

## Contaminants Of Emerging Concern In The Environment Ecological And Human Health Considerations Acs Symposium Series

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.

Many manmade chemicals used in consumer products are ultimately washed down the drain and are collected in municipal sewers. Efficient chemical monitoring at wastewater treatment (WWT) plants thus may provide up-to-date information on chemical usage rates for epidemiological assessments. The objective of the present study was to extrapolate this concept, termed 'sewage epidemiology', to include municipal sewage sludge (MSS) in identifying and prioritizing contaminants of emerging concern (CECs). To test this the following specific aims were defined: i) to screen and identify CECs in nationally representative samples of MSS and to provide nationwide inventories of CECs in U.S. MSS; ii) to investigate the fate and persistence in MSS-amended soils, of sludge-borne hydrophobic CECs; and iii) to develop an analytical tool relying on contaminant levels in MSS as an indicator for identifying and prioritizing hydrophobic CECs. Chemicals that are primarily discharged to the sewage systems (alkylphenol surfactants) and widespread persistent organohalogen pollutants (perfluorochemicals and brominated flame retardants) were analyzed in nationally representative MSS samples. A meta-analysis showed that CECs contribute about 0.04-0.15% to the total dry mass of MSS, a mass equivalent of 2,700-7,900 metric tonnes of chemicals annually. An analysis of archived mesocosms from a sludge weathering study showed that 64 CECs persisted in MSS/soil mixtures over the course of the experiment, with half-lives ranging between 224 and >990 days; these results suggest an inherent persistence of CECs that accumulate in MSS. A comparison of the spectrum of chemicals (n=52) analyzed in nationally representative biological specimens from humans and MSS revealed 70% overlap. This observed co-occurrence of contaminants in both matrices suggests that MSS may serve as an indicator for ongoing human exposures and body burdens of pollutants in humans. In conclusion, I posit that this novel approach in sewage epidemiology may serve to pre-screen and prioritize the several thousands of known or suspected CECs to identify those that are most prone to pose a risk to human health and the environment. This book focuses on innovative treatment technologies for the elimination of emerging contaminants in wastewater and drinking water treatment processes. The book also discusses sources and occurrence of emerging contaminants in municipal and industrial waste, giving an overview of state-of-the-art analytical methods for their identification. Further important aspects covered include the acute and chronic effects and overall impact of emerging contaminants on the environment.

Emerging and Nanomaterial Contaminants in Wastewater: Advanced Treatment Technologies describes the state-of-the-art of remediation technologies, such as those involving nanotechnology, filtration devices (e.g. membranes), strategies involving adsorption and precipitation processes, development of new sorbents, nanosorbents, biosorbents, green technology, bio-electrokinetics, degradation of pollutants, advanced oxidative process, oxidative electrochemical and photocatalytic processes, catalytic degradation, and emerging hybrid technologies, such as photocatalyst membrane photoreactors using TiO<sub>2</sub>. Scientists and researchers in academia and industry will benefit from this comprehensive resource on the fundamental science behind the mechanisms at which wastewater sources can be purified from emerging contaminants. Provides a fundamental understanding of emerging contaminants to help readers select appropriate remediation technologies Discusses, in detail, new and advanced green technologies that remove emerging contaminants from wastewater Shows how to ensure water quality and save public health by protecting water resources from contaminants

This volume offers an overview of the occurrence of emerging organic contaminants in Mediterranean rivers and their relevance to their chemical and ecological quality under water scarcity. With chapters covering the effects under multiple stress conditions of pharmaceuticals, polar pesticides, personal care products, and industrial chemicals, the observations presented can be applicable to other parts of the world where water scarcity is an issue. It is of interest to environmental chemists, ecologists, environmental engineers, and ecotoxicologists, as well as water managers and decision-makers. This volume takes a multidisciplinary approach to study and evaluate the global human vulnerability to the exposure of contaminants of emerging concern (CECs) in the natural environment. It provides a comprehensive resource on structurally diverse groups of chemical compounds that have adverse effects on the aquatic environment. It explores the global strength, environmental status, chemical risk assessment and management strategies of CECs with relevant modern techniques. The principle focus is on concurrent emerging water quality issues. It defines the impacts of the environmental exposure of trace concentrations of CECs and/or their metabolites and discusses possible technological advances to combat the emerging pollutants. It will be useful to researchers, multi-stakeholder expert groups, policymakers, and graduate students.

Pharmaceuticals and Personal Care Products Waste Management and Treatment Technology: Emerging Contaminants and Micro Pollutants provides the tools and techniques for identifying these contaminants and applying the most effective technology for their remediation, recovery and treatment. The consumption of pharmaceuticals and personal care

products (PPCPs) has grown significantly over the last 35 years, thus increasing their potential risk to the environment. As PPCPs are very difficult to detect and remove using conventional wastewater treatment methods, this book provides solutions to a growing problem. Includes sampling, analytical and characterization methods and technology for detecting PPCPs in the environment Provides advanced treatment and disposal technologies for the removal of PPCPs from wastewater, surface water, landfills and septic systems Examines the pathways of PPCPs into the environment

"The primary objective of EPA's Nine POTW Study (the Study) was to investigate the occurrence of Contaminants of Emerging Concern (CECs) in untreated and fully treated wastewater at publicly owned treatment works (POTWs). EPA also initially investigated the occurrence of conventional, non-conventional, and toxic pollutants, including many of the pollutants in EPA's 1982 "50-POTW Study" (EPA, 1982). For the first four POTWs in this Study, EPA selected facilities that treated industrial discharges because POTWs receiving significant volumes of discharges from pharmaceutical or other manufacturing facilities might be expected to receive a significant quantity and variety of CECs ... This report presents the findings from the Nine POTW Study for informational purposes. Caution should be used in interpreting the results. For several reasons, the study does not lend itself to national conclusions. The Study had two very distinct stages, each with different analytical methods, sampling techniques and POTW selection criteria. The nine POTWs in this study are not statistically representative of all POTWs in the country, nor would they be expected to statistically represent particular subpopulations of POTWs. The analytical methods were under development during much of this study, which resulted in certain data quality issues during laboratory analysis. Additionally, sample collection efforts were not designed to calculate removal of CECs from POTWs. Although some reduction in concentration levels of many CECs was observed in the effluent, the data are not sufficient to draw any conclusions about treatment effectiveness."--Introduction.

HANDBOOK OF CATCHMENT MANAGEMENT In 2010, the first edition of the Handbook of Catchment Management provided a benchmark on how our understanding and actions in water management within a catchment context had evolved in recent decades. Over ten years on, the catchment management concept is entering a new phase of development aligned to contemporary and future challenges. These include climate change uncertainty, further understanding in ecological functioning under change, the drive for a low-carbon, energy efficient and circular society, multiple uses of water, the emergence of new pollutants of concern, new approaches to valuation, finance and pricing mechanisms, stewardship and community engagement, the integration of water across the Sustainable Development Goals (SDG) and the link between water, energy and food. These developments are framed within an increasingly data rich world where new analytics, sensor technology and processing power are informing increasingly real-time decision making. The challenge is also to increase cross-compliance and policy integration to meet multiple stakeholder objectives, and to link actions to achieve cost-effective outcomes. In addition, there are a number of new and exciting city, region and basin-scale real-world examples of contemporary and new catchment thinking; integrating science, technology, knowledge and governance to address multiple drivers and complex problems from across the globe. The time is now right, to capture the new challenges facing catchment management and water resources management globally. This revised and updated edition of the Handbook of Catchment Management features: Thoroughly rewritten chapters which provide an up-to-date view of catchment management issues and contexts New case study material highlighting multi-sectoral management in different globally significant basins and different geographical locations Up-to-date topics selected for their resonance not only in natural sciences and engineering, but also in other fields, such as socio-economics, law and policy The Handbook is designed for a broad audience, but will be particularly useful for advanced students, researchers, academics and water sector professionals such as planners, consultants and regulators.

This book documents the current science of CECs with important new data on the risks associated with a broad range of persistent organic pollutants.

Chiral Organic Pollutants introduces readers to the growing challenges of chirality in synthetic chemicals. In this volume, contributors brilliantly summarize the characteristics of chiral pollutants to provide tools and techniques for effectively assessing their environmental and human health risks. Chapters cover recent research on the physicochemical properties, sources, exposure pathways, environmental fate, toxicity, and enantioselective analysis of chiral organic pollutants. Chiral Organic Pollutants also provides comprehensive discussions on the current trends in the synthesis and legislation of chiral chemicals. Key Features: Includes sampling and analytical methods for the enantioselective analysis of a wide array of chiral organic pollutants in food and the environment Summarizes recent research on the sources, fate, transport, and toxicity of chiral organic pollutants in the environment Critically examines the sources and pathways of chiral organic pollutants such as pesticides, pharmaceuticals, and flame retardants in food Includes a comprehensive discussion on current trends in the enantioselective synthesis and chiral switching of pesticides and pharmaceuticals Provides analysis of current national and international regulations of chiral synthetic chemicals The use of chiral synthetic chemicals such as pesticides, pharmaceuticals, personal care products, and halogenated flame retardants has significantly grown in the past 60 years. Hence, understanding the human and environmental health effects of chiral organic pollutants is crucial in the industry, academia, and policymaking. Chiral Organic Pollutants is an excellent textbook and reference for students, scientists, engineers, and policymakers interested in food quality, environmental pollution, chemical analysis, organic synthesis, and toxicology. Also available in the Food Analysis and Properties Series: Analysis of Nanoplastics and Microplastics in Food, edited by Leo M.L. Nollet and Khwaja Salahuddin Siddiqi (ISBN: 9781138600188) Proteomics for Food Authentication, edited by Leo M.L. Nollet, and Semih Ötle? (ISBN: 9780367205058) Mass Spectrometry Imaging in Food Analysis, edited by Leo M.L. Nollet (ISBN: 9781138370692) For a complete list of books in this series, please visit our website at: [www.crcpress.com/Food-Analysis--Properties/book-series/CRCFOODANPRO](http://www.crcpress.com/Food-Analysis--Properties/book-series/CRCFOODANPRO)

Artificial or constructed wetlands are an emerging technology particularly for tropical areas with water scarcity. For big cities, the sustainable management of water resources taking into account proper use is always challenging. The book presents case studies illustrating the above. As plants and microorganisms are a fundamental part of the correct functioning of these systems, their contribution to the degradation of the organic matter and to the removal and transformation of the pollutant compounds present in the wastewaters is also a highlight of this book.

This book reviews the globally important freshwater resource of the Great Lakes, which is currently threatened by contaminants that compromise water quality and impact its ecological and economic health. Divided into four parts, this volume covers historic, current and emerging sources of contamination from heavy metals and persistent organic pollutants to microplastics; and identifies

their ecological impacts. Due to factors ranging from rapidly changing land use practices, climate change and our emerging understanding of their impact on biological, chemical and physical interactions, the effectiveness of management strategies has proven highly variable. Continued enhancements in the rate of lake recovery are required to sustain the health of the Great Lakes. Accordingly, the book also explores recent advances in contaminant detection, along with future steps forward in lake management approaches. Revealing our current knowledge gaps and providing a roadmap towards sustainable solutions, the book offers a valuable asset for scientists, managers and the public alike.

**Contaminants of Emerging Concern in Water and Wastewater: Advanced Treatment Processes** presents the state-of-the-art in the design and use of adsorbents, membranes, and UV/oxidation processes, along with the challenges that will need to be addressed to close the gap between development and implementation in water/wastewater treatment applications. Chapters cover adsorbent and membrane design and performance, direct comparison of performance data between new (inorganic and metal organic nanoporous materials) and classic adsorbents and membranes, a list of advantages, disadvantages, and challenges related to performance limitations, regenerability, and upscaling. In addition, users will find sections on the identification of potential site and off-site applications that are listed according to adsorbent and membrane types, transformation of CECs in low- and/or medium-pressure UV irradiation processes used for disinfection, the oxidation of CECs by chlorine and ozone, and a comparison of advanced oxidation processes for the treatment of a variety of CECs in water and wastewater. Addresses the advantages/disadvantages of select technologies, including energy resource needs and waste management issues of reverse osmosis, amongst other issues Presents information on the advancements of technology within the realm of Engineered Treatments of CECs Focuses on the inherent science and technology of advanced treatment processes

Over the last 15 years, the focus of chemical pollution has shifted from conventional pollutants to so-called "emerging" or "new" unregulated contaminants. These include pharmaceuticals and personal care products, hormones, UV filters, perfluorinated compounds, polybrominated flame retardants (BFRs), pesticides, plasticizers, artificial sweeteners, illicit drugs, and endocrine disruptor compounds (EDCs). Despite the increasing number of published studies covering emerging contaminants, we know almost nothing about the effects of their transformation products and/or metabolites.

This two-volume set provides a unique collection of research on transformation products, their occurrence, fate and risks in the environment. It contains 32 chapters, organised into 7 parts, each with a distinct focus: • General Considerations • Transformation Processes and Treatment Strategies • Analytical Strategies • Occurrence, Fate and Effects in the Environment • Global Speciality and Environmental Status • Risk Assessment, Management and Regulatory Framework • Outlook Transformation Products of Emerging Contaminants in the Environment is a valuable resource for researchers and industry professionals in environmental chemistry, analytical chemistry, ecotoxicology, environmental sciences, and hydrology, as well as environmental consultants and regulatory bodies.

This volume reports on anthropogenic chemicals, a new category of environmental contaminant that is predominantly unregulated and human-made, occurring in air, soil, water, food, and human and animal tissues in trace concentrations. With an increasing population, use of new and diverse chemicals that can enter the water supply, and emergence of new microbial pathogens, the U.S. federal government is faced with a regulatory dilemma: Where should it focus its attention and limited resources to ensure safe drinking water supplies for the future? **Identifying Future Drinking Water**

**Contaminants** is based on a 1998 workshop on emerging drinking water contaminants. It includes a dozen papers that were presented on new and emerging microbiological and chemical drinking water contaminants, associated analytical and water treatment methods for their detection and removal, and existing and proposed environmental databases to assist in their proactive identification and regulation. The papers are preceded by a conceptual approach and related recommendations to EPA for the periodic creation of future Drinking Water Contaminant Candidate Lists (CCLs--produced every five years--include currently unregulated chemical and microbiological substances that are known or anticipated to occur in public water systems and that may pose health risks).

**Contaminants of Emerging Concern in Water and Wastewater Advanced Treatment Processes** Butterworth-Heinemann **Management of Contaminants of Emerging Concern (CEC) in Environment** provides information about new concepts and latest developments in origin, reaction pathways, transportation, transformation products, identification, and adverse effects of CEC, as well as recent remediation technologies and tools for CEC. The book explores processes such as nanotechnology for the degradation of CEC by using various heterogeneous catalysts. The chapters incorporate both theoretical and practical aspects and can serve as a baseline for future studies. So, **Management of Contaminants of Emerging Concern (CEC) in Environment** is an indispensable resource for university students, teachers, and researchers, especially those working in the area of remediation and management of contaminants of emerging concern.

Takes a holistic approach, focusing on the origin of contaminants, type of contaminants, remediation technologies, regulations and legal aspects Applies chemical, physical and biological processes for the treatment of emerging contaminants Written by a team of internationally reputed and rising researchers

The term "emerging contaminants" and its multiple variants has come to refer to unregulated compounds discovered in the environment that are also found to represent a potential threat to human and ecological receptors. Such contaminants create unique and considerable challenges as the push to address them typically outpaces the understanding of their toxicity, their need for regulation, their occurrence, and techniques for treating the environmental media they affect. With these challenges in mind, this handbook serves as a primer regarding the topic of emerging contaminants, with current and practical information to help support the goal of protection where they are encountered. Features Explores the definition, identification, and life cycle of emerging contaminants. Reviews current information on sources, toxicology, regulation, and new tools for characterization and treatment of: 1,4-Dioxane (mature in its emerging contaminant life cycle) Per- and polyfluoroalkyl substances (PFASs; a newer group of emerging contaminant) Hexavalent chromium (former emerging contaminant with evolving science) 1,2,3-Trichloropropane (progressing in its emerging contaminant life cycle) Provides thoughts on opportunities in managing emerging contaminants to help balance

uncertainty, compress life cycle, and optimize outcomes.

Functional and structural nanomaterials are emerging materials that display interesting physical and chemical properties because of their size and surface area to volume ratio. Applications for these materials include uses in removing pollutants from the environment. Looking at the current state-of-the-art as well as future trends in the use of nanomaterials for tackling environmental issues this book covers everything from the synthesis and characterisation of these materials to their use in the removal of specific contaminants. *Functional Hybrid Nanomaterials for Environmental Remediation* is a useful resource both for nanomaterial scientists interested in the real world application of hybrid nanomaterials and for environmental chemists and environmental engineers interested in novel materials for environmental remediation.

This is the time when legacy, pathogenic, and emerging contaminants must be talked about, understood, and dealt with together. While the geogenic contamination of the groundwater is a well-established phenomenon that is considered as legacy contaminants that risk people's health globally, both pathogenic and emerging contaminants like various water-borne pathogens and pharmaceutical personal care products (PPCPs) are becoming imperative for their acute and chronic toxic effects. While contaminated groundwater consumption leads to skin pigmentation, hyperkeratosis, kidney damage, cardiovascular disease, and children's overall development, poor sanitation-related pathogenic microorganisms cause a significant number of child and prenatal deaths. Simultaneously, antibiotic microbial resistance (AMR) is expected to kill 100 million people by 2050. However, there are rare texts that combine aspects of all these three under a single book cover. This book gives an understanding of the occurrence, fate, and transport of geogenic, microbial, and anthropogenic contaminants in the groundwater. It covers not only the scientific and technical aspects but also environmental, legal, and policy aspects for contaminant management in the environment under the paradigm shift of COVID-19. This book is intended to bring the focus on the natural contaminants—biotic or abiotic—in the post-COVID Anthropocene, which is illustrating a significant alteration of systems and the subsequent downstream impacts owing to globalization. This book has compiled global work on emergence, mass flow, partitioning, and activation of geogenic, emerging, and pathogenic contaminants in various spheres of environment with special emphasis on soil, sediment, and aquatic systems for enhancing the understanding on their migration and evolution for the welfare of mankind.

Across the United States, thousands of hazardous waste sites are contaminated with chemicals that prevent the underlying groundwater from meeting drinking water standards. These include Superfund sites and other facilities that handle and dispose of hazardous waste, active and inactive dry cleaners, and leaking underground storage tanks; many are at federal facilities such as military installations. While many sites have been closed over the past 30 years through cleanup programs run by the U.S. Department of Defense, the U.S. EPA, and other state and federal agencies, the remaining caseload is much more difficult to address because the nature of the contamination and subsurface conditions make it difficult to achieve drinking water standards in the affected groundwater. *Alternatives for Managing the Nation's Complex Contaminated Groundwater Sites* estimates that at least 126,000 sites across the U.S. still have contaminated groundwater, and their closure is expected to cost at least \$110 billion to \$127 billion. About 10 percent of these sites are considered "complex," meaning restoration is unlikely to be achieved in the next 50 to 100 years due to technological limitations. At sites where contaminant concentrations have plateaued at levels above cleanup goals despite active efforts, the report recommends evaluating whether the sites should transition to long-term management, where risks would be monitored and harmful exposures prevented, but at reduced costs.

An excellent, concise, and interdisciplinary overview of different classes of emerging pollutants arising, for example, from pharmaceuticals, pesticides, personal care products, and industrial chemicals and their impact on water, soil, and air. Following an introduction to chemical pollutants, with special attention focused on organic compounds and their properties, the book goes on to describe major emerging pollutants grouped according to their applications in different sectors of industrial or economic activity. For each type of compound, the chemical structure, main properties, and source are presented, along with their fate in the environment as pollutants, the latest analytical methods for detection, possible health or ecology consequences, as well as current regulatory laws. New developments, such as nanotechnology as a pollution source, are also included. The book closes with a chapter devoted to conclusions and future perspectives.

Emerging contaminants are chemical and biological agents for which there is growing concern about their potential health and environmental effects. The threat lies in the fact that the sources, fate and toxicology of most of these compounds have not yet been studied. Emerging contaminants, therefore, include a large number of both recently discovered and well-known compounds such as rare earth elements, viruses, bacteria, nanomaterials, microplastics, pharmaceuticals, endocrine disruptors, hormones, personal care products, cosmetics, pesticides, surfactants and industrial chemicals. Emerging contaminants have been found in many daily products, and some of them accumulate in the food chain. Correlations have been observed between aquatic pollution by emerging contaminants and discharges from wastewater treatment plants. Most actual remediation methods are not effective at removing emerging contaminants. This second volume presents comprehensive knowledge on emerging contaminants with a focus on remediation.

Providing an understanding of the fate and mitigation strategies for emerging and geogenic contaminants in the groundwater: removal techniques and mitigation approaches; treatment strategies, including bioremediation and natural attenuation; environmental assessment, groundwater vulnerability, health effects and regulations.

"This book explores current issues dealing with the occurrence, toxicology, and abatement of emerging contaminants. It also examines new technologies and developments in sample preparation and detection of contaminants in water resources."--

*Advances in Water Purification Techniques: Meeting the Needs of Developed and Developing Countries* provides a variety of approaches to water purification that can help assist readers with their research and applications. Water contamination problems occur frequently worldwide, hence the most updated knowledge on water purification systems can be helpful in employing the right type of filter or other mechanism of decontamination. The problems with arsenic contamination of water in Bangladesh and the lead problem in Flint, Michigan remind us of the need to monitor water pollution rigorously, from both point and non-point sources. Provides a valuable resource on how to solve water contamination problems or develop new approaches to water purification Presents advanced methods for monitoring water contamination Describes various approaches to water purification Encourages new developments in water purification techniques Includes methods for assessing and monitoring environmental contaminants Covers recent advancement in molecular techniques

This book describes how psychiatric pharmaceuticals, namely antidepressants, anxiolytics, sedatives and hypnotics are among the most prescribed active substances due to the higher occurrence of psychiatric disorders throughout the world. It goes on to demonstrate how patients' excretion of the active compounds along with several metabolites is considered to be the main pathway for the occurrence of these emerging pollutants in wastewater treatment plant effluents, surface and drinking water, soils and sediments. Further chapters are devoted to an exploration of these pharmaceuticals' high persistence, toxicity and intrinsic biological activity, which can affect the nervous and endocrine systems of terrestrial and aquatic non-target organisms, the dissemination of these compounds in environment matrices and the growing number of associated problems and concerns. The remainder of the book describes how conventional wastewater treatment processes are generally inefficient when it comes to the removal of this type of pollutants, giving rise to the demand for implementing alternative or complementary treatment technologies. Extensive research studies on the efficiency of the degradation and/or removal of these pollutants are summarized, and adsorption, membrane and advanced oxidation processes (AOP) are proposed. Given its content and structure, the

book offers a concise summary of the most significant findings on psychiatric pharmaceutical removal in wastewater.

Water is at the core of all life on Earth and exists as one of the main components of the human body. Because water is essential to life, addressing water pollution and sustainability issues is of great concern to environmentalists and public health specialists alike. Impact of Water Pollution on Human Health and Environmental Sustainability highlights several important water-related issues and explores a number of potential solutions to the problem of water sustainability. Focusing on research-based perspectives on water availability, industrial and agricultural pollution, water contamination, and their impacts on the human population as well as the environment, this crucial publication is a necessary addition to academic and government libraries serving graduate-level students, environmental scientists, public health workers, policy makers, and legislators seeking the latest information on sustainable and contaminant-free water resources.

Emerging Contaminants in the Environment: Challenges and Sustainable Practices covers all aspects of emerging contaminants in the environment, from basic understanding to different types of emerging contaminants, how these threaten organisms, environmental fate studies, detection methods, and sustainable practices of dealing with contaminants. Emerging contaminant remediation is a pressing need due to ever-increasing pollution in the environment and it has gained a lot of scientific and public attention due to its high effectiveness and sustainability. The bioremediation discussions of these contaminants is covered from the perspective of proven technologies and practices through case studies and real-world data. One of the main benefits of the book is the guide to how to eliminate (through sustainable remediation) emerging contaminants, including applied areas in current perspectives. The book goes on to summarize future challenges and sustainable solutions. Emerging Contaminants in the Environment: Challenges and Sustainable Practices provides academics, researchers, students, and practitioners interested in detection and elimination of emerging contaminants from the environment, with the latest advances by leading experts in emerging contaminants the field of environmental sciences. Covers most aspects of the most predominant emerging contaminants in the environment, including in soil, air, and water Describes the occurrence of these contaminants, the problems each cause, and the sustainable practices to deal with the contaminants Includes case studies to provide real-world examples of sustainable practices and emerging contaminant remediation

This open access book reviews the water-agro-food and socio-eco-system of the Seine River basin (76,000 km<sup>2</sup>), and offers a historical perspective on the river's long-term contamination. The Seine basin is inhabited by circa 17 million people and is impacted by intensive agricultural practices and industrial activities. These pressures have gradually affected its hydrological, chemical and ecological functioning, leading to a maximum chemical degradation between the 1960s and the 1990s. Over the last three decades, while major water-quality improvements have been observed, new issues (e.g. endocrine disruptors, microplastics) have also emerged. The state of the Seine River network, from the headwaters to estuary, is increasingly controlled by the balance between pressures and social responses. This socio-ecosystem provides a unique example of the functioning of a territory under heavy anthropogenic pressure during the Anthropocene era. The achievements made were possible due to the long-term PIREN Seine research program, established in 1989 and today part of the French socio-ecological research network "Zones Ateliers", itself part of the international Long-term Socio-economic and Ecological Research Network (LTSER). Written by experts in the field, the book provides an introduction to the water budget and the territorial metabolism of the Seine basin, and studies the trajectories and impact of various pollutants in the Seine River. It offers insights into the ecological functioning, the integration of agricultural practices, the analysis of aquatic organic matter, and the evolution of fish assemblages in the Seine basin, and also presents research perspectives and approaches to improve the water quality of the Seine River. Given its scope, it will appeal to environmental managers, scientists and policymakers interested in the long-term contamination of the Seine River

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