Series Preface

With remarkable vision, Prof. Otto Hutzinger initiated *The Handbook of Environmental Chemistry* in 1980 and became the founding Editor-in-Chief. At that time, environmental chemistry was an emerging field, aiming at a complete description of the Earth's environment, encompassing the physical, chemical, biological, and geological transformations of chemical substances occurring on a local as well as a global scale. Environmental chemistry was intended to provide an account of the impact of man's activities on the natural environment by describing observed changes.

While a considerable amount of knowledge has been accumulated over the last three decades, as reflected in the more than 70 volumes of *The Handbook of Environmental Chemistry,* there are still many scientific and policy challenges ahead due to the complexity and interdisciplinary nature of the field. The series will therefore continue to provide compilations of current knowledge. Contributions are written by leading experts with practical experience in their fields. *The Handbook of Environmental Chemistry* grows with the increases in our scientific understanding, and provides a valuable source not only for scientists but also for environmental managers and decision-makers. Today, the series covers a broad range of environmental topics from a chemical perspective, including methodological advances in environmental analytical chemistry.

In recent years, there has been a growing tendency to include subject matter of societal relevance in the broad view of environmental chemistry. Topics include life cycle analysis, environmental management, sustainable development, and socio-economic, legal and even political problems, among others. While these topics are of great importance for the development and acceptance of *The Handbook of Environmental Chemistry,* the publisher and Editors-in-Chief have decided to keep the handbook essentially a source of information on "hard sciences" with a particular emphasis on chemistry, but also covering biology, geology, hydrology and engineering as applied to environmental sciences.

The volumes of the series are written at an advanced level, addressing the needs of both researchers and graduate students, as well as of people outside the field of

"pure" chemistry, including those in industry, business, government, research establishments, and public interest groups. It would be very satisfying to see these volumes used as a basis for graduate courses in environmental chemistry. With its high standards of scientific quality and clarity, *The Handbook of Environmental Chemistry* provides a solid basis from which scientists can share their knowledge on the different aspects of environmental problems, presenting a wide spectrum of viewpoints and approaches.

The Handbook of Environmental Chemistry is available both in print and online via www.springerlink.com/content/110354/. Articles are published online as soon as they have been approved for publication. Authors, Volume Editors and Editors-in-Chief are rewarded by the broad acceptance of *The Handbook of Environmental Chemistry* by the scientific community, from whom suggestions for new topics to the Editors-in-Chief are always very welcome.

Damià Barceló
Andrey G. Kostianoy
Editors-in-Chief

Volume Preface

The Danube River Basin covers an area of 801,463 km^2, and it is the largest river basin under the EU jurisdiction. It is shared by 19 countries, and this makes it the "most international" river basin in the world. The Danube River Basin is not only characterized by its size and large number of countries but also by its diverse landscapes and the major socio-economic differences that exist. Due to this richness in landscape the Danube River Basin shows a tremendous diversity of habitats through which rivers and streams flow including glaciated high-gradient mountains, forested midland mountains and hills, upland plateaus and through plains and wet lowlands, i.e., the Danube Delta, near sea level.

Given the number of the countries and the diversity of social, political and economic conditions the transboundary river basin management has always been of supreme importance in the Danube River Basin. The Danube River Protection Convention being the legal instrument for transboundary water management was signed in 1994 and it led into establishing the International Commission for the Protection of the Danube River (ICPDR). The ICPDR has been used as a platform for implementing the EU Water Framework Directive and of the EU Floods Directive in the Danube River Basin District. The ICPDR established the Transnational Monitoring Network as an operational tool for water quality monitoring in the Danube River Basin and created a number of permanent expert bodies which have been dealing with the river basin management issues, flood risk management, surface water monitoring and assessment, pressures and measures, hydromorphology, groundwater and other relevant topics. These expert groups are proactive in collecting and evaluating the information necessary for a proper management of an international river basin. Cooperating with other international organizations and institutions active in the basin (e.g., IAD, IAWD, WWF, NORMAN), networking with scientific and regional projects focusing on water management and especially organizing Joint Danube Surveys has further expanded the pool of experts who cooperate on a transboundary level in Danube water research and management. The decades of this successful cooperation resulted not only in collection of an immense amount of data but also in their improved quality and homogeneity.

This book reviews the available knowledge about the chemical, biological and hydromorphological quality elements in the Danube. The first part examines the chemical pollution of surface waters focusing on organic compounds (with a special attention given to EU WFD priority substances and Danube River Basin specific pollutants), heavy metals and nutrients. The attention is, however, also given to pollution of groundwater and drinking water resources by hazardous substances and to the radioactivity in the Danube.

The second part reviews the biology and hydromorphology of the Danube. It focuses on benthic macroinvertebrates, phytobenthos, macrophytes, fish, phytoplankton and microbiology. Separate chapters are dedicated to gaps and uncertainties in the ecological status assessment and to invasive alien species. The chapters on the Danube hydromorphology, sediment management and isotope hydrology contribute to providing a complete picture about the status of the Danube. The comprehensive information provided in the book chapters enables to explore the links between the biology, chemistry and hydromorphology under the conditions of a large river. The backbone of the presented facts is based on the data collected in the frame of the two Joint Danube Surveys organized by the ICPDR in 2001 and 2007 but the overall information provided by the book goes beyond these surveys and has an ambition to reflect the state-of-the-matter in the knowledge about the Danube water quality.

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http://www.springer.com/978-3-662-47738-0

The Danube River Basin
Liska, I. (Ed.)
2015, XV, 523 p. 185 illus., 125 illus. in color.,
Hardcover
ISBN: 978-3-662-47738-0