Bioeconomy for Beginners

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Editor

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Foreword

"Basically, bioeconomy is nothing new". With this remarkable sentence begins the first chapter of this book, *Bioeconomy for Beginners* (although, fortunately, not only for "beginners"). We, a small group of EU officials in the Directorate-General for Research, were well aware of this when, in September 2005 in Brussels, we presented the Knowledge-Based Bioeconomy (KBBE) Programme to the public as a new component of the 7th EU Research Programme, with a budget of two billion euros as starting baggage. We were of the opinion that the immense knowledge available today about the particularities of the so-called biological resources of plant, animal and microorganism (renewability, climate friendliness, elements for a circular economy and, above all, potential for new functions and properties) justified such a novel and provoking approach, especially when comparing non-fossil resources with fossil resources. But this approach was initially "limited" to research activities.

We would not have imagined at that time that, in 2017, just 12 years later, almost 60 states, international organisations and regions worldwide would have adopted this new, old economic concept in the form of national programmes, strategies, action plans and road maps going beyond research and technology!

The number of scientific and nonscientific statements (and everything in between), books, essays and reports on the bioeconomy can hardly be counted anymore; specialised web portals are useful for dealing with that. But a compendium, *Bioeconomy for Beginners*, does not yet exist, at least not in German-speaking countries, as the editor rightly states in his preface. He adds that the main criterion for this output should be intelligibility in language and content. Nevertheless, with all due respect to this qualification, this book is not a so-called popular scientific work. Fortunately, the complexity and density of the bioeconomy, as we know it today due to our enormous sum of new knowledge about the biological resources on which it is based, require more than linguistic comprehension and understanding for a successful entry into this "economy of life", namely, intellectual sincerity and honesty, scientific seriousness, freedom from ideologies, genuine knowledge and true authentic competence and, above all, openness to other newly generated flows of knowledge, for example, in the nano-field and information field or, recently, in the context of the digital revolution. In my view, these criteria have been fully met, especially in the exciting remarks on the future of the bioeconomy, including in the context of the current discussions on Sustainable Development Goals ("SDGs") and how to achieve them, the circular economy and the further development of global climate protection according to COP 21 and 22.

From the point of view of the "fathers" or "founders" of the European bioeconomy, I would like to take this opportunity to state to all authors and beginners: we have never imagined that, with this old and new form of economy, we would be offering a *silver bullet*. We only wanted to make a contribution towards ensuring that, with the help of and in harmony with nature, economic actions may continue to enable the billions of inhabitants of our planet to live a sustainable and decent life upon it. This desire and concern are very skilfully and convincingly expressed in many contributions to this book, and I would like to express my sincere thanks for that.

Christian Patermann
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March 2017

Preface

"Bioeconomy" has become a frequently used buzzword in specialist circles in politics, business and science over the past decade. Many talk about it, but it is often unclear as to what is meant when people speak of the bioeconomy. After all, experts from very different industries and disciplines are at work in service of its realisation. In the general public's perception, the term simply does not exist. "Hardly anyone knows the term bioeconomy. Yet it stands for the most ambitious economic project of the future". In fact, "bioeconomy" is far more than merely a buzzword for insiders. Rather, the word denotes a concept that must never go out of fashion if mankind is interested in long-term survival on this Earth. It is about the necessary transition from the age of fossil fuels, which began about 200 years ago, into a worldwide economic system based on renewable raw materials (and renewable energies).

The purpose of this book is to present the fundamentals of the concept of bioeconomy. Without losing sight of its possible diversity, it sees the realisation of this concept as a threefold challenge: a scientific one, an economic one and an ecological one. By explaining these three challenges from the not necessarily consistent perspectives of highly qualified authors, it offers an integral introduction to bioeconomy, a well-founded introduction to a dynamic field of research and practice that will raise more questions than it answers, and yet one that fills a gap. So far, there has been no generally understandable introduction to the field of bioeconomy.

The age of fossil fuels, the peak of which we are currently living through, will one day have been only a brief epoch in the history of human development. The reason why this statement is likely to be true is described in the introductory ▶ Chap. 1 through classification of the baseline conditions of a knowledge-based bioeconomy historically and geographically.

Bioeconomy is based on the energetic and material use of biomass, on the one hand, and the application of biological systems, on the other. Where this biomass comes from is explained in ▶ Chap. 2. It describes the provision of biomass from the fields of agriculture, forestry, fishery and waste management.

Biomass, whose use is at stake, must primarily benefit the nutrition of the growing world population. ▶ Chapter 3 therefore outlines what bioeconomy means for the food and feed sectors and highlights essential elements of nutrition in the context of bioeconomy.

▶ Chapter 4 presents the path from biomass to those platform chemicals that also form the basis of the petroleum-based economy. It shows how triglycerides, sugar, starch and nonedible lignocellulose can be processed into platform chemicals in biorefineries for the production of fuel and chemicals.

Biotechnology plays a key role in the bioeconomy. Accordingly, ▶ Chap. 5 first introduces the current importance of biotechnology as a production process and then describes the perspectives of synthetic biology.

From an economic-political perspective, the path to a bioeconomy represents a controlled transformation. ▶ Chapter 6 discusses the possibility of a transformation of the world production system towards a knowledge-based bioeconomy.

From a business management point of view, the successful transition to a bioeconomy requires the integration of a wide variety of industries and disciplines that have had little to do with each other up to now, i.e. the formation of new value creation networks. The opportunities and challenges associated with this will be discussed in ▶ Chap. 7.

Idealistic motives alone will contribute little to the success of bioeconomic products. Rather, these products must be able to compete with fossil-based products in terms of their manufacturing costs and sales price. The emerging bioeconomy must survive this competition on the market in order to find customer acceptance. Its prospects in this regard and what means will be necessary for it to become successful are described in ▶ Chap. 8.

In addition, bioeconomy must match verifiable sustainability criteria, for the prefix "bio" alone does not meet the claim of being ecological. Therefore, ▶ Chap. 9 investigates, starting from the United Nations' *sustainable development goals*, the conditions for a sustainable bioeconomy.

In official announcements, bioeconomy is often seen as a key to unlimited economic and consumption growth. But is this the core of its self-conception, and does it correspond to the goal of a transformation to sustainability? Shouldn't bioeconomy rather be oriented towards sufficiency strategies? This question is addressed in ► Chap. 10 from a philosophical perspective.

Some years ago, my friend Richard Gallagher, then editor of *The Scientist*, now president and editor in chief of *Annual Reviews*, made me aware of the importance of bioeconomy. My first thanks go to him at this point. A chance encounter with Merlet Behncke-Braunbeck from Springer Verlag gave me the impulse to develop the concept of this book. With untiring enthusiasm and competence, she supported me in implementing this concept step by step. Without the inspiring preliminary talks with "my" authors and their committed, knowledgeable and reliable work, realization of this book would have been unthinkable. I would like to thank them very much for this, in particular, Professor Ulrich Schurr, who was my scientific advisor. I would like to thank Carola Lerch for her meticulous and precise project management, as well as everyone who was involved in the production of this book on behalf of the publisher. I would especially like to thank my wife, Ellen Scheibe, for her support and her loving understanding during my not always easy but always exciting work on this book.

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