycling treated waters for the irrigation of crops. Explains the fundamental science and engineering principles behind each topic Provides an easy-to-understand, descriptive overview of complex 'black box' drainage and treatment systems and general design issues involved Includes a comprehensive analysis of asset performance, modelling of treatment processes, and an assessment of sustainability and economics In a world confronted with escalating environmental crises, are academics asking the right questions and advocating the best solutions? This Research Agenda paves the way for new and established scholars in the field, identifying the significant gaps in research and emerging issues for future generations in global environmental politics. "Guides readers toward the road less consumptive, offering practical advice and moral support while making

a convincing case that individual actions . . . do matter.” —Elizabeth Royte, author, *Garbage Land and Bottlemania* Like many people, Beth Terry didn’t think an individual could have much impact on the environment. But while laid up after surgery, she read an article about the staggering amount of plastic polluting the oceans, and decided then and there to kick her plastic habit. In *Plastic-Free*, she shows you how you can too, providing personal anecdotes, stats about the environmental and health problems related to plastic, and individual solutions and tips on how to limit your plastic footprint. Presenting both beginner and advanced steps, Terry includes handy checklists and tables for easy reference, ways to get involved in larger community actions, and profiles of individuals—*Plastic-Free Heroes*—who have gone beyond personal solutions to create change on a larger scale. Fully updated for the paperback edition, *Plastic-Free* also includes sections on letting go of eco-guilt, strategies for coping with overwhelming problems, and ways to relate to other people who aren’t as far along on the plastic-free path. Both a practical guide and the story of a personal journey from helplessness to empowerment, *Plastic-Free* is a must-read for those concerned about the ongoing health and happiness of themselves, their children, and the planet. *Society and the Environment* examines today’s environmental controversies within a socio-organizational context. After outlining the contours of “pragmatic environmentalism,” Carolan explores the material world: air, water, biodiversity, and trash. He considers the pressures that exist where ecology and society collide, such as population growth and its associated increased demands for food and energy. Carolan also investigates how various ecological issues, such as climate change, are affecting our very own personal health. Finally, he drills into the social/structural dynamics—including political economy and the international legal system—that create ongoing momentum for environmental ills. This interdisciplinary text features a three-part structure in each chapter that covers “fast facts” about the issue at hand, examines its wide-ranging implications, and offers balanced consideration of possible real-world solutions. Bolstering that analysis, a variety of boxes highlight

relevant case studies as well as the value judgments which lurk everywhere in talk about environmental phenomena. New to this edition are “Movement Matters” boxes, which showcase grassroots movements that have affected legislation. Discussion questions and key terms enhance the text's usefulness, making *Society and the Environment* the perfect learning tool for courses on environmental sociology. Sustainable agriculture is a rapidly growing field aiming at producing food and energy in a sustainable way for humans and their children. Sustainable agriculture is a discipline that addresses current issues such as climate change, increasing food and fuel prices, poor-nation starvation, rich-nation obesity, water pollution, soil erosion, fertility loss, pest control, and biodiversity depletion. Novel, environmentally-friendly solutions are proposed based on integrated knowledge from sciences as diverse as agronomy, soil science, molecular biology, chemistry, toxicology, ecology, economy, and social sciences. Indeed, sustainable agriculture decipher mechanisms of processes that occur from the molecular level to the farming system to the global level at time scales ranging from seconds to centuries. For that, scientists use the system approach that involves studying components and interactions of a whole system to address scientific, economic and social issues. In that respect, sustainable agriculture is not a classical, narrow science. Instead of solving problems using the classical painkiller approach that treats only negative impacts, sustainable agriculture treats problem sources. Because most actual society issues are now intertwined, global, and fast-developing, sustainable agriculture will bring solutions to build a safer world. This book series gathers review articles that analyze current agricultural issues and knowledge, then propose alternative solutions. It will therefore help all scientists, decision-makers, professors, farmers and politicians who wish to build a safe agriculture, energy and food system for future generations. *Plastic Waste and Recycling: Environmental Impact, Societal Issues, Prevention, and Solutions* begins with an introduction to the different types of plastic materials, their uses, and the concepts of reduce, reuse and recycle before examining plastic types, chemistry and degradation

patterns that are organized by non-degradable plastic, degradable and biodegradable plastics, biopolymers and bioplastics. Other sections cover current challenges relating to plastic waste, explain the sources of waste and their routes into the environment, and provide systematic coverage of plastic waste treatment methods, including mechanical processing, monomerization, blast furnace feedstocks, gasification, thermal recycling, and conversion to fuel. This is an essential guide for anyone involved in plastic waste or recycling, including researchers and advanced students across plastics engineering, polymer science, polymer chemistry, environmental science, and sustainable materials. This book describes how man-made litter, primarily plastic, has spread into the remotest parts of the oceans and covers all aspects of this pollution problem from the impacts on wildlife and human health to socio-economic and political issues. Marine litter is a prime threat to marine wildlife, habitats and food webs worldwide. The book illustrates how advanced technologies from deep-sea research, microbiology and mathematic modelling as well as classic beach litter counts by volunteers contributed to the broad awareness of marine litter as a problem of global significance. The authors summarise more than five decades of marine litter research, which receives growing attention after the recent discovery of great oceanic garbage patches and the ubiquity of microscopic plastic particles in marine organisms and habitats. In 16 chapters, authors from all over the world have created a universal view on the diverse field of marine litter pollution, the biological impacts, dedicated research activities, and the various national and international legislative efforts to combat this environmental problem. They recommend future research directions necessary for a comprehensive understanding of this environmental issue and the development of efficient management strategies. This book addresses scientists, and it provides a solid knowledge base for policy makers, NGOs, and the broader public. Sol-gel processing is a soft-chemistry method to obtain functional materials at low temperatures. This route can be used to produce very sophisticated nanomaterials and to tailor the materials to very specific applications. Adsorption and detection

of pollutants, water purification and soil remediation represent challenging fields of application that can be exploited by sol-gel materials. In this volume several contributions from invited speakers and participants at the NATO advanced research workshop on "Sol-gel approaches to materials for pollution control, water purification and soil remediation", which has been held in Kiev, Ukraine on October 2007, are reported. The book offers a wide and updated overview of the most advanced sol-gel methods for materials processing and at the same time presents several case studies concerning possible solutions for environmental issues. General articles on sol-gel from the invited speakers and focused research articles allow getting inside sol-gel applications on this very important field. This book is open access under a CC BY 4.0 license. This volume focuses on microscopic plastic debris, also referred to as microplastics, which have been detected in aquatic environments around the globe and have accordingly raised serious concerns. The book explores whether microplastics represent emerging contaminants in freshwater systems, an area that remains underrepresented to date. Given the complexity of the issue, the book covers the current state-of-research on microplastics in rivers and lakes, including analytical aspects, environmental concentrations and sources, modelling approaches, interactions with biota, and ecological implications. To provide a broader perspective, the book also discusses lessons learned from nanomaterials and the implications of plastic debris for regulation, politics, economy, and society. In a research field that is rapidly evolving, it offers a solid overview for environmental chemists, engineers, and toxicologists, as well as water managers and policy-makers. This book is a compilation of detailed and latest knowledge on the various types of environmental pollutants released from various natural as well as anthropogenic sources, their toxicological effects in environments, humans, animals and plants as well as various bioremediation approaches for their safe disposal into the environments. In this book, an extensive focus has been made on the various types of environmental pollutants discharged from various sources, their toxicological effects in environments, humans, animals and

plants as well as their biodegradation and bioremediation approaches for environmental cleanup. The presence, at sea, of large amounts of plastic and microplastics, which are sometimes invisible and results from the fragmentation of larger debris, requires an in-depth knowledge of the nature of ocean debris, its transport mechanisms, life cycle and effects on the environment. This volume provides new insights in the topic of plastic pollution, an actual and important problem for the marine environment. Historically, the development of civilization has upset much of the earth's ecosystem leading to air, land, and water pollution. The author defines pollution as the introduction of a foreign substance into an ecosystem via air, land or water. This book delves into issues that effect the everyday lives of people who come in contact with these hazards. By examining these issues, this body of work aims to stimulate debate and offer solutions to the ever-growing threat to the environment and humanity. Includes problems with each chapter, Explores issues such as control of gaseous emissions, waste recycling and waste disposal, Explains physical and thermal methods of waste management, Provides definitions and resources for future reference, Discusses the history of environmental technology. Nanotechnology and Enzyme Technology Combined to Address Environmental Problems discusses how nanotechnology and enzyme technology work independently and together to help researchers and environmental professionals learn about this revolutionary and cross-disciplinary field. Nanotechnology has provided a range of nanomaterials, some of which are helpful in the protection of the environment and climate. They can be used to improve durability against mechanical stress, help in cleaning, enhance energy efficiency as insulation, save energy consumption during transportation due to catalytic properties, and more. This book highlights this technology as it continues to provide solutions for various environmental problems. Covers air and water pollution remediation in the developing field of combining nanotechnology with enzyme technology Reviews the sustainability potentials of combining nanotechnology and enzyme technology, including energy production Applies current research and

utilization to a variety of environmental issues, including pollution and energy production **Microbe-Assisted Phytoremediation of Environmental Pollutants: Recent Advances and Challenges** provides comprehensive information on the principles and practical knowledge of microbe-assisted phytoremediation of organic and inorganic pollutants for environmental safety. This book describes the physiological, biochemical, microbiological, and molecular basis of microbe-assisted phytoremediation and contains many relevant topics to fill the gaps in developing an understanding of microbe-assisted phytoremediation of environmental pollutants. The book provides state-of-the-art knowledge on fundamental, practical, and purposeful utilization of plant-associated bacteria (plant growth-promoting rhizobacteria [PGPR] and endophytes) and arbuscular mycorrhizal fungi for plant-growth promotion and enhanced phytoremediation of environmental pollutants in the contaminated matrix. Features: Provides a state-of-the-art overview of microbe-assisted phytoremediation Emphasizes the roles of PGPR, endophytes, and mycorrhizal fungi in assisted phytoremediation Elucidates biochemical and molecular mechanisms of microbe-assisted phytoremediation Details field studies and success stories of microbe-assisted phytoremediation Explores advances, challenges, and future directions in microbe-assisted phytoremediation The book serves as a valuable resource for researchers, ecotoxicologists, environmental scientists and engineers, environmental microbiologists and biotechnologists, environmental health and risk scientists, environmental science managers and administrators, remediation practitioners, environmental policymakers, and students at the postgraduate and doctoral levels in the relevant fields who wish to work on microbe-assisted phytoremediation of pollutants for environmental safety and sustainability.

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