Sustainable Development Goals Series - Climate Action

Udo Schickhoff - R.B. Singh - Suraj Mal Editors

Mountain Landscapes in Transition

Effects of Land Use and Climate Change

This book compiles available knowledge of the response of mountain ecosystems to recent climate and land use change and intends to bridge the gap between science, policy and the community concerned.

The chapters present key concepts, major drivers and key processes of mountain response, providing transdisciplinary orientation to mountain studies incorporating experiences of academics, community leaders and policy-makers from developed and less developed countries. The book chapters are arranged in two sections. The first section concerns the response processes of mountain environments to climate change. This section addresses climate change itself (past, current and future changes of temperature and precipitation) and its impacts on the cryosphere, hydrosphere, biosphere, and human-environment systems.

The second section focuses on the response processes of mountain environments to land use/land cover change. The case studies address effects of changing agriculture and pastoralism, forest/water resources management and urbanization processes, landscape management, and biodiversity conservation.

The book is designed as an interdisciplinary publication which critically evaluates developments in mountains of the world with contributions from both social and natural sciences.







1	The World's Mountains in the Anthropocene	1
Part	I Climate Change and Response Processes of Mountain Environments	
2	Markers of Climate Change: Analysing Extreme Temperature Indices Over the Himalayan Mountains and Adjoining Punjab Plains Manu Raj Sharma, Vishwa B. S. Chandel, and Karanjot Kaur Brar	149
3	Spatial Variations and Long-Term Trends (1901–2013) of Rainfall Across Uttarakhand Himalaya, India Suraj Mal, Manohar Arora, Abhishek Banerjee, R.B. Singh, Christopher A. Scott, Simon K. Allen, and Ramchandra Karki	163
4	Spatio-Temporal Heterogeneity in Glaciers Response Across Western Himalaya	185
5	Temporal Variability of the Satopanth Glacier Facies at Sub-pixel Scale, Garhwal Himalaya, India	207
6	Anticipated Shifting of Thermal and Moisture Boundary Under Changing Climate Across Nepal	219
7	Quantifying Uncertainties in Climate Change Projection and Its Impact on Water Availability in the Thuli Bheri River Basin, Nepal	235

8	Decreasing Water Availability as a Threat for Traditional Irrigation-Based Land-Use Systems in the Mustang Himalaya/Nepal	253
9	Glaciers, Climate and People: Holocene Transitions in the Stubai Valley	267
10	Environmental and Socio-Economic Consequences of Recent Mountain Glacier Fluctuations in Norway Philipp Marr, Stefan Winkler, and Jörg Löffler	289
11	Paraglacial Timescale and Sediment Fluxes for Hillslope Land Systems in the Northern Appalachian Mountains of Eastern Canada Daniel Germain and Ludwig Stabile-Caillé	315
12	Distance from Retreating Snowfields Influences Alpine Plant Functional Traits at Glacier National Park, Montana Martha E. Apple, Macy K. Ricketts, Alice C. Martin, and Dennis J. Moritz	331
13	Environmental Drivers of Species Composition and Tree Species Density of a Near-Natural Central Himalayan Treeline Ecotone: Consequences for the Response to Climate Change. Niels Schwab, Birgit Bürzle, Jürgen Böhner, Ram Prasad Chaudhary, Thomas Scholten, and Udo Schickhoff	349
14	Modelling the Ecological Niche of a Treeline Tree Species (Betula utilis) in the Himalayas—A Methodological Overview Maria Bobrowski	371
15	Conifer Growth During Warming Hiatus in the Altay-Sayan Mountain Region, Siberia Viacheslav I. Kharuk, Sergei T. Im, and Il'ya A. Petrov	385
16	Climate-Induced Fir (Abies sibirica Ledeb.) Mortality in the Siberian Mountains. Viacheslav I. Kharuk, Sergei T. Im, Il'ya A. Petrov, Alexander S. Shushpanov, and Maria L. Dvinskaya	403
17	Climate Change and Dynamics of Vegetation in the Lesser Caucasus: An Overview	417

18	Changing Climate Scenario in High Altitude Regions: Comparison of Observed Trends and Perceptions of Agro-Pastoralists in Darma Valley, Uttarakhand, India Deepika Rawat and Udo Schickhoff	429
19	Current Crisis and Future Woes: The Case of Climate Change in the Drakensberg Mountains Region of Southern Africa and Its Socio-economic Impacts in the Region Geoffrey Mukwada	449
Par	t II Response Processes of Mountain Environments to Land Use Change	
20	Assessment and Prediction of Land Use/Land Cover Changes of Beas Basin Using a Modeling Approach	471
21	Dynamics of Land-Use/Cover Change in Mizoram, Eastern Extension of Himalaya Vishwambhar Prasad Sati	489
22	Changing Scenario of Tropical Forests Due to Shifting Cultivation in the Indo-Burma Bio-Geographical Hotspot: A Study on Three Major Hill Ranges of Tripura, North-East India Jatan Debnath, Nibedita Das (Pan), Amal Debnath, and Istak Ahmed	501
23	Urbanization in Himalaya—An Interregional Perspective to Land Use and Urban Growth Dynamics	517
24	The Changing Landscape of the Plantation Sector in the Central Highlands of Sri Lanka	539
25	Mountain Pastures of Qilian Shan Under Continuous Grazing: Main Environmental Gradients, Vegetation Composition and Soil Properties Alina Baranova and Udo Schickhoff	555
26	Mountain Habitats Dynamics Under Changing Grazing Management Schemes in Greece Michael Vrahnakis and Yannis Kazoglou	575
27	Landscape Dynamics in the Northwestern Mountains of the Iberian Peninsula: Case Study Ancares-Courel Mountain Range	593

28	in the Northern Calcareous Alps (Germany/Austria)	601
29	Assessing the Impact of Climate Change Versus Land Use on Tree- and Forest Line Dynamics in Norway	613
30	Social-Ecological-Technical Misalignments Threaten Mountain Water Tower Resilience in Utah, USA Michelle A. Baker and Courtney G. Flint	627
31	Changing Paradigm in Transboundary Landscape Management: A Retrospect from the Hindu Kush	(20)
	Himalaya Nakul Chettri, Srijana Joshi, Bandana Shakya, Sunita Chaudhary, Lipy Adhikari, Nabin Bhattarai, Eklabya Sharma, and David J. Molden	639