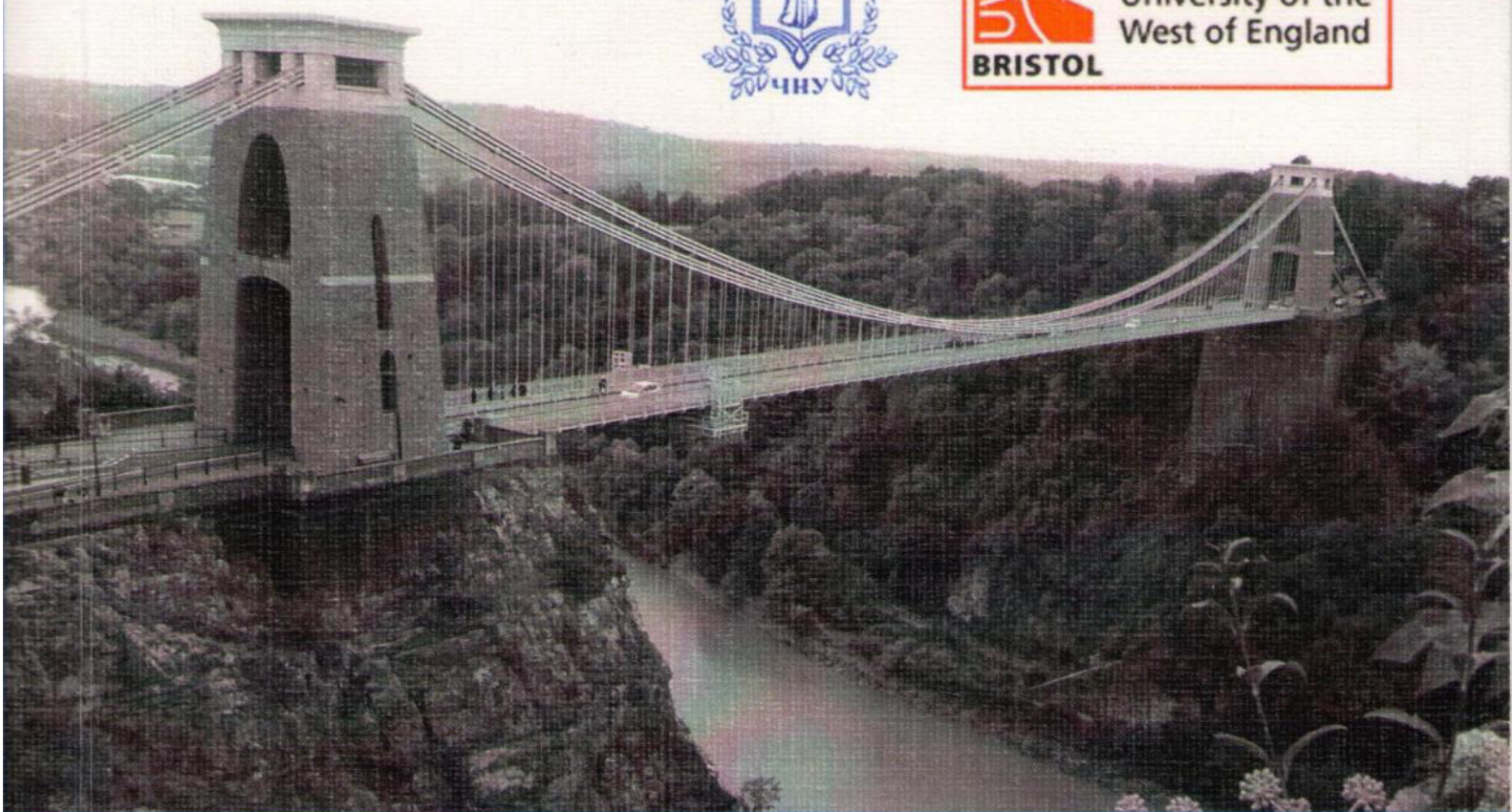




University of the  
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# WATER SECURITY

MONOGRAPH



Bristol – Mykolaiv 2016



**Petro Mohyla Black Sea National University, Ukraine  
University of the West of England, United Kingdom**

# **WATER SECURITY**

**MONOGRAPH**

**edited by  
Olena Mitryasova  
Chad Staddon**

**Bristol – Mykolaiv 2016**

**UDC 502.171:556] : 005.336.4 (100)**

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*Approved for publication by the Academic Council of Petro Mohyla Black Sea National University, Ukraine*

**Water Security: Monograph.** – Mykolaiv: PMBSNU – Bristol: UWE, 2016. – 308 p.

Editors: prof. Olena Mitryasova & prof. Chad Staddon

ISBN 978-617-7421-13-8

The monograph is devoted to problems of water services economics and policy, water usage, sewerage, management, quality and pollution of waters, monitoring, measures to improve the state of water objects, quality of water, system and technology of sewage treatment.

The monograph was published with the support of British Council in the joint project of internationalization of higher education.

The book is written for scientists, lecturers, postgraduate students, engineers and students who specialize in the field of environmental researches, where the object of study is water.

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10, 68-Desantnykiv St., Mykolaiv, 54003, Ukraine

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Frenchay Campus, Coldharbour Lane, Bristol, BS16 1QY, UK

tel.: 01173283214

<http://www.uwe.ac.uk>

Printed by: FOP Shvets V.M., Phone: +38 (0512) 500448;

Certificate subject publishing MK №5078 from 01.04.2016

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## FOREWORD

Water was given a magic power to become the force of life on Earth  
*Leonardo da Vinci*

Water stands alone in the history of our planet. There is a natural body, which could be compared to her influence on the course of fundamental, most ambitious geological processes. Not only the surface but deep-scale biosphere-part of the planet are most significant in its ramifications, its existence and its properties

*Volodymyr Vernadsky*

Water resources are one of the vital components of the planet and the prerequisite for socio-economic development of society, the satisfaction of basic human needs, activities in the field of food production, preservation of ecosystems.

Ecologically destructive models of a development in many countries of the world have led to the degradation of water resources, which is reflected in their volume and quality. The need arises to ensure the optimal use of water, protection of fresh water resources, monitoring of water resources, the search for new technologies and methods of wastewater treatment, the investigation of the quality of drinking water.

Over the past decades in water management in many countries use an ecosystem approach. Ecosystem water management is carried out by the state and society through a basin management based of paid water use. Basin principle is this method of water management, which basic unit is the area of the river basin, where the latter is a system of established environmental and socio-economic connections. Now the river basin approach enables to foresee the effects of anthropogenic activities for early warning of environmental catastrophe.

Among the methods of wastewater treatment is more effective and promising biological methods that have shown good results in the water preparation.

The urgency of the problems of management, monitoring and forecasting of water resources in conditions of intense water use, drinking water quality are the issues related to technology, methods of wastewater treatment, biological and biochemical aspects of municipal and industrial wastewater treatment i.e. a wide range of scientific research subjects, where an object is the water has caused the publishing of collective monograph under the general name «Water Security».

The main thematic modules of the monograph:

- Water services economics and policy.
- Water use and sewerage.

- Water management.
- Quality and pollution of waters.
- Water monitoring.
- Measures to improve the state of water objects.
- Quality of drinking water and its impact on health.
- System and technology of sewage treatment.

The release of the book became possible in the framework of the International project, through 2016 under the auspices of the British Council in Ukraine between the Petro Mohyla Black Sea National University (Ukraine) and the University of the West of England (United Kingdom).

The project would be impossible without the support of the Government of the United Kingdom in the framework of the global partnership. On the pages of monographs filed work of scientists from Ukraine, United Kingdom, Poland, Russia and Switzerland. There is especially the wide geography of Ukrainian scientists.

The monograph is the result of the scientific achievements of scientists, leading specialists from universities and organizations: Petro Mohyla Black Sea National University; University of the West of England; Vinnytsia National Technical University; Moscow State Regional University; Lviv Polytechnic National University; State Higher Technical School in Nowy Sacz, Odessa National Academy of Food Technologies; Kharkov National University of Construction and Architecture; University of Applied Sciences and Arts Northwestern Switzerland FHNW; Odessa National Economic University; Lviv City Communal Enterprise «Lvivvodokanal»; Chernivtsi Faculty of the National Technical University «Kharkiv Polytechnic Institute»; Bukovinian State Medical University; Hetman Petro Sahaidachnyi National Army Academy; Odessa State Environmental University; Mykolaiv National University Named after V.O. Sukhomlynsky; Pavlo Tychyna Uman State Pedagogical University; National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute»; National University of Life and Environmental Sciences of Ukraine.

We express our sincere thanks to all the authors, esteemed colleagues, who in a short time presented the own, original, interesting researches on the problems of water security, contributing to this book was published.

In the future we hope that the scientific expertise is on the pages of this edition will find a creative affiliate cooperation through a successful joint implementation of actual ideas, proposals, scientific and practical developments.

*Prof. Olena Mitryasova & Prof. Chad Staddon  
Mykolaiv & Bristol  
November 2016*