

Global Initiatives

Global Observation Research Initiative in Alpine Environments (GLORIA)

GLORIA is a worldwide, long-term observation network in alpine environments – it collects data on vegetation and temperature which yield information used to assess and predict losses in biodiversity and other threats related to climate change. To date, it is comprised of a network of more than 50 working groups in 61 target regions on 5 continents. www.gloria.ac.at

The focus on summit areas

A key advantage that high mountain areas have over lowlands is that, with increasing altitude, ecosystems become less complex and factors related to temperature become more important. Another advantage is that they are less prone to direct human impact– the higher the elevation the less likely that the effects of warming can be confused with those created by human intervention. For these reasons high mountain ecosystems are particularly suitable as global indicators of global warming.

Mountain biodiversity provides information about the integrity of the entire mountain ecosystem. GLORIA studies vascular plants in particular because they (1) occur over a wide range of high mountain systems (from humid to arid regions), (2) are often specific to a certain elevation belt, (3) are of fundamental importance for ecosystem functioning, (4) can be readily recorded in the field (since they are sessile and macroscopic), and (5) experts are mostly available for study of this organism group. Among climate variables, soil temperature is measured since it is of outstanding ecological importance not only for the temperature regime itself but

also for detecting the length of the snow-cover period, and it is relatively easy to measure compared to other variables.

The design and sampling method

Each GLORIA sampling site consists of permanent plots around a summit. Detailed sampling of species' cover within each quadrant provides a baseline for detecting changes in species' composition; repeat measurements at different time intervals are used to detect changes in vegetation patterns.

GLORIA – implementation of the network

GLORIA is a worldwide community of ecologists committed to establishing the foundations of a long-term programme that will yield results for future generations. GLORIA sites are deployed in the alpine zone across every altitude, latitude, and longitude of the planet's major biomes. GLORIA's simple approach has made it possible to establish numerous sites within and across continents. As of November 2008, GLORIA had 30 active target regions in Europe, 14 in North America, 8 in South America (with 11 additional sites planned for 2009) and 3 in Australasia. No sites have been established in Africa but there have been several expressions of interest. GLORIA is still underrepresented in Asia where at present only 6 sites are active. Within the Hindu Kush-Himalayan Region, sites are established in Yunnan and Sichuan (China), and setup of new sites in Nepal, Sikkim (India), and Tibet (China) is planned for 2009 and 2010.

GMBA – Global Mountain Biodiversity Assessment: a DIVERSITAS network

GMBA is a cross-cutting network of DIVERSITAS which actively explores and synthesises findings from research into mountain biodiversity and provides a link between science and policy. GMBA documents and synthesises knowledge on mountain biodiversity and communicates these findings to international policy fora and interested institutions. At present, GMBA is a network of about 400 researchers and policy makers in the field of mountain biodiversity, and 946 subscribed members, in 71 countries.

The Swiss Academy of Sciences and DIVERSITAS played an active role in the creation of GMBA in 2000 in fulfilment of the objectives of Agenda 21. GMBA is a research network that looks at how high elevation biological diversity is responding to global changes. To provide a complete picture, GMBA looks at all 3 dimensions; the horizontal, biogeographic dimension with a zonal emphasis on the global scale; the vertical bioclimatic dimension with elevation transects on a regional scale; and the temporal dimension,

looking at past, present, and future situations by revisiting sites and using modelling.

GMBA attempts to make the most of the data extant and often synthesises hidden and fragmented results of research on mountain biodiversity to bring them to the attention of a widespread audience. By increasing the visibility of mountain biodiversity issues, GMBA helps to shape a global corporate identity for a scattered research community. GMBA advocates studies on how human activities have impacted natural and cultural landscapes in the mountains. GMBA encourages the sustainable development of rural upland areas. It provides data and information in a format usable to policy makers and stakeholders.

Mountain biodiversity data mining

GMBA, in cooperation with the Global Biodiversity Information Facility (GBIF), is encouraging a worldwide effort to mine geo-referenced databases on mountain organisms since accurate geographical coordinates and altitude specifications (georeferences) of observed or collected biological species are the vital link between

biological data and other geophysical information. Functional insight and theory will only emerge from large-scale cross-continental comparisons of the upper montane zone, the treelike ecotone and the alpine regions, and elevation transects.

Electronic archives of biological data are a novel way of testing evolutionary and ecological theory throughout the world's mountain ranges. The separation of global from regional environmental conditions along elevation transects provides new perspectives and paves the way for a fresh understanding of how mountain biota adapt. Similarly, information on rock chemistry and mountain topography offers test conditions for soil-related drivers of biodiversity and species' radiation and in an evolutionary context across a suite of geographical scales.

GMBA and GBIF are constructing a thematic Internet portal which will make it possible to search a vast archive for data on mountain biodiversity, and permit GBIF data to be used in a mountain-specific context in which geo-referencing will make it possible to link biological information with other geophysical data.

The Mountain Research Initiative (MRI)

MRI promotes and coordinates research on global change in mountain regions around the world and, through its regional networks, it catalyses the interdisciplinary research needed to fill current knowledge gaps. MRI is not a biodiversity research network per se, but rather seeks to complement such work by facilitating long-term monitoring of environmental change in mountain regions, integrated model-based studies, process studies, and providing advice on sustainable land use and natural resource management through the promotion and coordination of research. In its seven years of existence, it has actively participated in the design of the international research agenda and through its regional networks has catalysed interdisciplinary research.

Actions on the global level: design of an international research agenda

The first major product of MRI was a 700-page compendium on 'Global change in mountain regions – An overview of current knowledge'. This set the groundwork and was followed by the GLOCHAMORE (Global CHange in MOuntain Regions) Project that coupled globally with UNESCO's Mountain

Biosphere Reserves. The GLOCHAMORE Research Strategy, the Project's final product, is an integrated and implementable research strategy to improve understanding of the causes and consequences of global change in mountain regions around the world.

How can MRI work regionally to fill scientific gaps?

MRI supports the work carried out by regional scientists through its four programme activities.

- Promoting inter- and transdisciplinary research on mountains by enlisting key scientists to work through their own national or multinational research funding agencies
- Helping to create the type of research proposed in the GLOCHAMORE strategy by supporting the formation of new research partnerships and catalysing groups and individuals to develop project proposals
- Focusing the community's attention on some of the most important issues in mountain regions by facilitating the development of peer-reviewed papers on specific key scientific issues, and the transfer of knowledge from scientists to managers

- Creating a more solid sense of community among researchers working on global change in the mountains by distributing relevant information and increasing the flow of information between them.

How does MRI foresee its work evolving in the coming years?

The history of MRI is a move from abstract ideas towards concrete activities and real people. Whereas the compilation of the GLOCHAMORE Research

Strategy was an intellectual challenge – defining and evaluating globally compelling global change research topics – the challenges now are much more human and entrepreneurial. MRI is headed in this direction.

During the 2007-2010 funding period MRI will continue its activities and continue to work through its three regional networks: MRI Africa, MRI American Cordillera, and MRI Europe and by 2010 MRI foresees expanding these activities to the Asian mountains.

ICIMOD's Biodiversity Portal

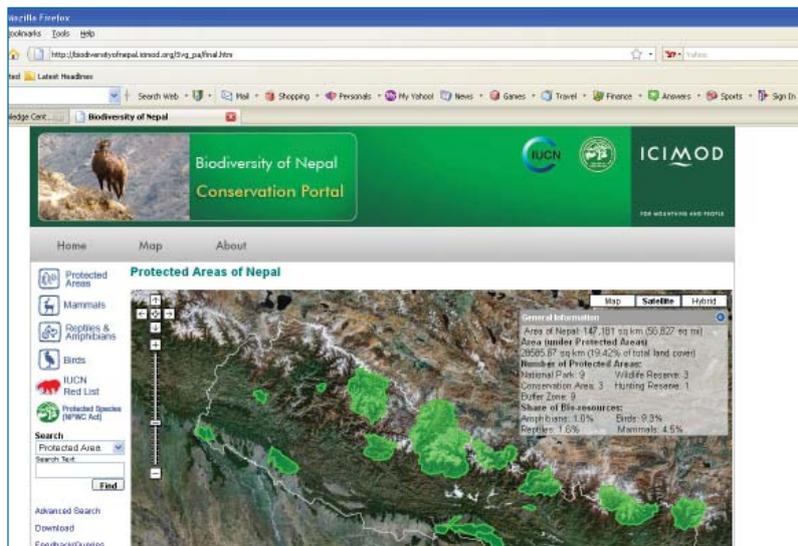
ICIMOD has recently developed a 'Biodiversity of Nepal' conservation portal in collaboration with IUCN and the Department of National Parks and Wildlife Conservation, as a means of sharing and providing access to information about natural resources and biodiversity in Nepal. A database and interactive mapping feature provide information on protected areas, mammals, reptiles and amphibians, birds, the IUCN Red List, and protected species.

<http://biodiversityofnepal.icimod.org>.

A regional approach

It is essential for conservation in the HKH to understand the driving forces behind environmental factors such as changes in the use of land, water, and energy; sensitivity and vulnerability to environmental variations and changes; and responses to and choices for managing environmental resources. However, most of these drivers are regional, multilateral, or at least bilateral, and cannot be studied on a country basis alone. Furthermore, information related to biodiversity, natural resources, and livelihoods in the HKH is sparse, and much of the information that is available is of poor quality and/or difficult to access. Thus in future, we hope to convert the Nepal-specific conservation portal into a Mountain Biodiversity Portal. This decision was taken at the workshop on 'Linking Geodata with Biodiversity Information in the Himalayas' held in November 2008.

The current, geo-referenced information portal will become a regional database for the HKH region using a decentralised and distributed network of



national partner institutions from participating member countries. The database will be of international standard and compatible with those of the Global Mountain Biodiversity Assessment (GMBA) and Global Biodiversity Information Facility (GBIF). It will facilitate exchange with other international agencies such as the Global Earth Observation System of Systems (GEOSS), IUCN, Ramsar Sites, Important Bird Areas (IBA), World Wide Fund for Nature (WWF), United Nations Environment Programme (UNEP), Critical Ecosystem Partnership Fund (CEPF), Food and Agriculture Organization (FAO), WESCOM, National Geographic, and others.

At a later stage, we will consider the possibility of using the portal to provide a decision support system (DSS) with combinations of simulation modelling, optimisation techniques, geographical information systems (GIS), and associated databases and user interface components.