
Preface

Climate change is one of the most serious threats and the greatest challenges facing human society today. According to the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. The unequivocal warming in the climate system has caused impacts on natural and human systems over the world and is bringing environmental risks having important implications for sustainable development. The environmental risk induced by climate change could be highly regional or even local. Although the IPCC reports have assessed the future impacts of climate change and risks at the global scale and/or from a regional perspective, it is not sufficient for decision-making due to its deficiency in risk assessment at regional and local scales. Assessment of regional environmental risks under climate change is urgently needed to support climate change adaptation at the regional scale. China is a developing country with relatively high level of agricultural population and relatively low level of urbanization but rapid rural-to-urban migration. There are several modernized cities and relatively less developed rural areas in China. Having a tremendously large territory, China has a complex and diverse terrain and a variety of ecosystems ranging from alpine tundra to evergreen tropics and from desert to forest. The climate of China is also diverse, wide-ranging from tropical climate in the south to subarctic climate in the north. With respect to these differences, regional vulnerabilities to climate change are different. Thus, different regions would face environmental risks differently under climate change. Understanding the different regional risks is essential for climate change adaptation in China.

In order to assess the risk of future climate change impacts, the most common means is to use climate-impact models driven by various climate change projections from the general circulation models (GCMs). The model-run scenarios for the IPCC AR5, collected by the Coupled Model Intercomparison Project Phase 5 (CMIP5) archive, are widely used as input forcing data for the climate-impact models. The Inter-Sectoral Impact Model Intercomparison Project (ISI-MIP), which is a community-driven climate-impact modeling initiative aimed to provide a quantitative and cross-sectoral synthesis of the differential impacts of climate change, has offered a framework for modeling of the impacts of climate change by sharing a daily-resolution, downscaled, and bias-corrected climate data from the CMIP5 archive. Many ISI-MIP outcomes have been used by or cited in the IPCC AR5. This atlas leverages the ISI-MIP framework to assess the environmental risks faced by China under climate change. While the common climate change projections provided by ISI-MIP are adopted, the vulnerabilities are assessed using the region-specific information in China. Uncertainty of the assessment is rooted in many aspects of the modeling framework. The spreads of both climate and impact models are large, in particular at the regional and local scales. Despite the irreducible model spread, the uncertainties should not prevent decision-making from using the assessment to support climate change adaptation actions. Indeed, many decisions, for example in insurance industry, have been made with huge uncertainty in future prediction. The multi-model ensembles, including multiple-impact model-runs driven by climate change projections from multiple climate models, are used to estimate future risks and to provide the

basis for uncertainty estimation. The atlas illustrates many multi-model ensembles, which allow decision-makers to know the implications of a wide range of future projections so they can manage the uncertainty and make adaptation policy arguments bearing the uncertainties.

The objective of the atlas is to provide the most comprehensive and accurate illustrations of environmental risks relating to climate change vulnerability and adaptation in China. It addresses the agricultural, ecosystem, and heat wave-related human health risk posed by climate change and presents the projected environmental risks in the twenty-first century under various climate change and socioeconomic scenarios. The detailed and concise risk assessments are mapped in grid units, allowing easy identification of the environmental risk for specific locations. The atlas contains six chapters. Chapter 1 presents the geographic, social, demographic and economic features in China. Chapter 2 illustrates the geographical distribution of temperature and precipitation and their long-term changes in the twenty-first century. Chapters 3–5 demonstrate the risks posed by climate change in the human health, agricultural, and ecosystem sectors with a focus on mortality due to heat wave, food production, and ecosystem shift over naturally vegetated land, respectively. Chapter 6 addresses the integrated environmental risk posed by climate change, which is a combined risk evaluation of climate change impacts on the basis of the risk assessments in the human health, agricultural, and ecosystem sectors. The maps in the atlas are with No. of licensed maps: JS(2016)01-143 (Star Map Press).

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I hope this atlas would provide the reader clear pictures of the environmental risks across different sectors posed by climate change and their evolution in the twenty-first century over China. I further hope that the atlas will contribute to the knowledge base for climate change adaptation in China and provide a valuable resource for students and professionals in the fields of geographic sciences and climate change.

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