

# **The Handbook of Environmental Chemistry**

**Founded by Otto Hutzinger**

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**Volume 26**

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# The Handbook of Environmental Chemistry

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# Urban Air Quality in Europe

Volume Editor: Mar Viana

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## **Aims and Scope**

Since 1980, *The Handbook of Environmental Chemistry* has provided sound and solid knowledge about environmental topics from a chemical perspective. Presenting a wide spectrum of viewpoints and approaches, the series now covers topics such as local and global changes of natural environment and climate; anthropogenic impact on the environment; water, air and soil pollution; remediation and waste characterization; environmental contaminants; biogeochemistry; geoecology; chemical reactions and processes; chemical and biological transformations as well as physical transport of chemicals in the environment; or environmental modeling. A particular focus of the series lies on methodological advances in environmental analytical chemistry.





## 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/](http://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 link between degrading air quality and adverse health outcomes is widely recognised (Lim et al. 2012). Ambient particulate matter pollution ranks as number 11 to 14 as a risk factor accounting for total burden of disease across Western, Central and Eastern Europe, while ambient ozone appears in positions 36 and 37 in the same ranking. Irrespective of particle size, epidemiological studies have shown a clear association between exposure to airborne pollutants and adverse cardiovascular and respiratory health outcomes. Evidence also shows adverse effects of short- and long-term exposure to gaseous pollutants, e.g. ozone, on all-cause, cardiovascular and respiratory mortality. The urban environment plays a key role in the occurrence of these health effects, given that it is in urban areas where the largest fraction of the population in Europe is exposed to degraded and degrading air quality.

Air quality is, however, an exceptionally broad subject, and it would be pretentious to aim to cover all of its aspects in one single book. Through its 16 chapters, this book aims to provide an overview of air quality in urban environments in Europe mainly from the point of view of the sources of atmospheric pollutants, whether they may be natural or anthropogenic, primary or secondary, and whether pollutants originate from local sources or are transported large distances across the continent. In this context, in Part I authors have contributed with valuable chapters dealing with emission sources such as biomass burning, vehicular traffic, industry and agriculture, but also with African dust and long-range transport of pollutants across the European regions. Assessments are based on measurements and exposure modelling approaches. The impact of these emission sources and processes on atmospheric particulate matter, ozone,  $\text{NO}_x$  and volatile and semi-volatile organic compounds is discussed. Based on air quality data, criteria for the identification of critical areas for particulate matter and  $\text{NO}_2$  in Europe are presented, followed by an analysis of air quality management approaches. In Part II future perspectives are presented, giving insights into potential upcoming air quality monitoring strategies and metrics of interest such as nanoparticles and submicron particle size distribution data. The relevance of indoor and outdoor exposure scenarios is also highlighted.

Certainly a number of aspects are not covered by this overview, such as ultrafine particle or secondary organic aerosol formation processes and their roles on air quality degradation, urban-scale dispersion models for air quality modelling or the

impact of air quality in regional background areas on pollutants in the urban environment. In sum, while we hope this book covers major aspects influencing air quality in urban areas, it also evidences the sheer size of this topic and the need to push research forward in this direction.

This book is intended for a broad audience, from environmental specialists working already in this field to newcomers who want to learn more about this issue. I would like to thank all the authors for their time and efforts in preparing their corresponding chapters, as well as my team leaders and I would also like to thank my team leaders and my co-workers for creating a motivating work environment, which allowed this project to come to life.

Barcelona, Spain

Mar Viana

## **Reference**

Lim et al (2012) *Lancet* 380:2224–2260

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