

Preface

Changes in Earth's biosphere as civilization has developed, its increased technogenic load, and reduced overall resources of resistant stability spur the natural and technological sciences to properly concentrate on the possibilities of interaction between sustainable human activity and natural ecosystems. Trees are a primary focus. Natural tree ecosystems (forests), in terms of the overall mass of the biosphere, have been devastated, in the majority of cases by human activity. Humans also have intensively utilized the energetic, biological, and recreational resources of trees throughout their life cycles. The involvement of industrial society in large-scale applications of fossil fuels along with the rapid development of industry has resulted in the urgent current issue of widespread pollution of the ecosystem and the threat of global warming.

The use of trees in ecological technologies is based on their unquestioned importance in maintaining stability in the biosphere as well as on their presence in a number of Earth's biomes and its ecosystems, particularly those of Scots pine growing in urbanized territories and zones affected by pollution sources. This aspect in particular creates favorable conditions for using trees as bioindicators for establishing the properties and levels of contamination and, in some cases, as a measure for reducing pollution. Because the consequences of negative changes occurring in nature can only be minimized once their essential character is understood, this book focuses mainly on trees as biogeochemical objects and discusses a mechanism by which heavy metals enter into trees, the impact of biotic stressors as determinants of entry, the specificity of metal accumulation in certain species of trees and their parts, the biophilicity of heavy metals, and other aspects of biogeochemistry.

Considering the extent of the life cycle of the tree and with respect to wood as an industrial material and an agent for the sequestration of atmospheric carbon dioxide, investigations into thermally treated wood products and the efficiency of their application in the field of environmental protection engineering are presented. Greater focus is shifted to the properties of biochar and to defining its advantages as a packing material of the filters.

Exhaustive treatment of the versatile role of trees in environmental protection technologies is hardly possible without specifically applied research methods. Thus, investigation into heavy metal concentrations and their distribution in tree rings has assisted in advancing technology for wood sampling and evaluating their representativeness. To assess the eco-technological aspect of using trees in environmental protection technologies, a method of dynamic factors that maximizes the elimination of the impact of local environmental geochemical features on the element uptake evaluation has been developed. As an effective method for examining various ecological aspects, a mathematical simulation of the processes of contaminant transport in the environment, including the original models developed by the authors of the book, has been applied.

The novelty of the book is its explication of the sustainable role of the tree in environmental protection technologies, and the book includes reviews, research, and an evaluation of the use of trees.

This publication is dedicated to scientists and experts in the field of environmental protection. Would-be scientists – Ph.D. and M.A. students – may refer to the study as a source of scientific knowledge in the field of environmental protection technologies.

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