

# **The Handbook of Environmental Chemistry**

**Founding Editor: Otto Hutzinger**

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**Volume 72**

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# Egyptian Coastal Lakes and Wetlands: Part II

Climate Change and Biodiversity

Volume Editors: Abdelazim M. Negm · Mohamed Ali Bek ·  
Sommer Abdel-Fattah

With contributions by

H. Abayazid · S. Abdel-Fattah · I. Abou El-Magd · E. Ali · M. A. Bek ·  
N. Donia · M. El-Bana · M. Elsayhaby · G. M. El-Shabrawy ·  
M. Elshemy · T. Galal · M. Khadr · M. T. Khalil · A. M. Negm ·  
K. Shaltout · A. M. Younis

*Editors*

Abdelazim M. Negm  
Faculty of Engineering  
Zagazig University  
Zagazig, Egypt

Mohamed Ali Bek  
Faculty of Engineering  
Tanta University  
Tanta, Egypt

Sommer Abdel-Fattah  
McMaster University  
Hamilton, Ontario  
Canada

ISSN 1867-979X

ISSN 1616-864X (electronic)

The Handbook of Environmental Chemistry

ISBN 978-3-319-93610-9

ISBN 978-3-319-93611-6 (eBook)

<https://doi.org/10.1007/978-3-319-93611-6>

Library of Congress Control Number: 2018953148

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The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

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## Editors-in-Chief

Prof. Dr. Damià Barceló

Department of Environmental Chemistry  
IDAEA-CSIC

C/Jordi Girona 18–26  
08034 Barcelona, Spain  
and

Catalan Institute for Water Research (ICRA)

H20 Building  
Scientific and Technological Park of the  
University of Girona

Emili Grahit, 101  
17003 Girona, Spain  
*dbcqam@cid.csic.es*

Prof. Dr. Andrey G. Kostianoy

P.P. Shirshov Institute of Oceanology  
Russian Academy of Sciences

36, Nakhimovsky Pr.  
117997 Moscow, Russia  
*kostianoy@gmail.com*

## Advisory Editors

Prof. Dr. Jacob de Boer

IVM, Vrije Universiteit Amsterdam, The Netherlands

Prof. Dr. Philippe Garrigues

University of Bordeaux, France

Prof. Dr. Ji-Dong Gu

The University of Hong Kong, China

Prof. Dr. Kevin C. Jones

University of Lancaster, United Kingdom

Prof. Dr. Thomas P. Knepper

University of Applied Science, Fresenius, Idstein, Germany

Prof. Dr. Alice Newton

University of Algarve, Faro, Portugal

Prof. Dr. Donald L. Sparks

Plant and Soil Sciences, University of Delaware, USA

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- Aims and Scope
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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



# Preface

Egyptian Northern Coastal lakes (Mariout or Mariut, Edku or Edko or Idku, Burullus or Borollus, Manzala and Bardawil) could be a source of wealth for Egypt if the Egyptian and the concerning authorities intend, plan, and implement the needed measures to keep the lakes sustainable. Therefore, *The Egyptian Coastal Lakes and Wetlands* in two volumes is produced by the Egyptian researchers and scientists to help and support who are interested in these lakes. This second volume is divided into four parts consisting of 11 chapters written by 14 authors. It focuses on climate change, biodiversity, zooplankton, fish and fisheries, water quality modeling, and remote sensing applications.

Part I of this volume consists of three chapters dealing with the impacts of climate change and water quality modeling. In the chapter titled “Environmental and Climatic Implications of Lake Manzala, Egypt: Modeling and Assessment,” the author presents the results of water quality modeling for Lake Manzala and their assessment and their connections to climate change. On the other hand, the chapter “Modeling of Water Quality Parameters in Manzala Lake Using Adaptive Neuro-Fuzzy Inference System and Stochastic Models” discusses the capabilities of Adaptive Neuro-Fuzzy Inference System (ANFIS) and stochastic models in prediction of water quality parameters based on field measurements in Manzala Lake. The use of ANFIS proved its effectiveness as a simple tool to predict water quality parameters and for onsite water quality parameters’ evaluation. The chapter titled “Investigating the Impacts of Dredging on Improving the Water Quality and Circulation of Lake Mariout via Hydrodynamics” presents the results of hydrodynamics modeling of Lake Mariout based on testing different scenarios of deepening the lake bottom to improve circulation and the water quality.

Part II consists of four chapters dealing with the biodiversity, fish, and fisheries in Egyptian Coastal Lakes. The chapter “Environmental Impacts on Egyptian Delta Lakes Biodiversity: A Case Study on Lake Burullus” presents the status of biodiversity of the coastal Lakes and how it was affected by the degraded water quality of the lakes with a focus on Lake Burullus. In the chapter titled “Coastal Lakes as

Hot Spots for Plant Diversity in Egypt,” the authors provide very useful information on landforms and morphometry, sediment and water characteristics, plant diversity and threatened species, conservation measures, and goods and services that the lakes offer as hot spot for plant diversity and nature conservation. The chapter is highly useful for decision makers to evaluate and value this ecosystem for biodiversity conservation. The third chapter of Part II titled “Responses of Zooplankton to Long-Term Environmental Changes in the Egyptian Coastal Lakes” presents zooplankton population dynamics including similarities and differences. It also discusses the zooplankton and environmental changes of coastal lakes and discusses the linking between zooplankton and fisheries. The last chapter of Part II is titled “Fisheries of Egyptian Delta Coastal Wetlands; Burullus Wetland Case Study.” It presents fish species composition and biodiversity in delta wetlands (coastal lakes), fish production rates and quantities, fishing gears and techniques, and fisheries. Additionally, some management measures for decision/policy makers are recommended.

Part III contains three chapters on the remote sensing application to the Egyptian coastal lakes. The chapter titled “Earth Observations for Egyptian Coastal Lakes Monitoring and Management” describes geomorphological properties of the lakes and uses the RS/GIS to map lakes’ boundaries and to detect the coastal changes. Also, the chapter presents how the water quality of the lakes and both physico-chemical parameters and biological component (Chl-a) using RS/GIS are evaluated. The simulation of the climatic changes and prediction of the impacts are discussed. The chapter presents a future plan for decision/policy makers for rehabilitation and management of the coastal lakes. The chapter “Are the Egyptian Coastal Lakes Sustainable? A Comprehensive Review Based on Remote Sensing Approach” presents the up-to-date investigations and their findings connected to the applications of the remote sensing to detect the land use and land changes (among other applications) of the coastal lakes and discuss whether the water bodies of the lakes are sustainable or not. In the last chapter of this part “Changes in a Coastal Lake Dynamic System and Potential Restoration,” the author discusses the aspects contributing to the changing structure of coastal lakes and the governing factors responsible for the declining dynamic system. Monitoring temporal and spatial changes of Burullus lake are presented based on the applications of the remote sensing technique and the use of the water quality index to assess the status of the lake.

Part IV summarizes the key points and the conclusions of the volume and presents a set of recommendations for future studies and to help the decision takers to take the necessary measures to develop, restore the lakes ecology, and keep them sustainable to support the Egyptian economy.

The editors would like to express their special thanks to all the authors who had contributed to this volume. Without their patience and effort in writing and revising the different versions to satisfy the high-quality standards of Springer, it would not have been possible to produce this volume and make it a reality. Great appreciation to all who contributed in one way or another to make this high-quality volume a real source of knowledge and with the latest findings in the field summarized to support

graduate students, researchers, scientists, and decision/policy makers in Egypt and everywhere who are interested in the coastal lakes. Acknowledgements must be extended to include all members of the Springer team who had worked hard for a long time to produce this high-quality unique volume.

The volume editor would be happy to receive any comments to improve future editions. Comments, feedback, suggestions for improvement, or new chapters for next editions are welcomed and should be sent directly to the volume editor.

Zagazig, Egypt  
Tanta, Egypt  
Hamilton, ON, Canada  
14 April 2018

Abdelazim M. Negm  
Mohamed Ali Bek  
Sommer Abdel-Fattah

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