

THE EMERGENCE OF BIO-ECONOMY OPPORTUNITIES AND RISKS. A FORWARD-LOOKING STUDY, Chief Editors: Emmanouil Koukios and Adam Mazurkiewicz; Associate Editors: Anna Sacio-Szymańska and Beata Poteralska, Publishing House of the Institute for Sustainable Technologies – National Research Institute, 2017, 285 pp., ISBN: 978-83-7789-484-2

According to the definition adopted by the European Commission, bio-economy encompasses the production of renewable biological resources and the conversion of these resources and waste streams into value-added products, such as food, feed, bio-based products, and bioenergy. Not coincidentally, this definition may be seen as a list of themes that are discussed in the monograph “*The Emergence of Bio-economy Opportunities and Risks. A Forward-Looking Study*”. The monograph was edited by Chief Editors Emmanouil Koukios and Adam Mazurkiewicz, with the support of Associate Editors Anna Sacio-Szymańska and Beata Poteralska, and published by the Institute for Sustainable Technologies, Radom, Poland. The publication is the result of a series of research activities, some of them financed by different EU research projects, including a Marie Skłodowska-Curie grant.

The monograph is divided into two main parts. Part I, entitled *The Bio-Tsunami Project* and authored by Emmanouil Koukios, summarizes the results of the research project “The New Tsunami of Socio-Technical Change: Foresight of Agro/Bio/Chemo/Eco/Cogno... Convergence (BIO-TSUNAMI)”, which was co-funded by the National Science Centre (NCN) of Poland. In its seven chapters, the presented material covers the research methodology adopted in the above-mentioned project, the identification of bioeconomy clusters understood as promising R&D fields and business opportunities, the assessment of relevant innovation factors, including global value chains and radical technological changes, as well as case studies of emerging bioeconomies – Poland and Greece. It is suggested that the emergence of bioeconomy can be considered as a major component of the economic and accompanying social phenomena that appear in cycles (waves of change). Considering the scope and depth of possible technological and socio-technical changes, along with the associated opportunities and risks, this new wave may be compared to a tsunami.

Part II of the monograph, entitled *Invited Papers*, is composed of ten contributions (divided into three sections), authored by teams of researchers from Greek, Italian and Polish institutions. The introductory section, comprising two contributions, discusses the issues of design and practical implementation of the scenario methodology in sectoral foresight, as well as new trends in technological education. Both contributions emphasize the importance of the innovative, sustainability-oriented thinking in working out strategies and policies to facilitate a harmonious development of the economy sectors.

In the subsequent section, five examples of strategic thinking in the development of various bio-economy sectors and their subsystems are presented. The examples include wastewater treatment in the dairy industry, penetration of bio-oriented thinking into different sectors of the Finnish economy, supply of cosmetic raw materials obtained by biotechnological methods, bioeconomy visions for Italy, and a strategy for sustainable development of olive oil production. Seen as a whole, the examples illustrate extensively the opportunities and risks associated with the bioeconomic wave of change.

The final section of Part II and the entire book is devoted to an emerging economy sector, *i.e.*, the industrial use of algae. This section comprises three contributions, which are focused on micro-algae processes, including algal biomass production, conversion of algal biomass to biofuels, and algae-based biorefining as a potential source of high added-value products, such as bioactive compounds, and food and feed additives. It is shown that the significant R&D and investment efforts required for the large-scale implementation of the use of algae may well pay off through the important ecological and economic benefits, including, among others, low-cost heat and power generation, and removal of CO₂ from the atmosphere.

By first outlining a broad problem area and subsequently throwing more light on some of the key subfields, providing a wealth of references, the book convincingly explains why the term “bio-tsunami” can

be considered as appropriate. It is a highly recommended reading for postgraduate students, researchers, engineers, economists and decision makers, who are interested in research and development, and in shaping policies related to the emergence of bioeconomy.

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