

BOOK REVIEW SECTION

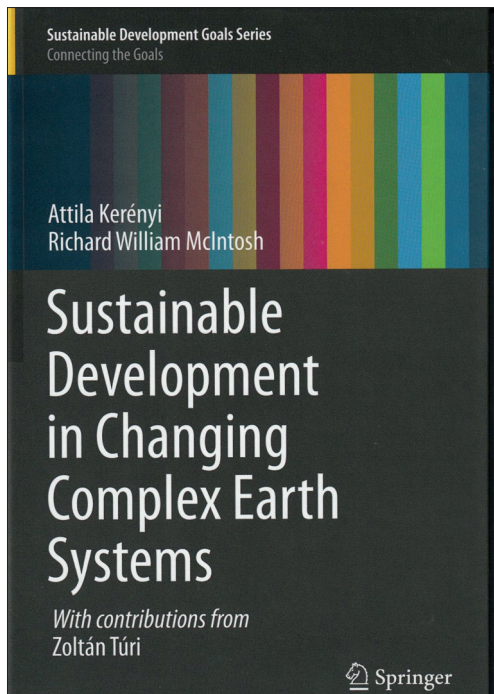
Kerényi, A. and McIntosh, R.W.: Sustainable Development in Changing Complex Earth Systems. Springer, Cham, 2020. 292 p.

Extracting and collating relevant information from the vast amount of knowledge revealed by science is the key to ensure the sustainability of human-influenced future. The Sustainable Development Goals (SDGs), formulated as part of the 2030 Agenda for Sustainable Development, identify 17 focus groups – sets of challenges – across different disciplines. Springer has organised a series of publications around these 17 major topics, dedicated 17+1 subseries to them. As part of the Sustainable Development Goals Series the global processes are measured by means of general system theories in this book. The foreword by Dénes Lóczy (University of Pécs, Hungary) reminds the reader of the fundamental problems of the terrestrial environment and of conflict situations resulting from the activities of human society which significantly shape the chances for sustainable development.

The purpose of the authors, Attila KERÉNYI and Richard William McINTOSH (University of Debrecen, Hungary), is to introduce and systematise all factors (geographical, environmental, social, economic and geopolitical issues) influencing sustainable development. The book summarises in seven chapters the state of knowledge using system theory tools and provides a clear logical approach to the background of the present environmental, geographical, socio-economic and geopolitical state of the world. In addition to examining the status quo based on the interactions between society and environment, it also presents the international trends of development. When they describe and explain relevant processes, the authors move a step back and examine the same processes from a distance. They clearly present their personal point of view in a number of topics throughout the work and often point out essential shortcomings in the internationally accepted views on global trends as well.

Chapter 1 explores both the process of the changing terrestrial environment and the historical evolution of the sustainable development concept. It provides a comprehensive picture of the geopolitical and economic efforts and achievements of global institutions such as the World Committee on Environment and Development of the United Nations (UN) that have achieved a major shift in social and economic attitudes along globalisation trends and have pushed long-term economic development processes in a more positive direction towards sustainable progress.

Chapter 2 introduces in detail and in a textbook style General System Theory and its applicability to better presenting and understanding Global Earth Systems. This chapter is not just a summary for professionals familiar with system theory. In addition to providing definitions, the necessary mathematical contexts, examples of the operation of systems is highlighted to illustrate the basic system theory principles needed for a comprehensive understanding the oncoming chapters of the book (classification, topology, system models and model making, Earth models). It describes different types of Earth Models, such as the PREM Model, Global Climate Simulation Models, GAIA, the "World Models", the Models of the Global Human Society, without discussing the deeper mathematical and physicochemical relationships in detail. Supplemented with explanations in the text, the illustrations in this chapter are easy to comprehend. Complex topics are presented in a clear language to the reader.



In chapters 3–5, using system theory, the book provides the subsystems that make up Global Earth Systems, their processes as well as the operation of the social and political systems that control them. Chapter 3 focuses exclusively on the presentation of impact processes in the geosphere, manifested by a few widely-known events (natural catastrophes) in the past, along with the effects of the impact processes originating from the geosphere hotspots. This chapter concludes with the theory presented by authors that post-disaster reconstruction entails the potential for sustainable development. It would be interesting as well to present a systematic examination of this theory – similarly to other cases treated in the book – so that the audience can gain a deeper insight into the motivations of the actors involved in the reconstruction works and what kind of influence they have on the processes of implementation of the relevant SD tools. Chapters 4 and 5 introduce and examine the internal processes of the Global Environmental System based on physical and chemical principles in different spheres along with the effects that determine human interactions in global and local human communities (Anthroposphere).

Subchapter 4.1.1, written by MCINTOSH, displays the general internal changes caused by natural and anthropogenic processes in the crust. It discusses the physical effects caused by energy and raw material demand, as well as the main cross-system processes (e.g. CO₂ emissions, acid rain, deforestation and groundwater overuse) between spheres induced by the extraction of raw materials through the example of major fuels (coal, natural oil, gas and uranium) and key industrial feedstock (minerals of modern technology). Each subchapter describes the main geopolitical and economic background and driving forces as well.

The following subchapters analyse, from the viewpoint of General System Theory, the material flows of a population, the expected population growth and, as a consequence, the negative interactions and conflicts between the shrinking natural environment and the expanding built environment, such as loss of territory or loss of ecological corridors which maintain landscape connectivity. It is claimed that the tendency of spatial evolution of human society is clearly recognisable: based on infrastructural and economic factors „cities became a dominant place of life and their significance will only rise”. These will lead to a range of conflicts since urban infrastructure cannot be expanded further and badly needed sustainable solutions (appropriate sewage treatment and green areas, overloaded traffic infrastructure indicated air pollution and noise loads) will not be found within such a short time. Afterwards the reader receives abundant information on the evolution of the sustainable development approach in cities, mentioning the background institutions and international associations, civil engagement which provide a platform for good practices to increase the liveability of settlements.

In subchapter 4.2, with the tools of system theory, authors describe soil degradation as a result of multiple anthropogenic impacts and the principle environmental problems induced by intensive agriculture. System diagrams illustrate the processes that exceed the primary systems. The author mentions the problems of intensive animal farming, leaching and acidification of soils and the use of wide-range pesticides, describes the material flows, but does not consider water demand in the study of material flows (Figure 4.4), despite the fact that one of the fundamental issues of intensive plant cultivation and cattle breeding is sustainable water use. (In other contexts, however, water issues are mentioned in subchapter 4.3.) Subchapters 4.4 and 4.5 focus on human-induced changes in the carbon cycle and on its inevitable consequences on climate change. It informs about the changes in biodiversity during the five most significant periods of extinction of the geological history, and cites the results (Living Planet Index) of WWF's observations of recent times. The book also tackles geographically large-scale changes e.g. loss of vegetation cover (deforestation), vanishing coral reefs through oil and chemical pollution, increasing water temperature and physical destruction, and provides detailed information on the efforts towards biologically sustainable fishing. A significant part of these regional changes are the result of anthropogenic modifications in the atmosphere associated with increased concentrations of greenhouse gases. KERÉNYI presents the development of global climate models; the IPCC's efforts to provide a broad, detailed multidisciplinary process review, as well as a very topical issue: the economically generated geopolitical aspirations of new resource-rich areas made accessible by climate change.

Although authors examine Earth-scale models, in order to illustrate the impact processes, several examples are listed from around the world. Amongst the international cases, it would be interesting for the Hungarian reader to learn about positive examples from Hungary, such as the good practice of Pécs city creating a low traffic and partially strict pedestrian zone in the entire city centre, which was a progressive local measure to improve air quality and quiet area similar to those cited for New York, London, Sydney and Vancouver.

In Chapter 6 the various SDGs related to proposals for solutions based on geopolitical conventions of the UN and engagement are outlined. A number of significant goals and their feasibility are discussed, e.g. renewing education, sustainable economic growth, decreasing inequalities, making peace among different religious and cultural civilisations. Besides this, the main issues are highlighted in a more complex view (in subchapter 6.7), in which the essential approaches are discussed in the context of the predictable evolution scenarios of human society. Authors devote a separate chapter to the description of the

Theory of the “Second Curve” as the development scenario of human society, as well as to the favourable globalisation of higher education through open online courses and to the achievements of Meadows and his research team (Massachusetts Institute of Technology) in the field of establishing SD criteria in the early 20th century. In addition, the possible development paths and their general criteria, shortcomings and the remaining (quite a few) unresolved issues, such as stabilising population growth are also highlighted.

The Conclusions (Chapter 7) focuses on these unresolved problems. By examining the 17 areas of acting identified by UN regarding the 2030 Agenda for Sustainable Development, it points out the shortcomings of systems and institutions needed for implementation, the inherent and human-based weaknesses, and the conflicts of interest of relevant actors. Authors see the potential for advancing local and regional solutions of problems arising from social differences and inconsistencies in religious and political views. They use the “Think global, act local” approach repeatedly in their suggested solutions, but they fail to provide a real solution either. They also observe sceptically the real long-term benefits of increased global connectivity and stability, and, in general, the long-term sustainability of the current globalised system. The chapter concludes that humanity, despite technological evolution, cannot neglect the continuous development of the individual through an advanced education system. It shows that speeding up environmental and social changes leads to accelerated changes in the probability and risk severity top charts of threats – presented in Tables 7.1 and 7.2 as results of World Economic Forum’s risk assessment –, meanwhile the speed of problem recognition cannot keep pace which makes adequate intervention difficult. It proves, that the technocratic approach alone does not respond to the negative processes of the late 21st century, but it can also result in significant, unpredictable social changes, to the realisation that small achievements in different areas are important but might not be sufficient for an effective global solution.

The book itself is structured proportionately as regards topics and navigates easily between subchapters. The size of the figures, tables and pictures does not hinder their interpretation, and the references to them are correct. The experience of reading is enhanced by the application of grey-coloured boxes that supply easy-to-understand, actual background information from context, providing examples and insights from public life that are related to the topic of the chapter.

The relevance of the book is confirmed by the enumeration of the conventions and institutions that have emerged in recent decades as a result of the global economic and world political endeavours also presented in the book. The most important ones, such as the Brundtland Report and IPCC, appear re-

peatedly in the relevant chapters, not only as mentions, but adequately explained in each chapter. This increases both the general readability of the book and the understanding of finer details.

Based on the above remarks, this book is well suited for shaping the attitudes of diverse expertise of the thematic areas of sustainable development. In addition, it can be used as a widely disseminated educational material in higher education, since it summarises the knowledge of certain disciplines, and encourages the reader to synthesise and to disclose the relationships between them. You should not be an expert in every subject to understand the essential messages of the book, because it is logically well structured and presents all required information from a wide range of areas of expertise. The system processes presented through widely known examples encourage the reader to think beyond and may induce excellent discussions between experts.

The opinions and remarks of the authors emphasise the importance of Sustainable Development Goals implementation throughout the book, while consistently advocating the importance of peaceful solutions and tackling social inequalities.

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