



Journal of Alpine Research | Revue de géographie alpine

96-4 | 2008

Recherche alpine : spécificité et devenir

The European and Global Dimension of Mountain Research

An Overview

Axel Borsdorf and Valerie Braun



Electronic version

URL: <http://journals.openedition.org/rga/630>

DOI: 10.4000/rga.630

ISSN: 1760-7426

Publisher

Association pour la diffusion de la recherche alpine

Printed version

Date of publication: 15 December 2008

Number of pages: 117-129

ISBN: 978-2-200-92503-1

ISSN: 0035-1121

Electronic reference

Axel Borsdorf and Valerie Braun, « The European and Global Dimension of Mountain Research », *Revue de Géographie Alpine | Journal of Alpine Research* [Online], 96-4 | 2008, Online since 24 June 2009, connection on 04 May 2019. URL : <http://journals.openedition.org/rga/630> ; DOI : 10.4000/rga.630



La Revue de Géographie Alpine est mise à disposition selon les termes de la licence Creative Commons Attribution - Pas d'Utilisation Commerciale - Pas de Modification 4.0 International.

The European and Global Dimension of Mountain Research – An Overview

Axel Borsdorf, Valerie Braun

Institut für Geographie der Leopold-Franzens-Universität – Innsbruck
Axel.Borsdorf@uibk.ac.at
valerie.braun@uibk.ac.at

Abstract: Within the last century the awareness of mountain regions and their complex system has grown and the motivation to protect these regions has yielded numerous initiatives around the globe with the aim of acting internationally and politically as well as joining forces to intensify inter- and transdisciplinarity in scientific work. The challenges of mountain research in the future will be to involve politicians, stakeholders and the mountain population more effectively in order to miti-

gate the pressures of globalization towards a sustainable regional development within mountain regions. The significance of providing an overview of institutions representing mountainous regions around the globe lies in showing the main focus of the different institutions and the areas they work in.

Keywords: Sustainable development, mountain regions, mountain initiatives, networking.



“**N**ature and man in high mountains experience at the moment an astonishingly public and scientific interest supported by the raised awareness of importance, endangerment and protection of the environment in this fascinating as well as important ecosystem for mankind”; this was written 24 years ago by Uhlig and Haffner (Uhlig & Haffner, 1984: 1). In 1941 Carl Troll, the father of the comparative high mountain research, has already satisfactorily declared that with the institutionalization of the high mountain research by the German scientific community in association with the German and Austrian Alpine Club a first crucial impulse was set alongside with the comparative oceanography and the polar research (Troll, 1941). Neither Troll nor Uhlig & Haffner were able to foresee, that this interest was going to rise proportionally in the coming decades. As a matter of fact the motivation to protect these specific regions rose with the raising awareness that the mountains are sensitive indicators of the global climatic change, genetic reserve for endangered species, a storage for increasingly scarce resources like water, energy, and minerals, a retreating room for old cultures, have potential for many economic sectors like tourism, sports, and services, just to mention some of the most important facts. But not only has the awareness towards these specific regions increased they were also exposed to significant structural changes within the last century (EEA, 2002):

- Human impact such as tourism, transportation, traffic-caused fragmentation of biotopes, land-use change and also atmospheric pollution are strongly affecting many mountain areas with generally negative effects on biodiversity.
- Other mountains suffer by a weak infrastructure and accessibility or by severe ethnic and political conflicts.

- The global importance and also the 'pleasure values' of mountainous ecosystems for people are being recognised in more and more international and European political fora. Also the number of regional initiatives formulated for the protection and the sustainable development of Europe's mountains is increasing.

Thus especially in the Alpine region many initiatives were founded in order to protect and develop this sensitive region in a sustainable manner:

- In 1952 the *Commission Internationale pour la Protection des Alpes* (CIPRA) has been founded and has been working in support of sustainable development in the Alps. With its focus on sustainable development, CIPRA's objective is to exploit the potential of the Alpine space at many levels and to preserve its cultural and natural diversity. In 1952, the year of the organisation's foundation, CIPRA accordingly called for the creation of an international agreement for full protection of the Alpine space in the form of the Alpine Convention (<http://www.cipra.org/en/CIPRA>).

- The German *Arbeitsgemeinschaft für vergleichende Hochgebirgsforschung e.V.*, hosted by the Bavarian Academy of Sciences, has a long standing tradition in international comparative research on the mountains and was founded as early as 1965 (www.lrz-muenchen.de).

- 1991 an international agreement for the protection and the sustainable development of the Alps was signed by all Alpine states (Germany, Austria, Italy, France, Switzerland, Slovenia, the principalities of Liechtenstein and Monaco) – the *Alpine Convention*. (www.alpenkonvention.org). In 2003, following this model, the representatives of the Czech Republic, Hungary, Poland, Romania, Serbia and Montenegro, Slovak Republic and Ukraine signed a first agreement on the framework of the *Carpathian Convention* (www.carpathianconvention.org). It was promoted by the Carpathian EcoRegion Initiative (www.carpat.es.org).

- 1999 an *International Scientific Committee on Research in the Alps* was founded (ISCAR). Mainly national research Institutions signed the ISCAR-Convention: Austrian Academy of Sciences, Vienna; Pôle européen universitaire et scientifique, Grenoble (France); Bavarian Academy of Sciences, Munich (Germany); National Mountain Institute, Rome (Italy); Slovenian Academy of Sciences and Arts, Ljubljana (Slovenia); Swiss Academy of Sciences (SAS), Berne and the Swiss Academy of Humanities and Social Sciences.

- In 2001 the *Mountain Research Initiative* was created and is funded by the Swiss National Science Foundation SNSF and endorsed by the following programs: International Geosphere-Biosphere Programm IGBP, International Human Dimensions Programme on Global Environmental Change IHDP, Global Land Project GLP, Global Terrestrial Monitoring System GTOS, and the UNESCO Man and the Biosphere Programme UNESCO MAB (<http://mri.scnatweb.ch>).

- Every two years a *Forum Alpinum* takes place intending to bring together scientists from all alpine countries (to be interantional), from all disciplines (to be interdisciplinary), and with stakeholders from society, policy and economy (to be transdisciplinary) (Psenner, Borsdorf & Grabherr, 2003).

- In 2000 the European Union established within the frame of the European Territorial Cooperation Programme the INTERREG III B *Alpine Space Programme*. In the period between 2000 – 2006 the programme funded 57 transnational projects. In 2007 the programme continues in the Structural Fund running from 2007 to 2013. (Leitz & Fleury, 2006). The programme's overall aim is to increase the competitiveness and the attractiveness in the Alpine Space by supporting transnational projects fostering territorial development and cohesion (<http://www.alpine-space.eu/>).
- Based on an initial financing by the 6th EC framework programme the network *Global Change in Mountain Regions* (GLOCHAMORE) was initiated, which is ministered by the Mountain Research Initiative (MRI), Berne (Switzerland). The GLOCHAMORE project aimed at the development of a Global Change research strategy for mountain regions, in particular, for protected areas such as UNESCO MAB Biosphere Reserves (http://www.nbu.ac.uk/biota/glochamore_page.htm).
- The ESPON study “Mountain Areas in Europe: Analysis of mountain areas in EU member states”, acceding and other European countries” gave an excellent overview on structures and development in European mountain regions.
- Over the past years a set of scientific agendas were developed. The most important are the GLOCHAMORE Research Strategy, the research agenda of the International Committee for Alpine Research (ISCAR) and the Multiannual Working Programme of the Alpine Convention.

Yet also remarkable are the old and new initiatives on international mountain research. The consortium on comparative high mountain research seated in Germany has, as well as the IGU (International Geographic Union-Commission *Diversity in Mountain Systems*) a long tradition on high mountain research. The possibility of gaining international subsidies enabled a new dimension of international scientific projects. An important instrument for sustainable development within the mountain environment is the *Mountain Partnership*. The Food and Agriculture Organisation (FAO) of the United Nations established at the World Summit for Sustainable Development in 2002 this worldwide “International Partnership for Sustainable Development in Mountain Regions” (www.mountainpartnership.org). The international network is a voluntary alliance of partners dedicated to improving the lives of mountain people and protecting mountain environments around the world.

Thus one could argue that mountain research on the European and even global level has obtained a high level. This is doubtless a result of the growing attention to environmental and development issues, which got decisive impulses by the 1992 Rio de Janeiro *United Nations Conference on Environment and Development* (UNCED) through the inclusion of a specific chapter in Agenda 21 and the following conferences. It became obvious that mountains serve as the water towers for the lowlands, which highly depend on their resources. Furthermore it became clear that the impacts of global warming are affecting the mountains more intensively than the lowland areas, and the economical, political and cultural globalisation has an enormous impact on mountain regions.

The importance of mountain issues has been recognized by the international community as one of the world's most vulnerable bio-geographical areas susceptible to land degradation, having variable climates, heterogeneous habitats often with the unique fauna and flora. Mountainous areas are frequently considered as 'water towers' for fresh water resources and areas suffering from loss of indigenous culture and traditions. We should also take into account the uncertainty of this fragile environment which might call for some short term measures to save certain critical biodiversity. For instance, the *Global Environment Facility* (GEF) Operational Strategy identifies mountains as one of the priority ecosystems where biodiversity needs to be conserved.

This is why mountain research was pushed all in the last decades and the science capacities and human capital in the universities and research institutions are quite high. This is reflected for instance by the application of more than 140 pre-proposals to the first call of the INTERREG IVb Alpine Space Programme. However only 22 of the proposals presented in the first call were selected to deliver a full proposal. So the remarkable potential of science is only to a small part in valued for the necessary progress of research in mountain regions.

The European Dimension

RESEARCH

The EEA report on the Alpine region (2002) states that the mountains of Europe constitute a unique biogeographic region. It includes some of the oldest and most recent mountains of the world; the Alps, the Scandes, the Pyrenees, the Carpathians, the Rhodopes, the Urals, the Caucasia and the Dinaric Alps. It covers a region of 780.000 km² in 22 countries or 14% of the EU. In general, the Alpine biogeographic region exhibits a great variety of ecosystems and habitat types, of which 90% are natural or semi-natural. Forests cover more than 40 % of the region's area and grasslands ca 25%. The region is of great importance as refuges for plants and especially so for animals with large area requirements. It further constitutes an in situ gene bank for numerous species (EEA 2002).

European mountain research faces a great variety of issues comprehending e.g. changes in high mountain ecosystems due to global climate changes as well as socio-economic changes in remote mountain valleys. Future development within mountain research within Europe will focus more on trans-disciplinarity and transnational cooperation. The Alpine Space Programme 2007-2013, INTERREG IVb, for example focuses on increasing competitiveness and attractiveness of the cooperation area by developing joint actions in fields where the transnational cooperation is required for sustainable solutions (see <http://www.alpine-space.eu/about-the-programme/objectives-and-strategies>). To foster sustainable development the bottom up approach is becoming increasingly important involving local stakeholders and population with workshops in the decision making process. Even within research projects these methods become important like within the Alpine Space Interreg IIIb DIAMONT project where indicators and instruments were discussed in six test regions in five Alpine countries to develop new strategies for regional sustainable development.

One of the main objectives and challenges for the future will for example be to homogenize the Alpine wide existing statistical data of different states and issues to strengthen transnational cooperation and political decisions. This task has already been undertaken within an Alpine wide atlas (Tappeiner, Borsdorf & Tasser, 2008) serving as a reference work. But for political decision making a harmonized data set available for the public will have to be necessary. Another interalpine database on steering instruments for sustainable development in alpine regions and on best practice models already exist and proved its practicability in the DIAMONT project (www.diamont-database.eu).

INSTITUTIONS

Within Europe the sustainable regional development of mountain regions and their protection has become of increasing importance and therefore these are the main objectives of many transnational organisations, like the Alpine as well as the Carpathian Convention. Both Conventions are supported by the European Union and work on transnational political influence on issues concerning these mountain areas. Some of the institutions were again funded only after the Rio world summit in 1992 (see above) to bring together the mountain community on a scientific level. The following list is a completion of the above listed on European institutions and does not claim to be complete:

- As early as in 1907 the French geographer Raoul Blanchard founded the *Institute of Alpine Geography* (IGA) at Grenoble, and from 1913 the *Revue de Géographie Alpine* is the leading journal of Alpine geographical research, which in 2004 started to be a bilingual journal (French and English; <http://iga.ujf-grenoble.fr>).
- This may be regarded as the model for the creation of other multidisciplinary mountain institute in Italy (Imont, now: EIM: *Ente Italiano della Montagna*; www.eim.gov.it) and the *European Academy Bolzano/Bozen* (EURAC, www.eurac.org), France (*Institut de la Montagne*; www.institut-montagne.org), Germany (*Alpenforschungsinstitut GmbH*; www.alpenforschung.de) and, to a certain degree Slovenia (*Anton Melik Geographical Institute* AMGI: <http://gi.zrc-sazu.si>).
- The *Mountain Research Group* (MRGI) is a special interest group of the Royal Geographical Society with the Institute of British Geographers (RGS-IBG) with the objective to form a mountain community for scientists working in this field (www.cms.uhi.ac.uk/rgsmrg/).
- Within the 6th Framework Programme of the European Union a Marie Curie Research and Training Network on *Mountain Risks from Prediction to Management and governance* was installed. The INTERREG IIIc (Sud) project *Euromountains.net* dealt with the improvement of the public and private services in mountains (infrastructure, culture and leisure time, health and social services, etc); the development and improvement of mountain resources and quality products; and furthermore with the management of the fragile mountain landscape, rural environment and natural resources.

CHALLENGES

The challenge of European mountain research in the future will be on the one hand to achieve a better coordination on ongoing mountain research linking different research groups together and on the other hand to disseminate the results and achievements on mountain among politicians and stakeholders. With globalization the demand on natural resources on mountain areas is increasing and this will require an adjustment of international political actions within tourism, economy and transit traffic. Within the last two decades many of the above mentioned institutions have helped to raise the political awareness on the needs on mountain regions but the pressure due to globalization will be cumulating. Every above mentioned institutions intent to increase the awareness on sustainable development within the mountain regions as well as to raise funds for research groups.

The Global Dimension

RESEARCH

Mountains occupy about a quarter of the Earth's land surface and host 12 per cent of the global population (700.000 people), whereas other 40 per cent live in adjacent medium and lower watershed areas. In temperate climates the population is concentrated to the lower levels of the mountains (up to 2000 m); in tropical climates mountains also include megacities like Mexico-City and Jakarta, and other large urban agglomerations (Bogotá, La Paz, Quito and others). As sources of water, energy, agriculture, forestry, and as centres of biological and cultural diversity, religion, recreation and tourism, mountains are important for at least half of humanity (Messerli & Ives 1997, see also Price, Jansky & Iatsenia 2004). In conclusion, mountains indeed have a global importance.

The people of mountain areas face major challenges. About half of them are vulnerable to food shortages and chronically malnutrition. Mountain people suffer more than others from the unequal distribution of assets and from conflicts. Global change, natural hazards like floods, land slides mudslides, avalanches and earthquakes, economic, cultural and political globalisation threaten the complex webs of life that mountains support. Moreover the rapid melting of glaciers and the degradation of watersheds is reducing the availability of life-sustaining water and increasing the conflict over dwindling supplies (Bishkek Mountain Platform 2001; Price, Jansky & Iatsenia 2004: 238-243).

In this context global mountain research focuses on the topics of mountain resources, global change, risk assessment, sustainable regional development, degradation, conservation and protection strategies for environment and cultures, poverty, connectivity, capacity building, governance, and conflict management.

Alexander von Humboldt may be regarded the father of comparative mountain research (Borsdorf, 2001; Ette, 2001). Like his contemporary Austrian fellow Thaddäus Haenke both are often called to be the soft conquerors of the Andes, making clear that scientific work in the field of international comparative mountain research is never related to polit-

ical or military purposes. In the 20th century the German geographer Carl Troll, followed by the ecologist Walter Hellmich, originated the modern design of mountain comparative approaches, which is now a powerful and high productive research focus. The Austrian Norbert Krebs even developed his methodology of a “Comparative Regional Geography” based on their results. Among the contemporary geographers Eckard Ehlers, Hermann Kreutzmann, Matthias Winiger, Michael Richter, Ulrike Möller-Böker, Martin Price and others may be mentioned. The concepts of vulnerability and resilience of mountain regions were sharpened in the mountains of the world, as well as the geography of conflicts, protected areas, and sustainable development.

Global change and regional sustainable development in mountain regions are the most prominent research subjects nowadays, followed by hazard and risk research. It is not by chance that the Helmholtz initiative “Risk Habitat Megacity” chose the mountain capital Santiago de Chile (and in future: Bogotá; www.risk-habitat-megacity.ufz.de) as the anchor cities of its research. At Innsbruck, the Faculty of Geo- and Atmospheric Research, created the research focus “Global Change and Regional Sustainability” (www.uibk.ac.at/geographie).

In the last years the shortage of resources got more and more attention in politics and science. The “limits of growth” were first defined in 1972 by the Club of Rome. However the impact of this finding was repressed in the following decades, when the two oil-crises were easily substituted by an active global economy. However, the scarcity of energy, water, minerals, the demand for fresh air and unpolluted water once more – and in a dramatic way – became evident once more in the last years. Mountains fulfil a great variety of ecosystem services for their own region, but even more for the piedmont and the even the lowlands, far away from the mountain ranges and for the whole globe. Thus research more and more addresses itself to these decisive questions for the future of mankind.

INSTITUTIONS

In order to address the various topics and to create a global network a set of organisations around the globe were founded to connect institutions, disseminate information and to provide input as well as to involve policy makers and stakeholders in the sustainable development of mountain regions. Many of these networks were established after the *United Nations Conference on Environment and Development* (UNCED). Regarding that most of the institutions were established in the 1990s the fate of the mountains was largely ignored until then in the deliberations of governments and organizations worldwide. The *Agenda 21*, a programme run by the United Nations (UN), is an international cooperation to accelerate sustainable development in developing countries and related domestic policies. Within the Agenda 21 the sustainable mountain development was implemented within chapter 13. In 1998, a resolution of the UN General Assembly declared that 2002 would be the *International Year of Mountains* (IYM). This resolution was supported by 130 countries. The full implementation of Agenda 21, the Programme for Further Implementation of Agenda 21 and the Commitments to the Rio principles, were strongly reaffirmed at the World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa

in August / September 2002. The WSSD devoted the Paragraph 42 of its Plan of Implementation to Mountains, and a global 'Mountain Partnership' was established.

The following section will list only but some of the global mountain networks, but does not claim to be complete:

- The *Global Mountain Program* (GMP) was established in 1997 to address Chapter 13 of Agenda 21. The program received support from the Swiss Agency for Humanitarian Aid and Development Cooperation (SDC) and the International Development Research Center (IDRC) (www.globalmountainprogram.org).

- The *International Centre for Integrated Mountain Development* (ICIMOD) is an independent regional knowledge, learning and enabling centre serving the eight regional member countries of the Hindu Kush-Himalayas (HKH) and the global mountain community. Founded in 1983, ICIMOD is based in Kathmandu, Nepal, and brings together a partnership of regional member countries, partner institutions, and donors with a commitment for development action to secure a better future for the people and environment of the Hindu Kush-Himalayas (www.icimod.org/home).

- The *Mountain Research Initiative* (MRI) was initiated as a joint project of IHDP (International Human Dimensions Program on Global Environmental Change) and IGBP (International Geosphere-Biosphere Program) and is funded by the Swiss National Science Foundation. It is also endorsed by the Global Land Project, the Global Terrestrial Monitoring System and by the UNESCO Man and the Biosphere Programme. The MRI coordinates the international high mountain research with the objectives to develop strategies for detecting signals of global environmental change in mountain environments; to define of the consequences of global environmental change for mountain regions as well as lowland systems dependent on mountain resources (highland-lowland interactions) and to design proposals towards sustainable land, water, and resource management for mountain regions at local to regional scales. One of the MRI projects is the *GLOCHAMORE* (Global Change in Mountain Regions) project. The European Agenda will be overtaken by the Research Unit Mountain Research: Man and Environment (IGF) at Innsbruck in 2008 (<http://mri.scnatweb.ch>).

- The *Mountain Partnership* was launched at the World Summit for Sustainable Development in Johannesburg (2002). It taps the wealth and diversity of resources, information, knowledge, and expertise of its members to support positive change in mountain areas. Presently, 48 countries, 15 intergovernmental organizations and 88 major groups (e.g. civil society, NGOs and the private sector) are members (www.mountainpartnership.org/default.asp).

- The *International Mountain Society* (IMS) is an association registered in Berne, Switzerland, for the purpose of advancing knowledge and disseminating information about mountain research and mountain development throughout the world. The IMS aims to promote sustainable mountain development through improved communication among institutions and individuals, with a particular focus on mountain ecoregions in the devel-

oping world. In pursuing this purpose, it collaborates with like-minded institutions. The IMS is a joint copyright holder and publisher of the journal *Mountain Research and Development (MRD)* (www.mrd-journal.org).

- The *International Permafrost Association*, founded in 1983, has as its objectives to foster the dissemination of knowledge concerning permafrost and to promote cooperation among persons and national or international organizations engaged in scientific investigation and engineering work on permafrost (www.ipa-permafrost.org).
- The *Mountain Forum* was founded in 1996 and originated from events following the 1992 Earth Summit in Rio. Mountain Forum's mission is to promote global action toward equitable and ecologically sustainable mountain development and conservation through information sharing, mutual support and advocacy (www.mtnforum.org).
- GLORIA (*Global Observation Research in Alpine Environments*) was initiated 1999 by the University of Vienna and the Austrian Academy of Sciences within a 5FP of the European Union and aims to establish and maintain a world-wide long-term observation network in alpine environments. Vegetation and temperature data collected at the 60 GLORIA sites will be used for discerning trends in species diversity and temperature. The data will be used to assess and predict losses in biodiversity and other threats to these fragile alpine ecosystems which are under accelerating climate change pressures (<http://www.gloria.ac.at>).

Nevertheless, one of the most significant decision regarding mountains taken by the UN General Assembly in November 1998 was designating the year 2002 as the *International Year of Mountains*. Twenty-five years ago the United Nations University introduced a *Programme on the Use and Management of Natural Resources*. It was initiated by Walter Manshard and originally was focussed on applied research and training in the humid tropics and subtropics. One component involved the study of "Highland-Lowland Interactive Systems". In practice, it served as the UNU mountain project and has evolved formally into "Mountain Ecology and Sustainable Development."

The *UNU University Mountain Project* in partnership with the Centre for Development and Environment (CDE) at the University of Berne, has since then developed a comprehensive programme on sustainable mountain development. It aims to contribute to improved understanding of the status of different mountain systems in relation to global change, the pressures these mountains are exposed to, including their consequences on human, natural, economic resources, and the responses created by different social groups and mountain societies. Mountain problems can also be mitigated by identifying the potentials and dynamics of social systems embedded in specific economic environments, and by identifying innovative solutions. The text below is widely orientated to the official presentation of this organisation (www.unu.edu/mountains2002).

At the beginning four components were included: agro-forestry systems; rural energy systems; water-land interactive systems; and highland-lowland interactive systems. The programme was subsequently enlarged to embrace arid and semi-arid lands, encompassing additional administrative components. A project co-ordinator, usually from an established

university, was appointed to take charge of each unit. Initially, every six months the project coordinators were invited to the UNU Centre in Tokyo for planning purposes.

Some quite prominent researchers who gave their impulses to the project were Jack D. Ives, Bruno Messerli, Gerardo Budowski and Hans Hurni. They encouraged the extension of the project to Yunnan, China, the Andes, Tajikistan, and Madagascar. The project had clearly become global in nature and a large number of institutional linkages evolved. The theoretical basis was closely linked with UNESCO's *MAB Programme* and the *Commission on Mountain Geocology* of the International Geographical Union. It facilitated the establishment of the *International Mountain Society* in 1980 and the quarterly journal *Mountain Research and Development* the following year. Thus, applied and fundamental research and the training of young scholars were the hallmarks of the project. Strong support was given to the formation of the *African Mountain Association* and the *Andean Mountain Association*. Moreover, elements of the research had repercussions that were far more significant than could have been anticipated at the time. This began when early results of the research in Nepal disproved the influential belief in catastrophic Himalayan environmental degradation.

Throughout most of the last thirty years the major aid and development agencies centred much of their investment in the Himalaya on the pursuit of policies based on an unsound assumption. This presumed that the Himalaya is facing an environmental crisis driven by massive deforestation of the mountain slopes by the rapidly expanding subsistence agricultural populations who depended upon forest products. This was causally linked with soil erosion and landsliding and increasingly severe flooding in distant lowlands. An international conference, held at Mohonk Mountain House, New York State, in 1986 brought this dominating paradigm under critical scrutiny. It was found to be basically unsound; the supporting arguments were published by Ives and Messerli (1989).

This process of fundamental research followed by open discussion exemplified the unique opportunity that academic status provides for UNU. Unlike the more policy-oriented United Nations agencies, it is better able to tackle politically sensitive issues.

Even more orientated to the issue of biodiversity is the *Global Mountain Biodiversity Assessment* (GMBA; <http://gmba.unibas.ch/research/research.htm>). It acts as a global network on mountain biodiversity research of *DIVERSITAS* (www.diversitas-international.org), an international global change research programme on biodiversity sciences and actively explores and explains the great biological richness of the mountains of the world. GMBA seeks to provide input to policy makers and stakeholders for the conservation and sustainable use of biodiversity in mountain regions. It was initiated by the Swiss Academy of Sciences and inaugurated by *DIVERSITAS* in 2000 in fulfilment of Agenda 21.

- GMBA aims at actively exploring and explaining the great biological richness of the mountains of the world and its responses to global change
- synthesizing often hidden and fragmented results of research on mountain biodiversity

- shaping a global corporate identity for a scattered research community
- increasing the visibility of mountain biodiversity issues
- advocating studies on the human influence on natural and cultural landscapes in the mountains
- encouraging sustainable development of rural upland areas
- providing input to policy makers and stakeholders

Parallel to these initiatives, revilingly orientated to the formation of networks, some outstanding research institutions on the global scale of mountain research should be mentioned.

The *Institute of Arctic and Alpine Research* (INSTAAR; <http://instaar.colorado.edu>) strives for excellence in research, education, and outreach related to Earth System Science and Global Change in high-latitude, alpine, and other environments. INSTAAR is located at the University of Colorado. It develops scientific knowledge of physical and biogeochemical environmental processes at local, regional and global scales, and applies this knowledge to improve society's awareness and understanding of natural and anthropogenic environmental change. The world's high-altitude and high-latitude regions are the Institute's traditional focus due to their sensitivity to environmental change. INSTAAR has increasingly broadened its geographic focus in a wide range of interdisciplinary studies of Quaternary and modern environments, research into geochronology, human and ecosystem ecology, hydrology, oceanography, landscape evolution, biogeochemistry, and climate. INSTAAR is the publisher of the well-known journal *Arctic, Antartic, and Alpine Research*.

- In 2000 the *Centre for Mountain Studies* (CMS; (www.cms.uhi.ca.uk)) was established at Perth College, with the objective of creating a centre of excellence for work in mountain areas within the emerging University of the Highlands and Islands. With a focus on mountain environments and the people who depend on them, both in Scotland and internationally, the CMS has four main goals: to undertake and communicate high-quality research;
- to convene meetings to disseminate and discuss knowledge and to develop research agendas;
- to contribute to informed policy-making processes;
- to lead in the development and delivery of academic courses and training.

With similar objectives the Austrian Academy of Sciences in 2006 founded its research unit for *Mountain Research: Man and Environment*, currently in the process to be transformed to an Institute for International Mountain Research. It is orientated on the different scales of global, international, national and regional dimensions to basic research, which opens itself to applications on the social, economical and political level, realizing comparative and regional specific investigations. The main topic is research on global change (climate warming and socio-economic globalisation and their consequences in mountain regions).

On a methodological level it aims to contribute to more effective methods in monitoring, remote sensing and laserscanning, modelling, simulation and scenario-techniques, visualisation, web-based geo-information systems, triangulation of quantitative and qualitative methods. The team is composed in a multi-disciplinary way, but aims to interact inter- and transdisciplinary or even post-disciplinary. Located at Innsbruck, Tyrol, it co-operates intensively with the university's research platform on Alpine research and the competence centre for hazard and risk management (www.oeaw.ac.at/igf). IGF is the publisher of the book series "Internationale Gebirgsforschung", and – beginning in 2009 – the *eco.mont – Journal of Protected Mountain Areas Research*.

Challenges

Global mountain research seems to be well organised in networks and research institutions. Although there might still exist a certain lack of efficiency, but there are indicators to improve the international and interdisciplinary cooperation (for options see: Masetti, Lys & Schmid 2007).

Mountain research is a real need, since the stress of global change effects not only the mountain themselves, but also the adjacent regions and the distant lowlands and even the global eco- and socio-ecological systems. However it seems that the expertise and competence of so many excellent researchers is not quite enough to be recognized by politicians and economists. In order to alert this the UNU university's Mountain Project, the GMBA and lately the IGF started a series of conferences, designed for politicians, to rise their consciousness on the sensibility, vulnerability, the important ecosystem functions and the severe social, ethnical, ecological, and economical problems of the world's mountain regions. The Innsbruck conferences *Managing Alpine Future* (2007) and *Global Change and Sustainable Development in Mountain Regions* (COST Strategic Conference 2008) reached both about 400 participants, among them many politicians, of 32 countries to improve the awareness of these problems. However, strategies for sustainable development of mountain regions cannot only be found by the cooperation of researchers and stakeholders, they must include the mountain population also. It seems, that this last step was not yet undertaken in a sufficient way.

A last challenge may be mentioned: Facing the challenges of climate and global change in mountain regions inter- and transdisciplinarity may not be enough. With the rise of post-modern thinking new concepts of post-disciplinarity or mode-2-research are discussed and may help to overcome the limited perspectives of specialists to get a more appropriate and comprehensive view of the mountain eco-socio-systems, in order to understand better and steer more efficiently the complex regional compounds. We need more Humboldts, and less (early) Oppenheimers.

References

- BISHKEK MOUNTAIN PLATFORM, 2001. – *United Nations General Assembly documents A/C.2/ 57/7* <http://www.globalmountainsummit.org/platform.html>.
- BORSDDORF A., 2001. – “Alexander von Humboldts »Amerikanische Reise« und ihre Bedeutung für die Geographie”. In: Ette, O. & W. L. Bernecker (eds.) *Ansichten Amerikas. Neuere Studien zu Alexander von Humboldt. Lateinamerika Studien* 43, Frankfurt/M, pp. 137-156.
- BORSDDORF A., 2005. – “Das Internationale Jahr der Berge, ein wissenschaftlich produktives Jahr für die Gebirgsliteratur”. *Die Erde* 135, 2, pp. 232-235.
- BORSDDORF A., 2006. – „Politische Rahmenbedingungen alpiner Raumentwicklung und Rauminformation. Das Europäische Raumentwicklungskonzept, die Alpenkonvention und die EFRE Programme in Relation zu DIAMONT“. In Borsdorf, A. & S. Lange (eds.): *Politische, kulturelle und wissenschaftliche Perspektiven der nachhaltigen Raumentwicklung in den Alpen*. Alpine Space: Man & Environment 2. Innsbruck, pp. 21-36.
- EEA – European Environment Agency (ed.), 2002. – *Europe’s Biodiversity. The Alpine Region – Mountains of Europe*. Brussels.
- ETTE O., BERNECKER W. L. (eds.), 2001. – *Ansichten Amerikas. Neuere Studien zu Alexander von Humboldt. Lateinamerika Studien* 43, Frankfurt/M.
- IVES J. D., MESSERLI B., 1989. – *The Himalayan Dilemma: Reconciling Development and Conservation*. London & New York.
- MASETTI D., LYS J.-A., SCHMID J., 2006. – *Improving Impacts of Research Partnerships*. Berne.
- MESSERLI B., Ives J., 1997. – *Mountains of the World. A Global Priority, a Contribution to Chapter 13 of Agenda 21*. New York.
- PRICE M., JANSKY L., IATSENIA A.A. (eds.), 2004. – *Key Issues for Mountain Areas*. Tokyo.
- PSENNER R., BORSDDORF A., GRABHERR G. (eds), 2003. – *Forum Alpinum 2002. The Nature of the Alps*. Wien.
- SWISS BIODIVERSITY FORUM, 2002. – *Visions in biodiversity Research. Towards a new integrative biodiversity science*. Berne.
- TAPPEINER U., BORSDDORF A., TASSER E. (eds.), 2008. – *Alpenatlas – Atlas des Alpes – Atlante delle Alpi – Atlas Alp – Mapping the Alps*. Heidelberg.
- TROLL C., 1941. – *Ökologische Landschaftsforschung und Vergleichende Hochgebirgsforschung*. Bonner Mitteilungen 21, 1941.
- UHLIG H., HAFFNER W. (eds.), 1984. – *Zur Entwicklung der vergleichenden Geographie der Hochgebirge*. Wege der Forschung 223. Darmstadt.