DOI: 10.1111/risa.14112

BOOK REVIEW

Review of *Atlas of Global Change Risk of Population and Economic Systems*

By Peijun Shi (ed). Springer Nature Singapore Pte. Ltd., Gateway East, Singapore 189721, Singapore, pp. xx+278. ISBN: 978-981-16-6690-2 (hbk), 978-981-16-6691-9 (ebk)

Feng Kong

College of Humanities and Development Studies, China Agricultural University, Beijing, China
E-mail: kongfeng0824@foxmail.com

Various disaster events have occurred around the world, causing serious economic losses and human casualties on every continent. The World Economic Forum's Global Risk Reports released every January beginning in 2006 show that extreme weather and climate events have far surpassed other risk factors in terms of the likelihood of occurrence and impact (Shi, 2019; Kong and Sun, 2021). Weather and climate events have become the top risk factor affecting human society. Three other risk factors closely related to extreme weather and climate events are inadequate climate change mitigation and adaptation measures, natural disasters, and ecological damage. These were ranked among the top five on the risk list for the past 3 years.

As a Chinese citizen and disaster risk management researcher, I have experienced or participated in assessing more than 10 mega-disaster events in China, including the mega-freezing rain and snow disaster in 2008, the Beijing storm and flood disaster in 2012, the Nepal earthquake disaster in 2015, the Shouguang flood in Shandong Province in 2018, and the Henan mega-storm and flood disaster in 2021. In the current context of global integration, it is clear that these disasters extend beyond the disaster area through production chains, supply chains, and networks of contacts, and that such effects can transcend short time limits. The impact of these disasters is great mainly because of the significant changes in disaster-bearing bodies that are important for human well-being. This valuable book, *Atlas of Global Change Risk of Population and Economic Systems*, presents a scientific assessment of the risks to global population and economic systems.

The book is divided into four main sections. The first section introduces the world's environmental patterns. From the perspective of disaster risk assessment, the author introduces the theory of the regional disaster system, which considers that the formation of disaster is the result of the interaction between the disaster-inducing environment, hazards, and exposures. Among them, the disaster-inducing environment becomes the root environmental factor of disaster formation. In this section, the author maps the global land cover pattern, global soil pattern, global climate zoning, global river system distribution, global topographic slope, and global land elevation, which provide the basic natural factors as the starting point for the subsequent interpretation of the related disaster risk patterns, that is, the characteristics of the disaster-inducing environment.

The second section evaluates the global temperature, precipitation, and near-surface wind speed patterns and their variability characteristics estimated for the 2030s and 2050s from the perspective of global climate change for the current and Representative Concentration Pathway (RCP)2.6, RCP4.5, and RCP8.5 scenarios from a 0.25° grid unit. RCPs are a series of comprehensive concentration and emission scenarios used as input parameters of climate change prediction models under the influence of human activities in the 21st century to describe the emissions of greenhouse gases, reactive gases, aerosols, and the concentrations of atmospheric components in the event of changes in population, socioeconomy, science and technology, energy consumption, and land use in the future. Among them, RCP2.6 is the scenario of very low greenhouse gas concentration, which limits the rise of global average temperature to 2°C. RCP4.5 is another climate scenario under government intervention. RCP8.5 is the baseline scenario in the absence of climate change policy intervention, the highest greenhouse gas emission scenario, which assumes that the population is the largest, the technological innovation rate is not high, and the energy improvement is slow, so the income growth is slow. In this book, the authors seek to investigate global climate change from the three aspects of tendency, variability, and extremes. The change of the mean value of climate is generally reflected in the change of tendency, while the extreme climate is reflected in the extreme. The variability of

climate is between the mean value and the extreme climate. At present, the characteristics of climate change in different regions of the world are all composed of the above three factors, and the author believes that these three factors can be used as potential factors to measure the risk of climate change.

This second section provides a risk interpretation perspective mainly from the perspective of hazards. But it is worth noting that global climate change is not appropriately characterized by changes in climate averages or extremes. Global climate change itself is characterized by convergent changes, volatile changes, and extreme event changes. Climate change in any region can be presented as a combination of these three types of changes, but it is only a matter of which change characteristic plays the dominant role, which is the basic starting point for regional climate risk management policy formulation. This book attempts to explain these three types of changes, but it does not clearly and comprehensively explain them. Because the characteristics of climate change in any region are a combination of the above three factors, which type of change plays a leading role will also vary in different regions, and this difference will vary with latitude, distance from the sea, altitude, micro-topography, and so forth. At the same time, the final risk of climate change will also be affected by local social and economic development.

The third section of the book focuses on the characteristics of population and economic system change, mainly mapping the current actual distribution patterns of world population and gross domestic product (GDP) in 0.25° grid units, and the projected population and GDP in 2030s and 2050s based on Shared Socioeconomic Pathways (SSPs) for SSP1, SSP2, and SSP3 scenarios distribution patterns. As an important part of the new generation of climate change scenarios, SSPs describe the different tracks of the development of the future socioeconomic system. They should reflect the relationship between the socioeconomic development model and climate change risks and should unify the comprehensive assessment model, climate model, and different forecasts and settings of population, economy and energy consumption among the three groups of impact, adaptation, and vulnerability research. Among these, SSP1 refers to taking the green road (low challenges of mitigation and adaptation), moving the world toward a more sustainable path. SSP2 is the middle route (the challenges of mitigation and adaptation are medium), and the world is following a path where social, economic, and technological trends will not significantly deviate from the historical model. SSP3 is regional competition—a bumpy road (mitigation and adaptation face huge challenges), the recovery of nationalism, concerns about competitiveness and security, and regional conflicts, prompting countries to pay more and more attention to domestic issues or at most regional issues. Between SSPs and RCPs, the Shared Climate Policy Assumptions are used as a link to implement certain climate mitigation/adaptation policies under a certain socioeconomic development path (SSPs) to achieve the corresponding radiative forcing (RCPs) goals (IPCC AR5, 2013).

The exposure of the population (GDP) to heat waves and heavy rainfall (drought) is a key presentation. This book assesses global crop distribution patterns and their exposure to extreme heat events and finds that crop exposure to extreme heat events is greater in areas with high population density. Global industrial value-added patterns and global road network patterns are also mapped. This section focuses on clarifying the characteristics of the current global population and economic systems and their changing characteristics under different future development scenarios. It tries to elaborate such regional linkages in terms of industrial value added and road networks, but this emphasis is not sufficient and it is difficult to measure or portray interregional demographic and economic trade linkages in a realistic way. The connection between population and international trade is not only industrial added value and road network, but also the size of population flow and economic trade flow. However, this depends on accurate data support, which in turn depends on the construction of more open and shared data platform and the willingness of stakeholders to open and share.

The last section of this book focuses on the population mortality risk of heat waves based on SSPs for the 2030s and 2050s for SSP1, SSP2, and SSP3 scenarios in 0.25° grid units, and the population mortality risk of flood based on RCP2.6, RCP4.5, and RCP8.5 scenarios for the 2030s and 2050s. Overall, the book devotes a significant amount of space to overemphasizing the current and future changing characteristics of global population and economic systems, with relatively limited presentation based on disaster risk analysis. This also raises the following questions: How can the credibility of its population and economic system projections be measured when the global economic and trade is profoundly changed in the future? What will be the pattern of population and economic development in each region influenced by the global political and economic, COVID-19, and national policies? In recent years, affected by various risk factors, the global economy has been greatly impacted, and the population pattern has been affected due to the limited personnel flow. What will be the characteristics of the economic and demographic patterns of all regions of the world when various risk factors are intensified or mitigated? How to solve risk factors from the perspective of risk governance and promote sustainable development is critical. The expansion of risk and its social amplification are managed daunting challenges for regional development (Kong & Sun, 2021). Therefore, the validity of such risk evaluations and risk management in the perspective of interregional economic linkages is a topic for future research.

This book contributes to the existing knowledge gaps in understanding future changes in global population and economic systems. In contrast to the Global Risk Report, this book presents risk characteristics from grid units across the globe. However, the book still leaves open many questions. First, from the perspective of integrated risk evaluation, this book only evaluates the risk of population mortality from heatwave and flood in the last section but does not present

the integrated climate disaster risk and integrated natural disaster risk pattern. Regarding global and regional economic and social development, the presentation of the overall risk pattern in the future will be an important basis for regional economic processes, population changes, and social pattern adjustments. A single disaster risk pattern helps but cannot provide comprehensive risk decision support for decision makers.

Second, global population flows, and economic trade linkages are less explored. For the cascading effects of risks, especially after catastrophes, their direct effects are often determined by instantaneous population flows and economic trade flows, rather than averaging states. Therefore, how to be able to capture the flow characteristics of population and economic systems across regions is a major issue for future risk evaluation. In addition, the indirect effects of disasters are often through the degree of inter-regional dependence, which can result in larger economic trade impacts if there is over-reliance on the disaster area. Therefore, a diversified regional economic trade pattern is also an important way to promote true multilateralism as a way to maintain the stable development of the world economy.

Third, the methods and metrics of disaster risk evaluation need to be further improved. The current large-scale evaluation of disaster risk is still mainly based on the linear multiplication rule of disaster system elements. However, it is noteworthy that this linear algorithm cannot accurately reflect the disaster risk formation process and oversimplifies the mechanism of disaster risk formation. This is mainly due to the gap in the understanding of disaster formation process. In addition, there are differences between disaster types in the measurement of disaster risk, and its comparability is poor. It cannot truly reflect the magnitude of the comprehensive differences in disaster risk among different regions.

In summary, this book provides thought-provoking and quantitative insights into the ongoing discussion on global risk, offering an important quantifiable contribution to the understanding of risk in global population and economic systems. Most of the chapters are based on the author's long-term observations and practice in disaster assessment. This book is a valuable and recommended resource for readers interested in natural disaster risk to global population and economic systems, global risk assessment and regional management, and global sustainable development. At the same time, this book can be used as extracurricular auxiliary materials for graduate students majoring in natural disaster assessment, climate change risk assessment, and comprehensive disaster risk analysis because this book can be applied to climate change risk courses, disaster risk science courses, and so forth, and has reference value for readers to understand climate change risk. The price of the hardcover and softcover books is 24.99 and 19.99 euros, respectively, which is affordable for readers.

ACKNOWLEDGMENTS

Editor Michael Greenberg provided helpful feedback on an earlier draft. Any remaining errors are of the author.

ORCID

Feng Kong https://orcid.org/0000-0002-7259-5598

REFERENCES

IPCC AR5. (2013). *Intergovernmental Panel on Climate Change 2013 Fifth Assessment Report (AR5)*. Cambridge University Press.

Kong, F., & Sun, S. (2021). Better understanding the catastrophe risk in interconnection and comprehensive disaster risk defense capability, with special reference to China. *Sustainability*, *13*(4), 1793. https://doi.org/10.3390/su13041793

Shi, P. (2019). *IHDP/future earth-integrated risk governance project series: disaster risk science*. Springer. https://doi.org/10.1007/978-981-13-6689-5