

# Preface

The issue of climate change and biodiversity has become part of both the popular lexicon and the public discourse. Discussions on these subjects often evoke fierce debate between adherents to different views of the anticipated threat posed. Yet there are many nuances regarding climate change and the threats to biodiversity they represent that are not well understood by the public. Our conceptual understanding hinges largely on images and paradigms within the popular culture that are often little more than caricatures of the actual underlying scientific concepts. To appreciate the potential threat that climate change represents to the global society, it is necessary that we first understand the true science underlying this phenomena.

The Intergovernmental Panel on Climate Change (IPCC) in its recent report pointed out that the global average of land and ocean surface temperature data shows an increase of 0.85 (0.65–1.060 °C) over the period 1880–2012. The total increase between the average of the 1850–1900 period and the 2003–2012 period is 0.78 (0.72–0.85) °C. The atmospheric concentrations of the greenhouse gases, i.e., carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O), have increased since 1750 due to anthropogenic activity. The overwhelming majority of climate scientists agree that human activities, especially the burning of fossil fuels, are responsible for most of the climate change currently being observed. These are very likely to trigger substantial changes in the structure and functioning of all ecosystems including biodiversity regions.

Climate change is already having an impact on biodiversity and is projected to become a progressively more significant threat in the coming decades. Climate change has a number of impacts on biodiversity, from the ecosystem to species level. Perhaps the most obvious effects are those that the changes in rainfall distribution, temperature, flooding, and sea level rise will have on ecosystem boundaries and the functions within them. Loss of Arctic sea ice threatens biodiversity across an entire biome and beyond. The related pressure of ocean acidification, resulting from higher concentrations of carbon dioxide in the atmosphere is also being observed. It is forcing biodiversity to adapt through changing habitat, life cycles, or development of new physical traits. This, in turn, will affect vital

ecosystem services for all humans, such as air and water purification, pollination and production of food, decomposition and nutrient cycling, and carbon sequestration.

Biodiversity conservation can help to reduce the effects of climate change. For example, conservation of habitats can reduce the amount of carbon dioxide released into the atmosphere. If we act now to mitigate greenhouse gas emissions and identify systems-based adaptation priorities, we can reduce the risk of species extinctions and limit damage to ecosystems. We can preserve intact habitats, especially those sensitive to climate change; improve our understanding of the climate change-biodiversity relationship; and view biodiversity as a solution to climate change.

This book, consisting of 20 research papers presented at the IGU Conference, Rohtak, March 14–16, 2013, encompasses the interlinked issues of climate change and biodiversity in the above-mentioned interactive areas. Thus, the book aims to present a study of both natural and human realms and their climatic interactions, focusing on space and regions, addressing and questioning both short-term and long-term strategies. This work will be useful for students, researchers, and teachers in various disciplines such as geoinformatics, geography, climatology, meteorology, forestry, environmental studies, ecology, and biodiversity.

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