



Special Issue

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Special Issue

Mountain Forests in a Changing World: Advances in Research on Sustainable Management and the Role of Academic Training

Dear Readers,

The International Year of Mountains in 2002 marked a milestone in putting mountains and mountain people on the international agenda in terms of science and policy. Since then, the scientific landscape has changed considerably: knowledge about and acceptance of climate change as an important driver in ecosystems has increased, and its potential for causing socioeconomic transformations has been acknowledged. Global energy problems and efforts to substitute renewable energy for fossil energy have increased the demand for biomass. As in the 19th century, when industrialization reached the mountain regions of Europe leading to an ever-growing demand for wood, the current pressure on biomass in other regions worldwide could have severe consequences for people living in mountains. In the 19th century in Europe, this pressure led to competition for land between pastoralists and foresters while avalanches, debris flows, and floods threatened villages, traffic, and agricultural land as well as pastures below continuously increasing clear-cut areas. This crisis triggered the creation of forest science and led to the development of forestry curricula. Since then, foresters in Central Europe have been challenged to consider multiple stakeholder interests in the sustainable management of mountain forests. In order to make the accumulated experience in mountain forestry at BOKU (University of Natural Resources and Applied Life Sciences, Vienna) available to foreign students and to provide German-speaking students with a chance to train for jobs abroad, a new master's course in mountain forestry was launched in the International Year of Mountains.

Six years later, we organized an international conference, "Mountain Forests in a Changing World," to present advances in mountain forest research in the broad context of sustainable management of mountain areas in the light of global change and to evaluate the role of academic training in sustainable mountain forest management. This conference, held at BOKU from 2 to 4 April 2008, was organized by the Department of Forest and Soil Sciences at BOKU in collaboration with the International Union of Forest Research Organizations (IUFRO), the Mountain Partnership (whose founding coincided with the start of our mountain forestry curriculum), and the United Nations Environment Programme (UNEP).

The focus of the conference was sustainable land use in forested mountain areas, reflected in the selection of papers presented that appear in this Special Issue. Despite all efforts to attain the Millennium Development Goals, economic and ecological differences between industrialized and developing countries are mostly increasing, and the recent food crisis marked a new low in efforts to improve livelihoods in developing countries. Bringing together scientists from both industrialized and developing countries in order to foster exchange and trigger collaboration was our contribution to new efforts to alleviate this troubling situation.

While it is generally accepted that science has a responsibility to society and should prompt policy changes, the actual interface between science and policy is, if present at all, not free of friction. In order to improve this situation, a training workshop, "Mountain Forestry Development: Working Effectively at the Interface of Forest Science and Forest Policy," was held just before and in connection with the conference. This workshop was organized by the IUFRO Special Programme for Developing Countries. The first paper in the Development section of this Special Issue, by Michael Kleine, presents different approaches for improving the translation of science into policy. A successful formulation of policies aiming to improve the sustainability of land use and thus the livelihoods of people, however, is no reason for pause: the paper by Twesigye Rwakakamba pinpoints the glaring gap between rather progressive policies in Uganda and their implementation in four mountainous districts of the country. The paper calls for implementation of existing policies and laws and suggests measures to achieve this.

*Globally, almost 80% of the people residing in mountains live below the poverty line. Particularly for marginalized communities, nontimber forest products are often the only source of income. In the Research section, Bussmann and Sharon examine the economic role and ecological consequences of collection and trade of medicinal plants in Northern Peru, an area with a highly developed traditional use of medicinal plants. Deforestation and scarcity of tree resources are major problems in a number of developing countries: Aynekulu *et al* characterize the response of *Juniperus procera*—a key species of afromontane forests—to temporary enclosure from grazing in Ethiopia, while Mekonnen *et al* analyze the value of different tree species as fodder for the highlands of Ethiopia, and argue for an increased use of tree resources as supplemental fodder.*

*There is ample evidence of shifts in the margins of species distribution envelopes with changing climate. At the conference, Jonathan Lenoir showed that the optimum elevation of 171 forest plant species shifted upward by an average of 29 m per decade between 1905 and 2005 in Western European mountain ranges. These shifts were larger for species restricted to mountains (Lenoir *et al* 2008). Steven W. Running presented alarming changes in disturbance regimes in the Western United States and highlighted altered disturbance regimes as a major consequence of climate change. In the Research section of this issue of MRD, López-Sánchez and Rodríguez-Soalleiro present a*

stand density management diagram for Douglas pine for plantations in Spain that allows for deriving optimum forest management strategies under changed risks for crown fires and wind damage. The effects of nitrogen and sulphur deposition—often a neglected but major driver of vegetation change, even in so-called background areas—are discussed by Dirnböck and Mirtl, who also evaluated the use of species diversity in 4 taxonomic groups as an indicator for nitrogen and sulphur deposition. Dalla Valle *et al* estimate increases of aboveground carbon sequestration as a consequence of forest expansion caused by abandoned agriculture in relation to the Kyoto Protocol. Finally, a new remote sensing-based method for quantifying such land use changes is presented by Král. The Special Issue concludes with an epilogue by Gerhard Glatzel, the founder and father of the curriculum for mountain forestry at BOKU.

The conference on “Mountain Forests in a Changing World” reflected a differentiation in research topics: while the majority of the research conducted in developed countries directly addressed global change and was based on results generated from research dealing with these issues, the vast majority of topics presented by researchers from developing countries were concerned with questions of livelihood, general sustainability of land use, and equity issues. In industrialized countries, there may be capabilities that enable partial offsetting of losses in the forest functions of mountain forests through adapted management, technical measures, or even insurances. Time can be bought with adaptation measures. Research capacities and funds for achieving this vary greatly between industrialized and developing countries: the share of developing countries in the global gross expenditure for research and development is 22%; Africa contributes 0.6% to global expenditures for research and development (UNESCO 2005). For researchers per million inhabitants, industrialized and developing countries differ by an order of magnitude: Africa has 1.1% of the world’s researchers, and the less developed countries only 0.1% (UNESCO 2005). This situation may be even more pronounced in often marginalized mountain areas. Only recently, Lutz *et al* (2008) published a global demographic study that proved the positive effect of education on the gross income of nations.

As a result of a final discussion, the conference suggested the following measures for tackling these challenges:

- A strong focus on capacity building is required, including academic training. This will enable developing countries to cope with the challenges of change.
- Research on sustainability and equity issues of land use in mountain areas should not stop after publication or presentation of the results. In order to achieve relevance in terms of changed land use practices and improved land use policies, scientists should actively include stakeholders in their research or actively transfer their results to the respective stakeholders.
- Research institutions in developed countries have an increased responsibility to collaborate with those in developing countries and share as well as transfer knowledge, and also make available infrastructure for research on the consequences of global change in mountain areas of developing countries.

We hope and trust that the articles published in this Special Issue will be as inspiring for MRD’s audience as the whole conference was for us. Our wish is that the combination of research carried out in industrialized and developing countries will narrow the gap between North and South and that the findings of the conference will trigger action toward global partnerships in research and education—a need particularly acute in times of accelerated change.

Georg Gratzer, Guest Editor

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