PREFACE

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The definition of wetland covers various types of ecosystems associated with the water and soils that have formed on our planet during its evolution. These ecosystems include lakes, rivers and their floodplains, peatlands, river deltas and their estuaries, coastal sea lanes, and coral reefs. Man has historically utilized the wetlands' resources and has learned from them. This became the basis for the development of artificial wetlands, which were and continue to be copies of selected ecosystems built to meet the specific needs of people or the environment. For millennia, man used these natural wetlands and created artificial wetlands mainly to obtain effective agricultural production. Their use is also associated largely with food acquisition and traditional agriculture. The difference, however, is that modern agriculture has also become their biggest threat and concerns every type of wetland. In addition, a second important factor that threatens wetlands is changes in these ecosystems' water conditions that humans began to implement on a large scale in the twentieth century. These changes derive from excessive water abstraction and drainage of areas for various purposes. If additionally pollution from various types of sewage and from the air is considered, then wetlands are the most threatened areas on the

planet. Observing how lakes and rivers look like, what water they have, how many fishes and what species are present, whether the water is suitable for drinking or recreation, whether peatlands or swamps are present, and how their catchments and banks look like can determine whether they are natural or completely changed. Another possibility is that they are monocultural agricultural and forest landscapes or desert areas, devoid of wetlands. We can quickly realize that rivers resemble canals, lakes resemble artificial reservoirs, and the surrounding space has been almost completely deprived of small peatlans, swamps, or natural water reservoirs. The more economically developed the area is, the greater the loss of various wetland surfaces. For this reason, Europe and North America have the largest losses of wetlands, and remaining wetlands are also the most polluted. Despite growing ecological awareness and increasingly stringent international protection regulations, the degradation of these areas continues; the undertaken protective actions have only slowed down the local pace of wetland degradation. Wetlands play a very important environmental function for our country, region, place of residence, and for the entire planet, as they are degraded great direct damage to the environment and indirect detriment to the people living on this planet is occurring. Their multilateral functions in maintaining a healthy environment have been kept to a minimum in many places on earth. In other places they have been preserved in a slightly changed state; however these can also be affected by the man's destructive hand. In this situation, does wetland degradation need to continue? Is it enough for the environment that we keep the wetlands that are left? In what direction should political, social, and scientific actions be aimed at to change the unfavourable state of wetlands? In order to find answers to these and many other questions about the current state, threats, and future development of wetland, science is helpful and should be the basis for undertaking actions aimed at:

- A fuller recognition of all the functions that wetlands play in the environment and a determination of their importance on a global, regional and local scale. Currently, many of these functions, such as hydrology, habitat, climate, and purification or retention are already

partially recognized. However, there is still an urgent need for further advancement of knowledge on this subject in order to directly link these functions to the local, regional, and global environment.

- Proper planning of activities that protect and reclaim these areas in relation to those that have been degraded through inhibition of their environmental functions. Very often, protection or reclamation measures do not effectively protect or restore degraded areas due to the lack of adequate knowledge about the functioning of such areas.

Science should be tasked with the development and implementation of a number of solutions in the form of various types of constructed wetlands, which could replace natural wetlands that have been removed by man. Examples of the implementation of constructed wetlands are: wastewater treatment, rainwater collection, surface and groundwater treatment, creation of retention reservoirs, and creation of recreational areas. However, these systems are used to a very small extent and thus require further scientific attention in order to demonstrate the positive roles they play directly in the local environment, and indirectly for people. Moreover, the factor limiting their use, such as for constructed wetland used for water or sewage treatment, is their high surface area demand. Therefore, scientific research should aim to optimize their purification processes in order to guarantee the effectiveness of removing pollutants and reducing space demand, and reduce the costs of their construction and maintenance. A special role may be played by constructed wetlands built on the basis of rainwater for recreational purposes. Such solutions can be built in single house neighborhoods, groups of houses, or housing estates, and serve many positive functions for the local environment and for people living there.

On the regional level, wetland science likely has the most achievements. In many countries wetland sciences are well recognized due to their importance in hydrology as well as faunal and floral diversity. The effect of this is the fact that many wetlands have been under legal protection, and for many of these wetlands new measures are constantly implemented to reduce the inflow of point and area pollutants. Too often, however, wetlands are

protected only because of their habitat values and not because of their functions. For this reason, the most frequently protected wetlands are peatlands and swamps; however, these protections do not include rivers and their valleys because of their protection against pollution, which flows along rivers and deposits mainly in seas as well as in lakes. These protections also include individual lakes, but their catchments, which are functionally linked with lakes, are ignored. Despite the already considerable scientific achievements in wetlands research, there is still a great demand for research, especially when focusing on wetland functions, mechanisms of their functioning, and their relations with the surrounding elements of the environment. On the other hand, at the regional level there is a need to build constructed wetlands, which could replace those that humans have eliminated. However, without a solid scientific basis indicating the necessity of such activities due to our environment, it is difficult to count on such actions to be taken at all.

When considering the role of wetlands on a global scale, science still has a lot to do, despite the many existing studies in this field. First of all, it should contribute to a more complete recognition of the importance of the largest wetlands, which are located in the Amazon Basin, Western Siberia, Canada, and in the Congo Valley. Their climatic, hydrological, and habitat role is little understood among societies inhabiting these places. Science also needs to sensitize the international community to the fact that these areas play an important role in the life of our planet. In the era of the global development of trade, industry, and agriculture, their state and protection should correspond not only to the countries in which they are located, but also to the entire international community. The maintenance of environmental functions by these regions should also become a subject of global action.

In this spirit, the effort has been made to publish this book which, to a limited extent, presents the meaning and functions of wetland at the local, regional, and global level. The first chapter presents one of the largest wetlands which is located in the West Siberian Lowland. This chapter presents the Lowland's geological history and its impact on the contemporary forms of wetlands in the form of peatlands, rivers and their

floodplains, lakes, river deltas, estuaries, and swamps. A large part of the chapter is devoted to the inventory of these areas, their environmental functions, and their threats. Chapter 2, also related to the wetlands of the West Siberian Lowland, presents the impact of peatlands and swamps on the seasonal physicochemical composition of waters in rivers that are fed from peatlands and swamps. The third chapter concerns the threats to peatlands of the West Siberian Lowland, which are a consequence of oil extraction. The chapter also describes how the composition of peat changes due to this type of pollution and how it affects the vegetation. Chapter 4 presents an extensive review of the ecology and geomorphology of the Danube River delta, which is one of the best preserved and more complex deltas in Europe in terms of evolution, morphology, landscapes, and biodiversity. Chapter 5 presents the inventory and threats to wetlands in Oceania and South Asian countries; special attention is given to the type of threats to the wetlands in each country. Chapter 6 discusses the current state of wetlands and their importance in Central Europe, using Hungary as an example. Chapter 7 focuses on the International Convention on Wetlands (Ramsar Convention) and presents the Convention's history, development, and its main bodies. The chapter also discusses the evaluation of its protection measures based on the example of the Polish environmental conservation system. Chapter 8 presents the multiservice and functions of constructed wetlands in order to boost this infrequently used technology and highlight the diversity of its applications. The last chapter presents the evolution of constructed wetlands used for wastewater treatment, which begins with irrigation fields and finishes with modern solution as improved wetland systems combined with water reuse.