



Book review

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WATER RESOURCES MANAGEMENT: METHODS, APPLICATIONS AND CHALLENGES

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Abstract: The paper represents a review of the monograph entitled *Water Resources Management: Methods, Applications and Challenges*, published in the series of Water Resources Planning, Development and Management by the Nova Science Publishers Inc. The aim of the review is to present a prominent monograph of international significance to the scientific community and broader readership. The monograph contains various aspects of water resources management, including their use for different purposes and impacts of natural factors and anthropogenic pressures on water resources.

Keywords: book review; prominent monograph; water resources management; international significance

Introduction

Water resources play an essential role in all aspects of human life and activities. Due to increased demand for water, appropriate water resources management should be established. In this context, monograph entitled *Water Resources Management: Methods, Applications and Challenges* edited by Ana Milanović Pešić and Dejana Jakovljević was published. It provides various aspects of water resources management, including some models and methods which are used for water resources estimation, their vulnerability, exposure to natural and anthropogenic influences, utilization, and legislative framework. This prominent monograph of international significance presents the result of the joint work of scientists from various scientific institutions and universities.

The monograph consists of 363 pages, 30 tables, 67 figures, including 19 maps, 12 photographs, and 36 charts and schemes. The monograph is divided into nine chapters. Besides this main content, it also contains Preface, List of Reviewers, and Contents at the beginning, as well as About the Editors and Index at the end of the monograph.

Brief overview of the chapters

The chapter *Impact of Regional Climate Changes on the Emergence of Extremely Dry Years in European Russia in the 21st Century* was written by Maria Vladimirovna Sidorova, Ekaterina Alexandrovna Kashutina, and Elena Anatol'evna Cherenkova (pp. 1–34). The authors predicted

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extremely dry years in European Russia in the 21st century based on climate projection models. Twelve global coupled ocean–atmosphere general circulation models (GCMs) of the Coupled Model Intercomparison Project Phase 5 (CMIP5) have been selected for this purpose. Multidirectional changes in the frequency of extremely dry years are predicted using the representative concentration pathway (RCP 4.5, RCP 4.8, and RCP 8.5), based on the calculation of the mean annual runoff, runoff variability index, and annual precipitation variability index. A spatio-temporal analysis has shown that the most significant changes are possible in the southern and southwestern parts of European Russia. These changes could be reflected in the runoff decrease. The most unfavorable scenario predicts the reduction of runoff to less than half of the current runoff and an increased frequency of extremely dry years by 6–8 times.

The chapter *Impact of Climate Change on River Discharge Regimes in the Danube River Basin: Example of Lim River (Montenegro)* was written by Golub Lj. Čulafić (pp. 35–68). The author presented the effects of climate change on the local scale in the Lim River Basin, which belongs to the Danube River Basin. The observed changes in precipitation and air temperature cause fluctuation in discharge. The results show decreased precipitation and an increased air temperature leading to discharge reduction in the period 1966–2014. During the last decade of the 20th and the first decades of the 21st century, both annual (0.06 °C/year) and seasonal (in the summer 0.09 °C/year) air temperatures have shown a growing trend, whereas precipitation trends have been negative, from –0.48 to –0.08 mm/year. The most significant changes have been observed in the negative seasonal precipitation trends (from –0.40 to –0.52 mm/year) leading to decreased mean discharges from 2.36 to 4.46 m³/s. Projections indicate that changes will continue in the future and that their intensity will depend on the climate scenario.

The chapter *Spatial Aspects of Flood Exposure in Serbia* was written by Jelena Kovačević-Majkić, Dragana Miljanović, and Dejan Doljak (pp. 69–122). The authors emphasized that flood hazard is one of the most frequent natural hazards in Serbia, and flood-prone areas with a 100-year return period cover about 18% of the country's territory. Exposure is recognized as a distinctive element between a natural hazard and a natural disaster. The authors presented and evaluated the current state of flood-exposed elements (total population, built-up area, protected areas, and mineral resources), which were taken as indicators. Based on the selected indicators and developed methodology, they presented the spatial aspects of flood exposure in Serbia. This chapter is the first study in which the new methodology is applied on the national level. Its results show that more than two million people (about 25% of the total population in Serbia) and almost 480 km² of the built-up area (28% of the total built-up area in Serbia) are exposed to floods. The exposure predominantly depends on the total population and the size of the built-up area while protected areas and deposits of mineral resources have a lower impact on flood exposure. The authors found the highest value of flood exposure in the Danube River, the Tisza River, the Sava River, and the Velika Morava River Basins. The results obtained in this study can be used as input data in flood risk assessment and flood risk management plans.

The chapter *Diffuse Biogenic Pollution of Water Bodies in the Volga River Basin — Example of Cheboksary Reservoir Basin* was written by Sergey Vladimirovich Yasinsky, Nikolaj Ivanovich Koronkevich, Ekaterina Alexandrovna Kashutina, Maria Vladimirovna Sidorova, and Alexej Nikolaevich Narykov (pp. 123–152). The authors discussed this topic throughout the unsatisfactory water quality in the Volga River Basin as a result of non-point (diffuse) pollution.

The Cheboksary River Basin, located in the central part of the Volga River Basin, was selected as an example of diffuse pollution by biogenic elements (BE). Direct anthropogenic load is associated with human life (rural population without central domestic sewage system), breeding of farm animals (organic fertilizers), and use of mineral fertilizers. The landscape-hydrological method has been applied to calculate the diffuse flow of BE (nitrogen and phosphorus). The results show that 80% of the total flow of BE originates from diffuse pollution, while the remaining 20% originates from wastewater from point sources. Calculations indicate significant removal of mineral nitrogen and phosphorous in the basin: only 38% of mineral phosphorus and 54% of mineral nitrogen produced from diffuse sources in the basin reach the Cheboksary Reservoir.

The chapter *Ecological Impact of Hydropower Building Yards in Romania* was written by Călin Dejeu and Rahela Carpa (pp. 153–194). The authors presented that hydropower building yards have a negative ecological impact on the rivers of Romania, although projects have been abandoned and have never reached the operational stage. The most famous example is the hydropower project in the Jiu Gorge National Park. Apart from this site, the study describes the impact of hydropower building yards at eight other sites. These sites are included in Natura 2000. The hydropower projects have harmful effects on discharge, river habitats, and species, as well as on the entire landscape. The study suggested that future investigation about the impact of abandoned building yards are needed and that restoration projects should be implemented taking into account the deterioration of these sites.

The chapter *Water Resource Management in National Parks in Serbia — Towards an Integrated Protection and Sustainable Tourism Use* was written by Jovana Brankov (pp. 195–230). The author presented an insight into the management of water resources in five national parks in Serbia and discussed their status as tourist attractions. The chapter opens with a brief overview of the main hydrographic resources in the protected areas of Serbia and their importance for tourism. In addition, the activities undertaken by visitors during their stay in the selected national parks (NP)—Đerdap NP and Tara NP—as well as their perceptions of hydrological and environmental issues are analyzed. The results of the survey show that the most typical visitors' activities practiced on the rivers in national parks in Serbia are short-distance tours offering a stimulating experience of a picturesque landscape, involving the natural and built environment, and water sports, including swimming and other recreational activities. Based on the analysis of attitudes on the quality of the environment, the visitors of both national parks rated the destinations as clean and undamaged, while their opinion about the cleanliness of hydrological resources was neutral. However, the real state of the water quality (especially of the Danube River in Đerdap NP) is partially worse than visitors' perceptions. The conclusion is that insufficient effort has been made to protect waters in national parks and to ensure efficient management. Based on this, some measures for the protection and sustainable use of natural resources are proposed.

The chapter *Water Resources Management in Serbia* was written by Ana Milanović Pešić, Dejana Jakovljević, and Dragana Milijašević Joksimović (pp. 231–300). The authors presented a general overview of water resources in Serbia in terms of quantity, quality, and spatial distribution. Keeping in mind their importance for the population and economic activities, the study analyzes the basic characteristics of water resources, legislation, regulatory, and institutional framework for water resource management, water use, and water quality. The findings indicate that the largest amount of water in Serbia is brought by the international

rivers flowing through this territory (Danube, Sava, Tisza, Drina), while domestic rivers provide less than 10% of the total runoff (with the largest share of the major national river, the Velika Morava). The authors also presented the overview of the projects related to the water resources management at the international level. In the second part of the chapter, various aspects of water resource utilization, including water supply, irrigation, hydropower production, navigation, fishing, and tourism development are systematically presented and analyzed. Keeping in mind the increasingly frequent water pollution, special attention in this chapter is focused on the methodology for water quality assessment and classification. According to the results obtained from 20 hydrological stations on the main rivers for the period 2009–2018, it has been concluded that water quality varies from bad to excellent. The majority of stations belong to the good (nine hydrological stations) and very good (seven hydrological stations) categories. Finally, several challenges have been identified with the aim of improving activities in the water resource management sector in Serbia.

The chapter *Experiences with Water Reuse in Urban Farming in West Africa* was written by Gordana Kranjac-Berisavljevic (pp. 301–328). The author pointed out that population growth and urbanization rates in West Africa are among the highest in the world. Due to this, there is an increasing demand for food produced in cities for their inhabitants. This chapter offers a brief discussion about the characteristics of urban and peri-urban agriculture in West Africa, with a special focus on vegetable growing, which relies on polluted water re-use from mostly open city drains, streams, and rivers, crisscrossing vast urban settlements. It presents an overview of polluted water use for agriculture in West African cities, based on several studies from the sub-region. In a separate section of the chapter, open-space farming in Ghana is analyzed in greater detail, with a particular focus on the city of Tamale. The findings indicate that the majority of urban farmers in Ghana produce vegetables using wastewater from open drains and streams to irrigate their farms. The study highlights serious health risks, both for producers handling the water and for consumers buying the products. It has been concluded that urban and peri-urban farming will continue to contribute increasingly to food security, job creation, and the economic growth of major cities in West Africa. The study also proposes some measures that could support urban and peri-urban farmers and ensure their better and safer performance and integration in land-use planning.

The chapter *A Review of Botswana 2012 National Water Policy* was written by Reniko Gondo and Oluwatoyin D. Kolawole (pp. 329–354). The authors emphasized that Botswana is a water-scarce country where the sustainable use of water resources is a major challenge. Water policy is an institutional mechanism seeking to ensure adequate water protection and efficient utilization of scarce water resources. The adoption and implementation of the 2012 National Water Policy are based on three principles: equity, efficiency, and environmental sustainability. The document emphasizes that water management should involve all stakeholders. The water pricing system, including domestic, commercial and industrial water tariffs, should improve the efficiency of distribution among different users and promote sustainable water consumption. In order to harmonize water policy with water legislation it is recommended to finalize the 2005 Water Bill.

Conclusion

This prominent monograph of international significance contains original research results and review chapters from hydrology and related sciences. The monograph *Water Resources*

Management: Methods, Applications and Challenges covers various aspects of water resources management, from climate change impacts on water resources, throughout the different aspects of water resource utilization to water resources management in the protected areas and an institutional and legal framework establishment. The authors emphasized the most important issues in their research areas, which is the added value of this comprehensive monograph. The monograph is written in English, which will provide its availability to worldwide scientific community and broader readership. Taking into account various aspects of water related topics, application of diverse models and methods in different geographical areas, the monograph *Water Resources Management: Methods, Applications and Challenges* could be useful for scientific community, and it could help policy and decision makers, as well as other stakeholders, in finding the solutions to some water related problems.