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## **Climate Change, Glacier Response, and Vegetation Dynamics in the Himalaya: Contributions Toward Future Earth Initiatives**

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## Climate Change, Glacier Response, and Vegetation Dynamics in the Himalaya: Contributions Toward Future Earth Initiatives

Edited by R. B. Singh, Udo Schickhoff, and Suraj Mal. Cham, Switzerland: Springer, 2016. xvi + 399 pp. Hardcover: US\$ 179.00, ISBN 978-3-319-28975-5. E-book: US\$ 139.00, ISBN 978-3-319-28977-9.

Glaciers respond visibly and often dramatically to climatic change, as do mountain biota and ecosystems. *Climate Change, Glacier Response, and Vegetation Dynamics in the Himalaya* logically combines the 2 topics in 20 chapters that range from the Pamirs in the west to the Nyainqentanghla Range in the east. The region is home to the world's tallest mountains and one of its greatest population densities: more than a billion people live in watersheds that start in the Himalaya. As a result, the contents of this book provide a timely perspective on cryospheric, hydrological, and ecological change.

The book has 3 sections: (1) overview chapters on climate change in High Mountain Asia set the stage for case studies on (2) glacier change, hydrological change, mountain hazards and risks, and (3) treeline dynamics and environmental change. Techniques used in these analyses include remote sensing, data mining,

hydrological modelling, field measurements, risk assessments, and dendroecology.

The contributors include academics and researchers from a variety of disciplines and backgrounds. As noted in the Foreword by Bruno Messerli, some chapters include authors from both inside and outside the region, and these mixed chapters represent an important step forward in global scientific progress and cooperation. While some chapters do not present ground-breaking research, they provide important context and background knowledge for the issues faced by the region: for example, elevation-dependent warming results in temperature trends that are greater here than in most other parts of the world—up to 1.2°C per decade—and more marked in winter than in summer. Precipitation trends are inconsistent across the region, but this may also reflect the lack of long-term and high-quality observations.

In my view, the focus on elevation and the diversity of topics presented within this book represent its greatest strengths. I had not appreciated the parallels between glacier changes and treeline shifts prior to seeing the two topics juxtaposed and combined here. But both are symptoms of climatic change, and both have strong dependencies on elevation. The chapter on temperature and precipitation gradients in the region thus represents an important perspective on an issue that has

received little attention previously and should probably receive more in the future.

Unfortunately, the dynamics of the monsoon, its interaction with the Himalayas, and its role in both glacier and ecosystem health are conspicuously missing. A chapter outlining these issues and the lack of certainty in projections of future monsoon strength and behavior would have been beneficial to place future hydrological, ecological, and glacier changes in context.

Overall, the book provides both breadth and detail on ongoing environmental changes in the Himalayas. Given the rate of these changes and their significance for downstream populations, this volume represents an important contribution. Although expensive as a hardcopy book, it would be suitable for researchers and graduate-level students working in the region on a variety of topics, or as a reference book for upper-level courses on mountains and environmental change.

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