

# Science for the Carpathians: Using Regional Capacity to Cope with Global Change

Astrid Björnsen Gurung

**Abstract** Emphasizing the global and regional importance of mountain ecosystem services and referring to the anticipated future environmental changes affecting the provision of these services, this chapter takes a closer look at the Carpathian Mountains. In addition to climate change and general effects of globalization, rapid socioeconomic transformations after the fall of the Iron Curtain pose an extra challenge to the sustainable development of the region. Describing the early efforts of organizing mountain science through programs such as UNESCO MAB and UNEP at the global scale, this chapter focuses on the recent history of research coordination for the European mountains, in particular on the activities of the Carpathian Convention and the European Program of the Mountain Research Initiative, which were among main driving factors for the initiation of the Science for the Carpathians (S4C) network. This regional mountain research network was established in 2008 to foster scientific collaboration and communication and to promote applied research and capacity building, which in turn would support sustainable development in the Carpathian Mountains. Forum Carpaticum, a biennial open science conference, has become a central activity of the S4C network counting more than 400 members today.

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A. Björnsen Gurung (✉)  
Mountain Research Initiative—Europe, University of Berne,  
Erlachstr. 9aTrakt 3 3012 Berne, Switzerland  
e-mail: astrid.bjoernsen@giub.unibe.ch

A. Björnsen Gurung  
Institute of Interdisciplinary Mountain Research, Austrian Academy of Sciences,  
Technikerstraße 21a, Otto Hittmair-Platz 1, ICT 6020 Innsbruck, Austria

## 1 Global Change Research in Mountains

Mountains are complex and fragile ecosystems characterized by verticality, highly differentiated climatic conditions and often by an abundance of water and rich biodiversity. At the same time, life in mountain areas can be threatened by avalanches, landslides, glacial lake outbursts, strong winds, or earthquakes. Remoteness and difficult access hamper economic and social development.

Despite these constraints, mountains offer significant opportunities. Mountain dwellers have adapted to life under harsh conditions and developed techniques to optimize farming, water use and forestry. Mountains provide a wide range of ecosystem services. Provisioning services come from agricultural and forestry systems, natural ecosystems and rivers. Regulating services relate particularly to climate, air quality, water flow, and the minimization of natural hazards. Supporting services to nutrient dispersal and cycling and seed dispersal, and cultural services are associated with tourism, recreation, aesthetics, protected areas and locations of religious importance (EEA 2010). People living in lowland areas or in big cities benefit from these various services. Global change may threaten, or at least alter, the capacity of mountain ecosystems to provide those goods and services necessary for both highland and lowland people (Huber et al. 2005).

The awareness of the global and regional importance of mountains, the fragility of their resources and difficult living conditions of many mountain people has increased significantly over the last decades. This insight, together with the challenge to manage and preserve mountain ecosystems under global change, created a need for a better understanding of the mountain ecosystems functioning. Even though mountain research has a long history, going back at least 200 years (Messerli 2001), it lacked a comprehensive knowledge, as the activities were scattered and conducted by individual scientists. As a global concern, and with an understanding that mountain research requires cooperation between science and policy, the topic gained attention only after 1970.

Two factors provided the impetus for organizing mountain science at the global and regional scales. In 1971, the launch of the Man and the Biosphere Programme of UNESCO provided a basis for more integrated mountain research. The 1st UN Conference on “Human Environment” in Stockholm in 1972 stirred and influenced an entire series of mountain conferences to follow. It declared, that “research should be promoted, assisted, coordinated, or undertaken by the Man and the Biosphere Programme” (UN Conference on the Human Environment 1972a) and further stated that international cooperation “is essential to effectively control, prevent, reduce and eliminate adverse environmental effects” (UN Conference on the Human Environment 1972b). It asked for cooperation at the international level in order to prevent environmental problems going beyond national borders.

Secondly, the vision and spirit of a group of scientists from various countries<sup>1</sup> promoted the idea of interdisciplinary research cooperation to address the challenges posed to mountain ecosystems at the global level. Their personal commitment contributed to the growing recognition of mountains in the global arena. In the favorable international political environment it facilitated the inclusion of Chap. 13, the “Mountain Chapter”, in Agenda 21, the plan of action endorsed at the UN Conference on Environment and Development in Rio de Janeiro in 1992. Placing mountains in the context of sustainable development, that event was crucial in instigating numerous mountain publications and follow-up activities.

The next milestone in the mountain research history was the first UN resolution on the theme of mountains in 1998, which included the designation of the year 2002 as the International Year of the Mountains (IYM). The IYM reinforced the implementation of Chap. 13 of Agenda 21 placing mountains on an equal footing with climate change, tropical deforestation and desertification. Among other objectives, the IYM was supposed to initiate new mountain research programmes. A solid knowledge base about mountain ecosystems and their responses to global change was identified as a precondition for the successful follow-up of the IYM, the implementation of Chap. 13, the development of national strategies for sustainable development and the formulation of mountain-specific policies (Hofer 2005). During the year 2002, the World Summit on Sustainable Development adopted a Plan of Implementation in which paragraph 42 was specifically devoted to mountains. In the wake of these events a number of international research programmes were launched, with the Mountain Research Initiative as one of the most prominent ones.

## 2 Mountain Research in Europe

The Mountain Research Initiative (MRI) is a scientific organization addressing global change issues in mountains around the world. As such, it was one of many factors stimulating the emergence of the Science for the Carpathians (S4C) initiative. The origins of the MRI are found in the 1990s, coincident with the preparations for the IYM in 2002. The International Geosphere Biosphere Programme (IGBP), together with the International Human Dimensions Programme (IHDP) and the Global Terrestrial Observation System (GTOS) proposed a joint initiative to “achieve an integrated approach for observing, modeling and investigating Global Change phenomena and processes in mountain regions, including the impacts of these changes and of human activities on mountain ecosystems” (UN General Assembly 2000).

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<sup>1</sup> Lawrence Hamilton, Ruedi Högger, Jack Ives, Bruno Messerli, Jayanta Bandyopadhyay, Peter Stones, Maurice Strong, and others.

A small group of devoted scientists translated this goal into an integrated interdisciplinary approach (Becker and Bugmann 2001) spanning a range of activities: monitoring, process studies, modeling, as well as guidance to policy and management. Based on this methodological approach, the two-year Global Change and Mountain Regions (GLOCHAMORE) project, a joint 6th Framework Programme initiative of the MRI, the UNESCO Man and the Biosphere Programme and the University of Vienna, formulated an integrated state-of-the-art research strategy for mountain regions (Björnson Gurung 2006), which drew on the expertise of more than 250 scientists and managers of mountain biosphere reserves worldwide.

To move the GLOCHAMORE Research Strategy towards implementation, the MRI started in 2006 initiating and supporting regional networks in North and South America, Africa, Asia and Europe, with regional initiatives in the Carpathians and Southeastern Europe.

Since its establishment in 2007, the European Program of the MRI (MRI-Europe) has put great emphasis on the establishment of active communities of mountain researchers driving forward the identification and prioritization of research needs at the regional scale, while taking the GLOCHAMORE Research Strategy as a departure point. This vision proved to be of importance for the future collaboration of MRI with scientists working in the Carpathians.

### **3 Mountain Research in the Carpathians**

Until recently, the significance of the Carpathian mountain research to the global mountain research community has not been adequately reflected. Even though this eco-region offers perfect conditions for a “natural laboratory” for global change research and has a rich mountain research history of its own with a wealth of local expertise and data, publishing in international journals was relatively low (Körner 2009). Especially during the communist time research results were only exceptionally published in international journals. After the fall of the Iron Curtain, the research collaboration and visibility has started to improve (e.g., the special issue of Mountain Research and Development dedicated to Environmental Transformation and Human Impact in the Polish Tatra Mountains, Ives 1992), and several international projects have been successfully launched, for instance, in the field of air pollution and forest health (Szaro et al. 2002; Bytnerowicz et al. 2002, 2003). Still, insufficient networking among Carpathian researchers and between Carpathian scientists and those from other countries has been identified as one of the major obstacles for the development of Carpathian research (Ostapowicz and Sitko 2009). Research collaboration is of particular significance here, as the environmental and socioeconomic problems observed in the Carpathians today cannot be adequately addressed by individual disciplines but require interdisciplinary research that focuses on elucidating the region in systemic terms.

The global mountain research community could greatly benefit from the experiences and knowledge of researchers in the Carpathian region. This mountain range not only hosts great natural diversity, exceptional at the European scale, but is also of high interest to human geographers and social scientists, as 20 years after the fall of the Iron Curtain, rapid socioeconomic transformation poses numerous challenges to sustainable development. On top of that, the region is affected by direct and indirect impacts of climate change and globalization (Kozak et al. 2011). Therefore, information exchange with the global mountain research communities needs to be intensified both in terms of stronger involvement in EU-funded research projects, peer-reviewed publications and participation in international conferences, and in terms of interdisciplinary research efforts. To make research useful to society, a dialogue and information transfer between research, policy and practice needs to be established.

## **4 The Science for the Carpathians Initiative**

The idea of the Science for the Carpathians initiative goes back to the negotiation process of the Framework Convention on the Protection and Sustainable Development of the Carpathians (Carpathian Convention) in 2001. The Ukrainian Government requested the United Nations Environment Programme—Regional Office for Europe (UNEP/ROE) to facilitate an intergovernmental consultation process among the Carpathian countries with the aim of drafting an international convention on the Carpathian mountains to be adopted at the Fifth Ministerial Conference “Environment for Europe” in 2003. At that time, the Alpine Convention was the only legally binding regional agreement specifically relating to mountain areas. The UNEP forwarded the request to the Italian Ministry for the Environment and Protection of Territory, as the Italian Government demonstrated a keen interest in promoting sustainable development in mountain areas after the Johannesburg Summit 2002.

The first significant step took place with the formation of the Alpine-Carpathian Partnership, launched during the International Year of the Mountain (2002) and supported by the Presidency of the Alpine Convention, which in that period was held by Italy. An initial informal meeting was hosted by the Ukrainian government in Kiev in November 2001, where participants agreed to a list of areas of cooperation. The formal negotiations between the Carpathian countries facilitated by UNEP/ROE took place during five preparatory meetings (Bolzano, Vaduz, Geneva, Vienna, Bolzano) with several international organizations, academic institutions and NGOs providing support.

After acceptance of the Carpathian Convention in Kiev in 2003, European Academy (EURAC) played a central role in the framing of scientific issues related to the Convention. The first Ad Hoc Expert Meeting of the Carpathian Convention in Bolzano in May 2004 welcomed the scientific support activities offered by EURAC and recommended stronger cooperation between the Carpathian

Convention's Interim Secretariat at UNEP in Vienna and EURAC. In October 2004, the two parties signed a Memorandum of Cooperation, including scientific, logistical and communication support.

Apart from the political environment, the INTERREG CADSES "Carpathian project" stimulated the creation of a Carpathian science initiative, as it clearly showed the necessity of organizing science in the region (Borsa et al. 2009). Initiated by the International Scientific Committee on Research in the Alps (ISCAR) and the Interim Secretariat of the Carpathian Convention (ISCC), a small group of scientists and stakeholders met at the Forum Alpinum 2007 in Engelberg, Switzerland, to develop first ideas for a science network in the Carpathians similar to the one existing in the Alps. These ideas were further elaborated during a consecutive meeting in Bolzano in October 2007. During the informal S4C meeting at the COST Conference on "Global Change and Sustainable Development in Mountains" (Innsbruck, April 2008), the S4C task force joined hands with the Carpathian Forestry Group. This resulted not only in the inclusion of active US scientists in the S4C information loop but had also a determinant impact on the quality and content of the 1st Forum Carpathicum.

The Institute of Geography and Spatial Management, Jagiellonian University, Kraków, Poland, EURAC, Joanneum Research, The University of Applied Sciences Eberswalde, Humboldt Universität zu Berlin, UNEP, and the MRI organized an S4C launching event in May 2008, which aimed at people from the Carpathian region. A crucial prerequisite for this event was the generation of a "Who's Who in Carpathian science" database established by the MRI including scientists having an interest in shaping future research activities in the region. Seventy people attended the first workshop and initiated the development of a research strategy for the Carpathian Mountains (Björnson Gurung et al. 2009; Ostapowicz and Sitko 2009).

In June 2008, two weeks after its official launch, the vision and preliminary goals of the S4C initiative were presented to the 2nd Ministerial Conference of Parties (COP2) of the Carpathian Convention in Bucharest, Romania (Björnson Gurung 2008). The Meeting adopted the Decision COP2/9, which welcomes the establishment of S4C as a platform of researchers for and in the Carpathians for the implementation of Article 12 (Environmental assessment and information system, monitoring and early warning) of the Carpathian Convention (ISCC 2008).

The partnership between S4C and MRI-Europe, starting in early 2008, turned out to be of mutual benefit for both, Carpathian researchers and the global MRI community. Similarly, the linkage between the science network and the ISCC not only has been an important stimulus to the strategic development of the initiative, but also a motivation factor for scientists to make their expertise available to policy makers. In 2008, S4C activities received an additional impetus when the MRI and the Institute of Interdisciplinary Mountain Research, at the Austrian Academy of Sciences started a joint implementation program with a focus on Central and Southeastern Europe.

In June 2009, the Institute of Landscape Ecology of the Slovak Academy of Sciences organized the first official planning meeting of the S4C initiative in

Bratislava, in cooperation with MRI-Europe, the Institute of Geography and Spatial Management, Jagiellonian University, ISCAR, the Swiss and Austrian Academies of Sciences, with the support of IGF, EURAC and the ISCC-UNEP. The meeting addressed the institutional setup and planning of the S4C network and nominated 14 members for the S4C Interim Scientific Steering Committee. A Memorandum describes tasks and responsibilities of the Steering Committee and outlines the objectives, as they are, for instance, the promotion of applied research, capacity building, improved networking and communication, and the support of sustainable development in the Carpathian region. At the same occasion, the 13 representatives of the Carpathian Academies of Sciences (Czech Republic, Hungary, Poland, Romania, Ukraine and Slovakia) who had accepted the invitation of the presidents of the Swiss and Austrian Academies discussed future directions of Carpathian research. They expressed high interest in the S4C activities and defined fields in which the Academies could contribute to foster research cooperation in the Carpathian region.

Since its launch in 2008, the S4C network has grown to 400 members by 2011 and is still growing. Its functioning is largely dependent from voluntary contributions of individual scientists. Despite national borders, a relatively weak tradition of scientific collaboration in the region and insufficient funding, the S4C network has an extraordinary sense of community and strong will to organize science at a pan-Carpathian scale. The Forum Carpaticum has already become a core activity of the network, complemented with communication tools such as the bi-monthly newsflash and the S4C website.

## **5 The Forum Carpaticum**

The Bratislava meeting was crucial to the development of the Forum Carpaticum: an open scientific conference devoted to the Carpathian region. Preparations to the 1st Forum gave a major impetus to the network development in the months to follow.

S4C benefited from the experience and expertise of ISCAR whose Office Manager was invited to Bratislava to provide insights on this Alpine research coordination effort with potential use for S4C. ISCAR promotes international cooperation in Alpine research. In 2000, the Alpine Conference recognized ISCAR as an official observer. In this function ISCAR provides research and scientific expertise to the official bodies of the Convention. Since 1994, ISCAR has organized the biennial Forum Alpinum with national partners. The Forum Alpinum is primarily a scientific conference aiming to promote international research cooperation on topics of relevance across the entire Alpine area. It has also been designed as an interface between the scientific community and the general public, providing opportunities for dialogue among various groups.

The 1st Forum Carpaticum 2010 was organized by the Jagiellonian University, Institute of Geography and Spatial Management, Kraków (15–18 September 2010)

and the S4C. In the style of the Forum Alpinum, it combined elements of a scientific conference, as a key to network development in the Carpathians, while offering workshops to stimulate the dialogue between research and practice. As the first mountain conference of this kind in the Carpathian region, the Forum's topic "Integrating nature and society towards sustainability" provided a wide framework within which representatives from a broad variety of disciplines could engage in the discussion on future research directions. 200 participants from 13 countries, mostly scientists but also practitioners and stakeholders (e.g., from the forestry sector), discussed the current status and emerging themes for future research (Ostapowicz 2010; Ostapowicz et al. 2010). The results were compiled and refined in the "Research Agenda for the Carpathians" (Kozak et al. 2011) and presented during the 3rd Meeting of the Conference of Parties to the Framework Convention on the Protection and Sustainable Development of the Carpathians in May 2011 in Bratislava, Slovakia.

## 6 Outlook

The Carpathian countries have the potential to develop a community of science, policy and practice based on the presumption that these forces can work together to tackle mountain issues at the Carpathian level. Building such community offers the opportunity to situate Carpathian mountain research and development at the European level in terms of recognition, resource use, as well as funding.

Together, the S4C network and the 1st Forum Carpaticum not only contributed to the visibility of the Carpathians in the global change research agendas for mountains but also induced new research ideas and activities with an attempt to link research, policy and practice. With the publication of the "Research Agenda for the Carpathians" (Kozak et al. 2011) the phase of developing research priorities draws to a close and attention shifts toward freeing capacity for the implementation of the identified priorities. As a next step, forces need to be mobilized and appropriate funding raised for research activities at the pan-Carpathian scale, which is both, a scientific and a political challenge.

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