IHDP UPDATE

NEWSLETTER OF THE INTERNATIONAL HUMAN DIMENSIONS PROGRAMME ON GLOBAL ENVIRONMENTAL CHANGE

01/2002

FOCUS:
MOUNTAINS

GLOBAL CHANGE AND MOUNTAINS

The need for an integrated approach to address human security in the 21st century | BY MEL REASONER, LISA GRAUMLICH, BRUNO MESSERLI AND HARALD BUGMANN

Photo: F. Jäger

➤ **Mountain regions represent about one fourth of the Earth's terrestrial surface,** provide goods and services to more than half of humanity and are in the nearby environs of approximately one fourth of the global population. Accordingly, they received attention at the highest level during the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro with the inclusion of Chapter 13: "Managing Fragile Ecosystems – Mountain Sustainable Development" in Agenda 21. Together with the UN declaration of the year 2002 as the "International Year of Mountains", these measures underscore the critical function of mountain ecosystems in providing goods and services such as water resources, forest products, refugia for threatened species, and unspoiled recreation areas for a rapidly growing and urbanized world population. In order to address the consequences of global change in mountains around the world, an initiative for collaborative research on global change and mountain regions – the **Mountain Research Initiative (MRI)** – was developed and officially launched in July 2001. This initiative aims to achieve an integrated multidisciplinary

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IHDP Update is published by the International Human Dimensions Programme on Global Enviromental Change (IHDP), Walter-Flex-Str. 3, 53113 Bonn, Germany, V.i.S.d.P.: Elisabeth Dyck

EDITORIAL

This issue of UPDATE, IHDP's quarterly newsletter, is special in several ways. Published since 1997, UPDATE has gone through several phases of development. An important step was the introduction of thematic issues in 2000. Since then, some of the major issues on IHDP's research agenda have been covered: Food, Carbon, Water, Vulnerability, Governance, and Sustainability and the Science/Policy Interface.

The focus of the present issue of UPDATE is "Mountains", a timely and appropriate theme. The United Nations declared 2002 as the International Year of Mountains to increase awareness of the global importance of mountain ecosystems and the challenges faced by mountain people and to stimulate long-term on-the-ground action.

We were therefore glad to accept a proposal by the "Mountain Research Initiative" (MRI), which was established under the umbrella of the International Geosphere-Biosphere Programme, IHDP and the Global Terrestrial Observing System, to produce a joint issue of this newsletter, focusing on major mountain areas in the world, human impacts on mountain systems and the consequences for sustainable development. The authors we were able to identify with MRI's help are experts in mountain research and have covered topics ranging from the Andes to Papua New Guinea and from the Himalaya to the Rocky Mountains. We hope that this newsletter will be read by many participants at events related to the International Year of Mountains and that human dimensions research in this area will continue to strengthen.

Another new feature of this newsletter is its design and layout. After five years, we decided to present UPDATE in a new "look". There are also some changes in the structure of the newsletter. In this and future issues we are publishing an interview with a personality in the field. We are also giving more attention to contributions from young researchers and are including at least two such articles. In addition to the research articles, we will continue to publish news from core and joint projects and reports from our National Committees, and are dedicating a page each to these topics. We hope that this will keep our community informed about latest developments in IHDP project research and encourage National Committees to continue their efforts in human dimensions research in their own countries.

As I write this editorial, I am aware that IHDP itself will also undergo changes in the coming months. In particular, the IHDP Scientific Committee meeting, which will be the last one to be attended by Arild Underdal (Chair), Anne Whyte (Vice-Chair) and Eckart Ehlers (Past Chair). Each of them has served two three-year terms on the committee and without their dedication, insights, guidance and enthusiasm, IHDP would not be the success that it is today.

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JILL JÄGER | IHDP Executive Director

approach for observing, modelling and investigating global change phenomena and processes in mountain regions, including their impacts on ecosystems and socio-economic systems (see page 5). The MRI has been formally endorsed by IHDP, the Global Terrestrial Observing System (GTOS) and four core projects of the International Geosphere-Biosphere Programme (IGBP). It will involve close collaboration between these organizations.

SCIENTIFIC RATIONALE FOR A FOCUS ON MOUNTAIN RESEARCH

The strong altitudinal gradients in mountain regions provide excellent opportunities to detect and analyse global change processes and phenomena. Meteorological, hydrological, cryospheric and ecological conditions change strongly over relatively short distances. Thus biodiversity tends to be high, and characteristic sequences of ecosystems and cryospheric systems are found along mountain slopes. The boundaries between these systems experience shifts due to environmental change and may be used as sensitive indicators of forcing mechanisms. In addition, the higher parts of many mountain ranges are not affected by direct human activities, and consequently, they provide locations where the environmental impacts of climate change alone can be studied directly. Lastly, mountain regions are widely distributed across the globe, from the Equator almost to the poles and from oceanic to highly continental climates. This global distribution provides opportunities for comparative regional studies and for analyses of regional differentiation of environmental change processes. Related to the changing environmental conditions along mountain slopes, changes also occur in socio-economic conditions, land-use and land-management practices, resource exploitation and the appeal of mountain regions for tourism.

STATE AND TRAJECTORIES OF MOUNTAIN REGIONS

Ten years ago, Chapter 13 of the Agenda 21 document acknowledged the important role of global change issues in mountain regions by pointing out that mountain environments are *essential to the survival of the global ecosystem* and that many of them are experiencing rapid degradation. The magnitude of these environmental problems has not abated over the last decade, and in many cases, they have been exacerbated by compounding issues. The traditional perception that mountains represent pristine systems completely isolated from human impact and only marginally connected to economic, political and cultural centres of influence, is rapidly becoming outdated. For example, the massive and widespread retreat of alpine glaciers highlights the impact of global climate change at high elevations and the consequences for lowland agriculture, hydroelectric power, mitigation of natural hazards and eco-tourism (Fig. 1). Similarly, greater physical, administrative and market integration of mountain and upland agriculture with mainstream systems has fundamentally altered local resource management strategies leading to resource use intensification and overexploitation. Many mountain systems are threatened by the increasingly global scale of both systemic human impacts, which impact environments at global scale,

Photo: M. Maisch

Fig. 1. Morteratsch Glacier in the region of Bernina (Grisons, Eastern Swiss Alps) showing the retreat of the snout over the last 150 years. The '1850' trimline is clearly visible on the right-hand side of the glacier. Since ca. 1850, this glacier has lost approximately 15 percent of its area and 25 percent of its former length. The overall retreat from 1878 to 1998 accounts for a total of 2 km with a mean annual retreat rate of approximately 17 m/y. This long-term average was markedly surpassed in recent years; the glacier receded by 38.9 m in 1999 and 29.6 m in 2000.

and cumulative ones, which operate at local scale but are becoming globally pervasive. These systems are moving along trajectories that couple high rates of environmental change in fragile ecosystems with economies that are strongly dependent on local environmental resources and limited in terms of response capability. Over the next few decades, these impacts will be compounded by globalisation processes that are likely to be equally important as drivers of change in mountain regions. The collective effect may significantly threaten the ability of mountain regions to provide critical goods and services, both to mountain inhabitants and to supply the extra-regional demands of other communities.

THE LINK BETWEEN MOUNTAINS AND HUMAN SECURITY

Human-water interactions are global change issues that will become critical in coming decades. The global demand for freshwater has increased at an alarming rate over the last century, doubling that of population growth. This trend will continue with more and more of the world's rapidly expanding population moving into urban areas. As a consequence, the mountain 'water towers of the world' will undoubtedly become even more important as sources of fresh water for much of humanity. This dependence will be intensified by the continued extraction of non-renewable water from lowland aquifers and unsustainable waste management practices in and around many conurbations.

Arid and semi-arid regions of the tropics and sub-tropics, home to roughly half the world's population, are primarily represented by developing nations, where freshwater withdrawals have quadrupled relative to the global population growth rate over the last decade. Mountains in these regions currently provide more than 80 to 90% of the water resources to the surrounding lowlands for irrigation, drinking water, industry and domestic use (Fig. 2). The area of irrigated agricultural land increased by more that 40% globally over the last thirty years. In mountain regions, irrigation abstractions have in many cases leapfrogged upslope, leaving water deficits in surrounding lowland areas leading to regional tensions. Moreover, all major river systems originate in mountain regions; the majority of these cross one or more political boundaries over their course, thereby setting the stage for international disputes. Considering that approximately 60 to 70% of available freshwater is currently used for food production, and that the complex and volatile issue of food security is very likely to become paramount in the 21st century, the link between the impact of environmental change on mountain water resources and human security becomes clear. Consequently, reinforcement of general human security in the 21st century will require implementation of effective water management strategies. These strategies must have the capacity to synthesize input from both physical and social sciences in order to track, anticipate and mitigate the impacts of global change in mountain regions.

GLOBAL CHANGE RESEARCH AND MOUNTAINS IN THE 21ST CENTURY

As humanity and the planet Earth enter the 21st century, it is clear that the relationship between the two must change. We are rapidly approaching important crossroads that will require tough choices to be made that balance the potential costs of technical, economic, behavioural and policy responses to environmental change. Significant tradeoffs will be necessary because 'business as usual' is no longer an option for most of the world's ecosystems, and mountain ecosystems are not an exception. However, mountain regions *are* exceptional in that they provide a disproportionately large fraction of the goods and services on which humanity has come to depend. Further, the potential for destabilization of human security from global change impacts in mountains is particularly high because of the link between potential changes in mountain water supply and 'downstream' populations that rely upon this fundamental resource.

In order to face the challenging environmental issues of the 21st century, a firm understanding of the consequences of

Photo: M. Grosjean

Fig. 2. Mt. Parinacota and Laguna Chungará in the Chilean Andes. Through the process of orographic uplift, mountains effectively extract moisture from the atmosphere, thereby providing the primary source of water for many arid and semi-arid regions. The transfer of water from mountains to surrounding lowland areas may be either direct via surface runoff of rainfall, or delayed by a) accumulation as snow/ice and subsequent glacial flow into the ablation zone where it is released as melt water, and b) through groundwater flow paths.

global change in mountain regions will be essential and integrative research approaches, such as the implementation strategy of the MRI (see page 5), will be required to translate scientific information into public awareness and effective policy response. Physical scientists addressing these issues cannot operate in isolation and will require close collaboration with the social science community to effect the implementation of sound environmental management strategies. The Amsterdam Declaration, signed by more than 800 scientists at the joint IGBP/IHDP/WCRP Global Change Open Science Conference "Challenges of a Changing Earth" in July 2001, states that the accelerating human transformation of the Earth's environment is not sustainable, and that a new system of global environmental science is required that will integrate across disciplines, environment and development issues and the natural and social sciences. This is particularly true for mountain regions, given the sensitive and complex nature of the relationship between mountain environments and the large number of people who inhabit and are dependent upon them.

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WEBLINKS

Mountain Research Initiative (MRI):
www.mri.unibe.ch

Biospheric Aspects of the Hydrological Cycle (BAHC):
www.pik-potsdam.de/~bahc/

Global Change and Terrestrial Ecosystems (GCTE):
www.gcte.org

The Global Observation Research Initiative in Alpine Environments (GLORIA):
www.gloria.ac.at/res/gloria_home/

Global Mountain Biodiversity Assessment (GMBA):
www.unibas.ch/gmba/

Global Terrestrial Observing System (GTOS):
www.fao.org/GTOS/

International Geosphere-Biosphere Programme (IGBP):
www.igbp.kva.se

Land-Use and Land-Cover Change (LUCC):
www.geo.ucl.ac.be/LUCC/lucc.html

Past Global Changes (PAGES):
www.pages.unibe.ch/

Terrestrial Ecosystem Monitoring Sites (TEMS):
www.wsl.ch/relics/rauminf/riv/datenbank/tems/database_tems.html

World Climate Research Programme:
www.wmo.ch/web/wcrp/wcrp-home.html

International Year of Mountains
www.mountains2002.org

Mountain Forum:
(A Global Network for Mountain Communities, Environments and Sustainable Development)
www.mtnforum.org

weblinks

MRI'S IMPLEMENTATION PLAN

The ultimate objectives of the Mountain Research Initiative (MRI) are: a) to develop a strategy for detecting signals of global environmental change in mountain environments; b) to define the consequences of global environmental change for mountain regions as well as lowland systems dependent on mountain resources; and c) to make proposals towards sustainable land, water and resource management for mountain regions at local to regional scales. To achieve the above objectives, the research under the MRI is structured around four Activities, each of which is divided into a small number of specific tasks.

ACTIVITY 1: Long-term monitoring and analysis of indicators of environmental change in mountain regions

This element of the Initiative will focus on mountain-specific indicators of environmental change, which are sensitive to changes in climate, atmospheric chemistry, radiation, and land use/land cover. A set of four mountain-specific indicator groups is considered:

1.1) Cryospheric indicators related to snow conditions, glaciers, permafrost and solifluction processes;
1.2) Terrestrial ecosystems, particularly mountain plant communities and soils;
1.3) Freshwater ecosystems, in particular high mountain streams and lakes;
1.4) Watershed hydrology, i.e. water balance components of high mountain watersheds/headwater basins.

Chinese Character for "Mountains"

ACTIVITY 2: Integrated model-based studies of environmental change in different mountain regions

To achieve the overall goals of the Initiative, it is necessary to develop a framework that permits the analysis and prediction of hydrological and ecological characteristics and their linkages with land use and climate at various spatial and temporal scales. Accordingly, this Activity is organized around the following:

2.1) Development of coupled ecological, hydrological and land-use models for the simulation of land cover and land surface processes in complex mountain landscapes;
2.2) Development of regional scale atmospheric models for mountain regions;
2.3) Integrated analysis of environmental change in mountain regions by means of fully coupled land-atmosphere models or by qualitative assessments;
2.4) Regional scale mountain land experiment to support the development, application and validation of the above models.

ACTIVITY 3: Process studies along altitudinal gradients and in associated headwater basins

Ecological and hydrological field studies and experiments along altitudinal gradients and at sensitive sites can provide invaluable data on potential responses of mountain ecosystems to anthropogenically induced environmental change. Research themes to be addressed within this Activity include:

3.1) Development of indicators of mountain ecosystem response to environmental forcing factors to facilitate process-related interpretation of historical and paleorecords;
3.2) Assessment of runoff generation and flow path dynamics on steep hill slopes and in headwater catchments;
3.3) The relationship between diversity and ecosystem function, taking advantage of the strong changes of diversity along altitudinal gradients.

ACTIVITY 4: : Sustainable land use and natural resources management

The overall objective of this Initiative is to evaluate and enhance sustainable land, water, and resource management strategies for mountain regions. Three priority areas are suggested for assessment:

4.1) Changes in forest resources, with potential implications for agriculture, rates of erosion and magnitude of floods, and biodiversity;
4.2) Intensification and/or extensification of agriculture (including grazing), with potential implications for food security, rates of erosion and magnitude of floods, and biodiversity;
4.3) Changes in water resources due to factors such as changing agricultural practices, increasing temporary or permanent population, and/or increasing energy generation, with implications for downstream water supply, energy availability, flooding, and sediment transfer.

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THE MRI IMPLEMENTATION PLAN has been published in the Global Change Report Series (IGBP Report 49, GTOS Report 28, IHDP Report 13) and can be ordered free of charge from the MRI Coordination Office, Bärenplatz 3, CH-3011 Bern, Switzerland, or downloaded from **www.mri.unibe.ch**

THE MOUNTAIN RESEARCH INITIATIVE

Three international global environmental change programmes – IHDP, the International Geosphere-Biosphere Programme (IGBP) and the Global Terrestrial Observing System (GTOS) – have joined forces to endorse an initiative that addresses areas where the impacts of the rapidly changing global environment are experienced particularly strongly: mountain regions.

Photo: L. Graumlich

➤ **Lisa J. Graumlich is a leading figure in the Mountain Research Initiative (MRI). She is Executive Director of the Big Sky Institute for Science and Natural History at Montana State University, USA, and a member of the Scientific Steering Committee of the IGBP/IHDP Project on Land-Use and Land-Cover Change (LUCC).**

Q: Dr. Graumlich, what is the overall objective of this initiative?

The overall objective of the MRI is to evaluate and enhance sustainable land, water and resource management strategies for mountain regions in the context of global environmental change. To achieve this objective, the MRI promotes a high level of integration between physical, ecological, social and economic scientists and practitioners. In essence, we take advantage of our focus on mountain regions to create links between the monitoring of, first, physical and biological processes; second, the modelling of critical human, watershed and ecosystem processes; and third, the overall sustainability of mountain resource systems. The MRI seeks to assess current resource use strategies and develop alternative strategies that take into account the myriad ways in which global change can alter the viability of traditional or local resource management strategies.

Q: Millions of people all over the world spend their holidays or recreational time in mountains. What are the impacts of activities such as winter and summer sports on mountain regions and mountain communities?

Mountains have always been a magnet to people in search of adventure or the solace of wilderness. A consequence of our improved transportation systems and increased spending on recreation is that mountains, once a refuge for the very hardy or the very wealthy, are now accessible to a large and diverse array of tourists. The infrastructure to support tourism, such as the construction of roads and the rapid expansion of towns and villages, has a far greater impact on mountain environments than the actual activity of the tourists, for example skiing or camping. The expansion of tourism often changes the traditional economic base from subsistence activities or resource extraction activities to a variety of service functions. In some regions, the rise of 'ecotourism' as an economic engine has had profound impacts on the perceived value of biodiversity or forested watersheds.

Q: The MRI is structured around several activities; one of them addresses sustainable land use and natural resource management, including forests, agriculture and water. Let's turn to the first one: forest resources.

The inaccessibility of mountains has meant that they are often regions where deforestation has had relatively minor impacts. However, increasingly mountain forests are changing in extent and composition under the combined influence of climate change and regional management strategies. The trajectory of change in montane forests is complicated. In some regions, abandonment of marginal agricultural land and/or 20th century suppression of fires have resulted in a substantial expansion of forests. In other regions, increased access and intensification of resource extraction have resulted in significant forest loss. In all cases, changes in forest cover affects watershed processes, patterns of biodiversity, and terrestrial carbon storage. The MRI seeks to understand the consequences of changes in montane forests for a suite of linked issues including sustainable harvesting techniques, non-timber forest products, tourism, watershed protection, conservation of biodiversity and carbon sequestration.

Q: Agricultural systems in mountains are often perceived as particularly vulnerable to global change. Why is that so?

Mountain agriculture is a marvel of adaptation to a series of challenges including short growing seasons, low soil fertility, limited accessibility and high cost of transport, and a limited opportunity for production gains associated with increasing the scale of production. Clearly, warming temperatures and increasing carbon dioxide will increase productivity of many high elevation cropping systems. The focus of the MRI is to place such changes into the context of increasing intensification of agriculture in mountains and its implications for local food security. Such an analysis will require a full understanding of the diverse interactions between climate and food production as well as the way in which factors, such as access to irrigation or indigenous soil and water prac-

tices, may make production systems more or less vulnerable to climatic variation.

Q: The 1998 Mountain Agenda refers to mountain regions as "water towers for the 21st century", as more than half of the world's population relies on fresh water from mountain regions. What research is planned in this area?

Assessing the sustainability of water resources requires integrated analyses of trends in supplies as well as demands. The MRI hopes to integrate the work of other IGBP projects on climate impacts on the hydrologic system with assessments of the potential ways in which increasing population and consumption may increase demands above levels of supply. The MRI also seeks to integrate our understanding of how land-use and land-cover change may alter not only the quantity of water but also the quality and/or timing of water flow, which in turn has implications for such hazards as floods.

Q: This Initiative is of specific interest to IHDP. What particular links have been identified?

At present, the strongest link between the MRI and IHDP is through the LUCC[1] Core Project. Embedded within the MRI science plans are several research strategies that derive from the progress that has been made over the past decade in the LUCC community, ranging from remote sensing tools to integrated modelling strategies. The MRI Scientific Steering Committee is also interested in strengthening the links with the other IHDP Core Projects. In particular, the work of the IDGEC[2] group offers opportunities for collaboration on the relative effectiveness of different institutional arrangements in fostering sustainable natural resource management in mountain regions. Similarly, we hope to form a stronger tie to GECHS[3] researchers, especially in terms of evaluating the many factors affecting food security in mountain regions.

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INTERVIEW BY ELISABETH DYCK

[1] IGBP/IHDP Project on Land-Use and Land-Cover Change | [2] IHDP Project on Institutional Dimensions of Global Environmental Change | [3] IHDP Project on Global Environmental Change and Human Security

THE ANDES OF CHILE:

CLASH BETWEEN ECONOMIC AND SUSTAINABLE DEVELOPMENT

Chile is the longest country in South America and has one of the most successful emerging economies in the region. However, rapid economic and social growth impact on its sustainable development. This article investigates the clash between economic development and the use of human and natural resources in northern Chile. | BY HUGO I. ROMERO

➤ **More than 4.500 km in length, Chile is the longest country** in South America. It is dominated by the Andes Mountains, which span arid subtropical, semi-arid Mediterranean, temperate and subpolar climates. It is one of the most dynamic and successfully emerging economies in the region.

The Atacama Desert, one of the driest places in the world, and the Puna de Atacama, where rainfall is irregular and scarce, are located in northern Chile (Fig. 1). Due to high evaporation and low runoff, most of the streams that originate in the Andean source region disappear before they reach the sea. In the inland core of the Atacama Desert, absolute aridity and lack of runoff necessitate that water must be provided from underground sources. Important water bodies are located in the surrounding highlands. Although indigenous people have occupied these areas for 10,000 years, the previous lack of economic activity has allowed the installation of several nature conservation areas.

As a consequence of higher winter rainfall and snow accumulation in the semi-arid region, several rivers connect the Andes summits with the Pacific Ocean (Fig. 2). Along the slopes and river floodplains, agricultural communities and settlements have developed. These communities employ both irrigated and non-irrigated traditional methods and take advantage of high solar radiation.

Northern Chile is highly dependent upon the Andean lowland-highlands spatial interactions. Without the support of the Andean highland water towers that sustain glaciers, salars, lakes, lagoons, wetlands and underground aquifers, the survival of communities in this part of the country would not be possible.

Recently mining operations in and around the Atacama Desert have significantly added to the Chilean economy. During the last twenty years, Chile increased its GNP almost threefold. This opened its small economy, for nearly 14 million inhabitants, to direct foreign capital investment, which has been devoted mainly to an intensive outward-oriented production of minerals and agricultural and forest products. The resources are exclusively located in the mountain areas.

Chile's per capita income is one of the highest in Latin America. Poverty has been reduced to less than 20%, and the country has been ranked highest of the developing countries in the UN Human Development Index. Even during the 1998 Asian crisis and the subsequent recession, its annual economic growth rate remained over 3 percent.

However, rapid economic and social growth does not necessarily mean sustainable development for northern Chile. Fig. 1 shows the clash between high and lowland goals, economic activities, and human and natural resources in and

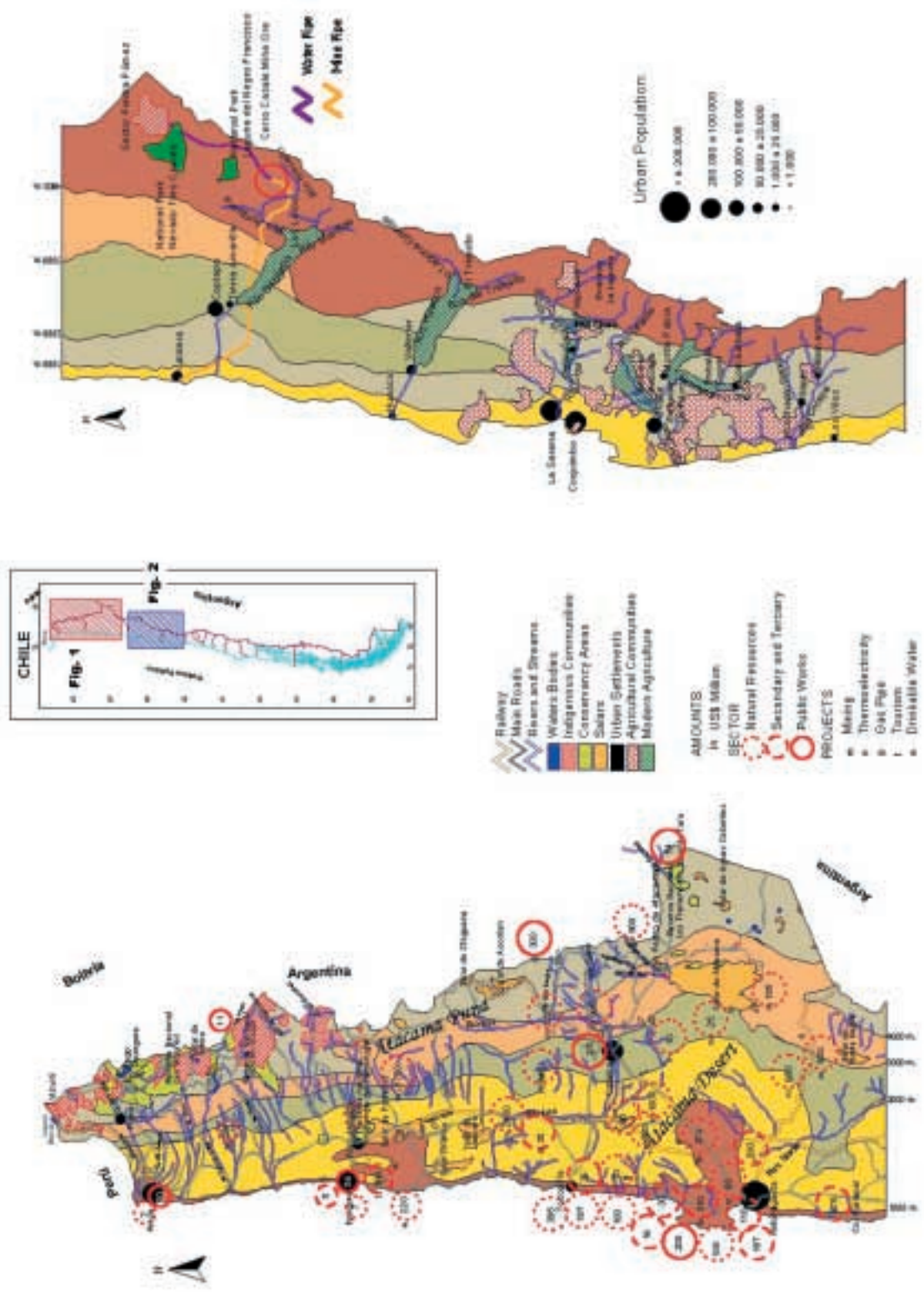

Fig. 2. Spatial clash between economic and urban development and human and natural resources in semi-arid areas.

Fig. 1. Spatial clash between economic development and human and natural resources in the Atacama Desert and Puna region.

around the Atacama Desert and the Puna region. Some highlands of the Puna de Atacama, located above 3000 m elevation, are natural conservation areas, such as national parks, natural reserves and specific sites to conserve flora and fauna. The areas have protected ecosystems and water sources, which feed a series of rivers and streams. They in turn are the main water supply for lower-elevation mines, agricultural oases and the increasing population of urban settlements along the coast, e.g. Arica, Iquique, Tocopilla, and Antofagasta.

Historically, herders and farmers from local indigenous peoples (*aymaras* and *atacameños*) have occupied the highlands, using grasslands and small oases located around the conservation areas. Their sustainable cultural-natural system is now severely threatened by increasing water demands of the lowland regions. In recent decades, transnational companies (Canada, USA, UK, South Africa, Luxembourg, Finland, Australia, Japan, etc.) and national private and public companies have invested a billion dollars in mining, energy, and transport, such as in roads, railways, harbours, water and mineral pipes, industries, and goods and services produced in nearby cities. Today Chile supplies nearly 43% of the global demand for copper with an annual production of 4.5 million tons.

This economic development threatens the sustainability of both human and natural resources of the Andean water towers. A new policy is needed to save the environmental resources of this region that will require the participation of the public and private sectors. A new transboundary organisation, able to bridge the Argentinean, Bolivian and Chilean Andes, becomes a real necessity.

In the semi-arid Mediterranean areas of Chile (Fig. 2), the location of mines, traditional agricultural communities, modern agricultural and trade companies, and urbanisation is the main source of spatial and environmental conflict. The Aldabarán gold mining project in the Copiapo valley by the Canadian Cerro Casale company is an example of this highland-lowland clash. The project represents an investment of US$ 1,430 million to put into production substantial gold and copper reserves, offering 4,000 jobs during a project lifespan of 18 years. A freshwater source is required for mineral production and transportation from Piedra Pomez. This area is the recharge region for two national parks, Nevado Tres Cruces and Laguna del Negro Francisco. Downstream, 11,700 ha of grasslands have been used traditionally by "Kollas", an indigenous community descendent from the Titikaka´s Tiwanaku Empire, which has occupied the Jorquera river tributary since the 19th century. Local communities have joined urban inhabitants of Copiapo city and modern farmers, who produce and export table grapes for American and European markets, to protect the supply and quality of water from mineral pollution and shortages. The mean annual rainfall in the Copiapo valley is less than 30 mm. Consequently, everything depends again upon the Andes Mountain water towers.

Another tension between highland and lowland development processes can be observed along the narrow valleys and slopes of the Huasco, Elqui and Limari valleys (Fig. 2). There are conflicting interests in this area between traditional agricultural communities and modern farmers associated with national and international fruit companies. Traditional communities have occupied these areas since colonial times because of an increase in winter rainfall. They have linked highlands and lowlands by using the slopes for rainfed agriculture and livestock production and by irrigating crops along the floodplains. Transhumance has been one of the main adaptations to exploit the diverse ecological belts. Modern outward-oriented agriculturists have purchased most of the water rights, thereby forcing local communities to emigrate. Once again, the price of economic success seems to include social disturbance and degradation of the natural environment.

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SCENIC: A NEW INITIATIVE FOR CENTRAL AND EASTERN EUROPE

BY DEBRA MEYER WEFERING

➤ IHDP has recognized an increasing interest and need in building a strong human dimensions network in Central and Eastern Europe and Newly Independent Countries. In collaboration with the Center for Integrated Regional Assessment (CIRA) and the Global Change System for Analysis, Research and Training (START), IHDP has taken the initiative for increased capacity building and international networking in Central and Eastern Europe.

The SCENIC Initiative (Global Change **S**cience in **C**entral and **E**astern Europe and **N**ewly **I**ndependent **C**ountries) brings together researchers to identify key issues of concern and the next generation of leadership in research on the human dimensions of global environmental change. Social scientists from all fields are looking at ways to implement IHDP activities in the region, sharing initiatives from their countries and building linkages for investigation of common issues. Key concepts currently discussed include *transition, adaptation, vulnerability, integrated assessment, and networking.*

An electronic discussion group has been set up for SCENIC to serve as a discussion forum and networking organisation in bringing together HD researchers. Outputs of the group will include the formulation of a focused research agenda for SCENIC, development of formal proposals for research funding, joint publications, partnerships and collaborative projects, as well as regular workshops within the region.

*Those interested in participating in future SCENIC discussions should contact Debra Meyer Wefering at the IHDP Secretariat (**wefering.ihdp@uni-bonn.de** or +49 (0)228 734956); she is an International Science Project Co-ordinator and responsible for IHDP activities within Central and Eastern Europe at the IHDP Secretariat.*

ALTAI MOUNTAIN KNOT

Between Conservation and Development – Syndromes of Globalisation | BY YURI P. BADENKOV

➤ **In 1996 China [1] announced an ambitious development** project for the East-Central-Asian Economic Zone, incorporating China's Xinjiang-Uygur Autonomous Region, regions of Western Siberia (Russia), Eastern Kazakhstan and North Western Mongolia. According to Chinese scientists, this Asian region is expected to represent a world centre of economic activity and development in the mid-21st century. The railway transportation corridor, "the Great Eurasian Continental Bridge", will represent the spine of this region. It will connect to the Trans-Siberian railway in the North and to the Silk Road in its new "railway" embodiment. The route will traverse the transfrontier remote highlands of Central Altai, the "ancient crown of Asia", and will significantly change local environments and the life of local people.

GEOGRAPHIC LOCATION

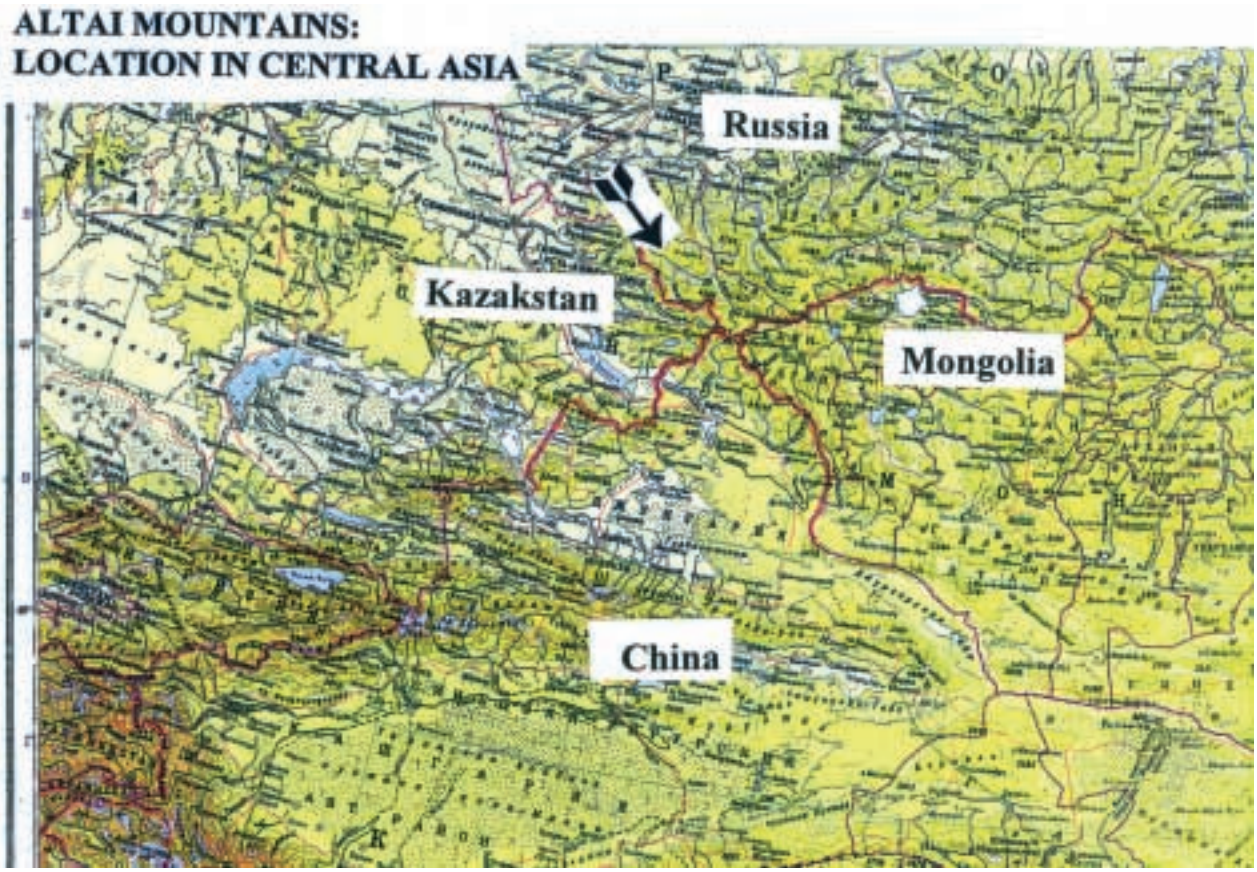
Altai is a mountain country located in the centre of Eurasia (Fig. 1). It represents a nodal area of the Eurasian continent in both physical geography and environmental features [2] and contains high, alpine peaks (Mt. Belukha, 4506 m) and a vast glacial area. One of the 200 major WWF world eco-regions is located in the Altai Mountains and is of crucial importance for understanding the Holocene history of Asian ecosystems. Altai Mountains form the headwaters of two major Asian rivers, the Ob and the Irtysh. In 1999 UNESCO acknowledged the global significance of the region by including five Altai clusters in the World Natural Heritage List.

This territory (about 150 km^2) is situated at the intersection of administrative borders of four countries: China, Kazakhstan, Mongolia, and Russia, which form the so-called "Altai Knot". Before the demise of the USSR in 1991, large herds of sheep and goat, totalling over 500,000 animals, were herded across this territory from Mongolia to slaughtering and meat processing plants in Eastern Kazakhstan. Now the border between Mongolia and Kazakhstan has a 67 km long interruption, representing a Russian border insert, the Altai Republic; consequently, this traditional channel of economic and inter-community connections has been lost.

CULTURAL AND NATURAL HERITAGE

Altai is at the crossroads of the world major cultures and religions: Buddhism, Islam, Christianity (Orthodox) and Shamanism. Followers of the Russian theosophist and artist Nikolas Roerich believe that Altai Mountains are the location

Fig. 1. Location of the Altai mountain region



of the mystical "Shambala", the sacred Buddhist country. The Altai region attracted the attention of the archaeological community in recent decades with the discovery of well-preserved 2,000-year-old human mummies [3]. Pieces of silk cloth and other artefacts found in burial mounds [4] of Altai indicate the presence of cultural and human activities in the region during ancient times. This leads to an important conclusion: nomads of the remote mountain territories did not live as closed isolated communities. Rather, for long periods they were active in trade and commerce with distant centres of lowland civilisations.

Photo: Yu. Badenkov

Family of Kazakh shepherds near a seasonal cabin in Jumaly Valley, Altai

The remote setting and severe climate determine social conditions in which the nomadic stockbreeders live; the Ukok Plateau has registered an absolute minimum winter temperature of minus 60° C. Kazakh shepherds live in traditional *yurta*, or in primitive cabins, which lack even basic amenities. Hence, low life expectancy, vitamin deficiency, and diseases are common.

Throughout the region, the most pressing issues are those typical for the majority of the world mountain regions: poverty, unemployment and outmigration. Many settlements and campsites are without electricity and communication facilities and are cut off from the rest of the world during winter. Mountain frontier regions are marginal in two ways: 1) they are located at the periphery of their states (except Kazakhstan), and 2) they are socially and economically marginal, because they are the poorest among neighbouring regions.

High biological, ecosystem and ethnic-cultural diversity exists in these frontier regions. Many rare species, such as the snow leopard, which attracts numerous environmental initiatives and the development of eco-tourism, are still to be found. The challenge is to integrate regional economic and social development projects and conservation of biological diversity across the region. Strategies for sustainable development and biodiversity conservation have been developed at national levels, but are lacking the regional transboundary

POPULATION

The Population of frontier regions is mostly represented by traditional ethnic groups of semi-nomadic stockbreeders: Kazakhs, Altais (Telenghets), Tuvins, Dyurbets and Uygurs (Table 1). Some regions of Russia, Kazakhstan and China have Russian populations, which migrated to the region in the early and middle 19th century, fleeing religious persecution, and in search of the legendary belovodye (white waters), the area of abundant resources that promised a life of happiness and honesty. Many of these immigrants, starovers, held on to traditional orthodox beliefs and followed strict behavioural patterns. In Altai, their settlement areas were associated with mountain-forest ecosystems (Ust-Koksa Region, Table 1).

Table 1. Population of frontier Altai regions

COUNTRY	ADMIN. UNIT	AREA IN KM²	POPULATION	ETHNIC GROUPS
Kazakhstan	Katon-Karagai	13,200	48,300	Kazakhs, Russians
Kazakhstan	Kurchum	22,200	51,600	Kazakhs , Russians
China	Buerzsyan	10,400	56,000	Kazakhs , Hans, Uygurs, Mongols
China	Habahe	8,400	64,000	Kazakhs, Hans, Hueiszi (Muslims)
Mongolia	Bayan-Ulghi	46,000	74,500	Kazakhs, Tuvins, Mongols, Uryankhais
Russia	Kosh-Agach	19,800	16,600	Kazakhs, Altais, Russians
Russia	Ust-Koksa	12,900	18,300	Russians, Altais

Photo: Yu. Badenkov

Russian-Chinese border on the Ukok Plateau; the sacred Tavyn Bogdo Ula peaks are in the background.

Computer design by O. Sulaberidze

Virtual "Great Eurasian Continental Bridge", crossing the fragile Ukok Plateau.

perspective. Bilateral relations do not meet the needs of co-operation at the international and the intercommunity level.

In 1998, the International Conference on "Strategic Considerations on the Development of Central Asia" held in Urumqi, Xinjiang, passed the "Altai Declaration (Protocol of Intentions)", which raised the issue of transboundary co-operation concerning biodiversity conservation and sustainable development [5]. The Conference proposed the development of the "Altai Convention on Regional Co-operation" [6], including a proposal to create the "Transboundary Biosphere Territory Altai", comprising frontier territories of four countries and protected territories within them. This would form the frame territory, thereby meeting the principles of the Biosphere Reserves UNESCO/MAB Seville strategy. The key objective of creating this international structure is to establish legal and institutional mechanisms that integrate interests of various stakeholders in the conservation of biological diversity and in economic and regional development.

Considering the above, the transportation corridor project, the "Great Eurasian Continental Bridge", may attract significant investments in the transboundary Altai Mountain region. With well-planned zone patterns, advanced mountain engineering technology for the construction project and a reliable monitoring system, the project may achieve the objective of sustainable development. It would include improved living conditions for the local population, conservation of biodiversity and economic progress. The computer simulation of the bridge (see left) demonstrates a possible engineering solution for constructing the transportation corridor across the most sensitive area, the Ukok Plateau at the border between Russia and China. This is only one of several possible options that address the dilemma of building a transportation corridor, while retaining the animal migration corridors. The corridor, which would be crossing the UNESCO World Natural Heritage Area, would need to meet the strict requirements of a World Engineering Heritage Object.

The construction of the transportation corridor across Altai may be perceived as a serious threat to the biological, ethnic and cultural diversity in the transfrontier territory of the Altai Mountain region. The effects of globalisation and global climate change are already being felt in these once hardly accessible regions. Finding a solution to the sustainability issue is the challenge of our time.

A major project on "Conservation of the Altai-Sayans Eco-Region", initiated by the Government of Russia and UNDP/GEF in 2001, is exploring solutions to this issue. Similar projects are planned in China, Kazakhstan and Mongolia.

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References to this article are included in the electronic version of Update 01/02 on the IHDP website at **www.ihdp.org/update0102/references.htm**

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➤ The IHDP **Update** newsletter features the activities of the International Human Dimensions Programme on Global Environmental Change and its research community.
Update is prepared by the
IHDP Secretariat,
Walter-Flex-Str.3,
53113 Bonn, Germany.

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Printed by: DCM, Meckenheim, Germany

Update is published four times per year.

AIR POLLUTION ISSUES IN THE ROCKY MOUNTAINS

Research and long-term monitoring of air pollution and ecosystem responses are needed to protect these important high-elevation regions | BY KATHY A. TONNESSEN

➤ **The Rocky Mountains of** the United States and Canada is a major biogeographic region and the source of freshwater supplies for much of western North America. Large tracts of this mountain range are protected as parks and wilderness areas in both countries. The high-elevation alpine areas of the Rockies have had minimal disruption by human activities. Yet there are threats to water quality, natural ecosystems and visitor enjoyment resulting from air pollution due to regional and global sources. The sensitivity of this region to air pollution and deposition is largely due to the accumulation of snow at high elevations and the rapid melting of seasonal snowpacks in the spring.

Photo: K. Tonnessen

Researcher transporting snow samples out of the back-country of Glacier National Park, Montana, USA

Regional air pollutants of concern include visibility-reducing particles, deposition of nitrogen and sulphur compounds, and deposition of toxic air contaminants, such as metals and organic compounds. The regional sources of air pollutants include population centres in proximity to the Rockies, such as Denver, Colorado, energy development and power plants in Colorado, Utah, Wyoming, Montana, Idaho, Alberta and British Columbia, and agricultural centres located along the eastern margin of the Rockies. Global emissions of air pollutants such as mercury, dioxin, pesticides and PCBs result in deposition to high elevation areas due to the "cold condensation" effect (that permits the distillation of volatile chemicals as air masses are cooled while moving up in elevation).

Resources at risk from air pollution in the Rockies include 1) the quality of water supplies for urban areas and agriculture, 2) alpine ecosystems affected by acids and nutrients, such as nitrogen, 3) fish species that can concentrate organics and metals, making them unfit for human consumption, and 4) scenic vistas degraded by particle pollution.

The connection between air pollution risk and climate change could exacerbate effects to alpine regions of the Rocky Mountains. The extent of snow-covered area, the ratio of rain to snow that falls at high elevations, and the melting of glaciers will all change the runoff patterns and water chemistry of lakes and streams in the alpine zone. These climate changes may result in less runoff for downstream users and may change the timing and quality of runoff needed to preserve natural ecosystem processes, wildlife populations and sport fisheries.

Research and long-term monitoring of both the air pollution stressors and the ecosystem responses are needed to allow resource managers to protect these important high-elevation regions. One of the most important variables to measure is the seasonal snowpack, both in terms of the total snow water equivalence and snow chemistry. A network of snow sampling sites is being measured annually along the Continental Divide in the US Rocky Mountains; sponsors include the National Park Service, the US Forest Service and the US Geological Survey. At maximum accumulation of snowpacks in the spring, researchers visit 75 selected sites and dig snowpits to estimate the total amount of moisture in the pack and the chemical loading, with emphasis on sulphur and nitrogen compounds emitted from power plants, automobiles and agricultural practices. Researchers in Canada have focused their work on tracing the accumulation and runoff of persistent organic pollutants in snowpacks and glaciers of Alberta and British Columbia. In addition to tracking changes in snow hydrology and chemistry both temporally and spatially, we also need more research on the effects of air pollution on water chemistry and biota. There is considerable interest in the effect of air pollutants deposited at high elevations on sensitive aquatic biota such as zooplankton, phytoplankton, fish and amphibians.

Photo: K. Tonnessen

Researchers digging a snowpit in Glacier National Park, Montana, USA, to determine the water content and the snow chemistry.

The regulatory response to regional and global air pollution effects on Rocky Mountain ecosystems is complicated by the multiple sources of air emissions and the international dimensions of the problem. In the United States, the Environmental Protection Agency and the states are responsible for controlling sources of air pollution. The Clean Air Act Amendments of 1990 encourage the states to form regional regulatory commissions to control air pollution from a multi-state area. The control of metals and persistent organic pollutants requires international treaties, such as the recently approved United Nations Convention on Persistent Organic Pollutants.

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IN PRAISE OF CLUMSINESS

Understanding Man and Nature as a single but complex system

BY MICHAEL THOMPSON AND MARTIN F. PRICE

➤ **The classic assumption in both ecology and social science** is that there is a one-way transition from state A to state B. In ecology, the process of succession ensures that an initially unstructured state of one huge niche filled with anarchic, opportunistic and competitive organisms (the R-strategists), is steadily transformed into a climax community: a structured and stratified arrangement of diversified niches, with clearly defined inter-relationships between the species (the K-strategists) that occupy them. In social science this predictable, linear and equilibrium-seeking model of change is paralleled by a number of "grand theories" in which some inexorable logic moves us all from mechanical to organic solidarity (Durkheim), from *Gemeinschaft* to *Gesellschaft* (Tönnies), from traditional to modern (Weber), from status to contract (Maine), from capitalism to communism (Marx), or, as modern theorists of institutions put it, from markets to hierarchies (Williamson). Different "masters" may define their A's and their B's differently, but all subscribe to a twofold scheme and to some driving force that carries the totality from A to B, such as rationalisation (Weber), internal contradiction (Marx), or spiraling transaction costs (Williamson).

These transitions, whether ecological or socio-cultural, are all in the direction of more orderliness, more differentiation, more connectedness, and more consistency, and once they have gone as far as they can go in that direction, that is that. In other words, these models of change end up making change impossible. Of course something on the outside may intervene and mess things up, thereby setting the whole thing in motion once more. Left to themselves, these models get ecosystems and socio-cultural systems from A to B and then stop. Change, these models tell us, is a temporary phenomenon.

There is clearly something less than satisfactory about these models. They explain change by getting rid of it, and they are increasingly incapable of making sense of what is going on – but how can we do better? By understanding *Man and Nature as a single but complex system* is our concise but rather opaque answer: an answer we will now try to clarify by looking at the social and ecological transactions that sustain a Himalayan village.

ALWAYS LEARNING, NEVER GETTING IT RIGHT

Himalayan villagers parcel out their transactions with their physical environment to four distinct *solidarities*, each of which is characterised by a distinct *management style*. Agricultural land, for instance, is privately owned whilst grazing land and forests are communally owned. But grazing land and forests do not suffer the "tragedy of the commons" because transactions in their products are under the control of a *commons managing institution*. Villagers appoint forest guardians, erect a "social fence", a declared boundary, and institute a system of fines, e.g. for those who allow their animals into the forest when access is forbidden.

Lacking any legal status, these commons managing arrangements work well in the face-to-face setting of a village and its physical resources. The transactions are regulated within a framework that assumes that you can take only so much from the commons, and that you can assess where the line between so much and too much should be drawn. The social construction inherent to this transactional realm is that nature is bountiful within knowable limits. This, to make a link with the ecological theories of C.S. (Buzz) Holling, is the myth of **Nature Perverse/Tolerant** (Fig. 1).

Decisions on agricultural land are entirely in the hands of individual owners, and fields can easily end up belonging to the moneylenders. In recent years, when forests and grazing lands have suffered degradation, villagers have responded by shifting some of their transactions from one realm to the other. They have allowed trees to grow on the banks between their terraced fields, thereby reducing the pressure on the village forest, and have switched to the stall-feeding of their animals, thereby making more efficient use of the forest and grazing land and receiving manure. In other words, transactions are parcelled out to the management styles that seem appropriate. If circumstances change, some of those transactions can be switched from one style to another.

Since they are subsistence farmers, whose aim is to remain viable over generations, their transactions within their local environment can be characterized as ***low risk, low reward***. During times when little farm work is to be done, many villagers engage in trading expeditions or in migrant labour in India. Trading expeditions are family-based and family-financed, and highly speculative: ***high risk, high reward***. So a farmer's individualized transactions, when added together over a full year, constitute a nicely spread risk portfolio. The attitude here is that "fortune favours the brave"; opportunities are there for the taking. The idea of nature is optimistic, expansive and non-punitive: **Nature Benign** (Fig. 1).

Social scientists in general, and institutional economists in particular, would see these two realms as corresponding to their classic distinction between *hierarchies* and *markets*. But these do not exhaust the transactional repertoire of the Himalayan villager. Some collectivised transactions do not involve formal status distinctions, such as those between forest guardians and ordinary villagers that characterize the *hierarchical* solidarity. Some individualized transactions are marked by the absence of bidding and bargaining, an essential characteristic of the markets that are generated by the *individualist* solidarity. The plurality, in other words, is fourfold, *not* twofold.

In many parts of the Himalaya village autonomy is always under threat, because powerful outside actors are laying

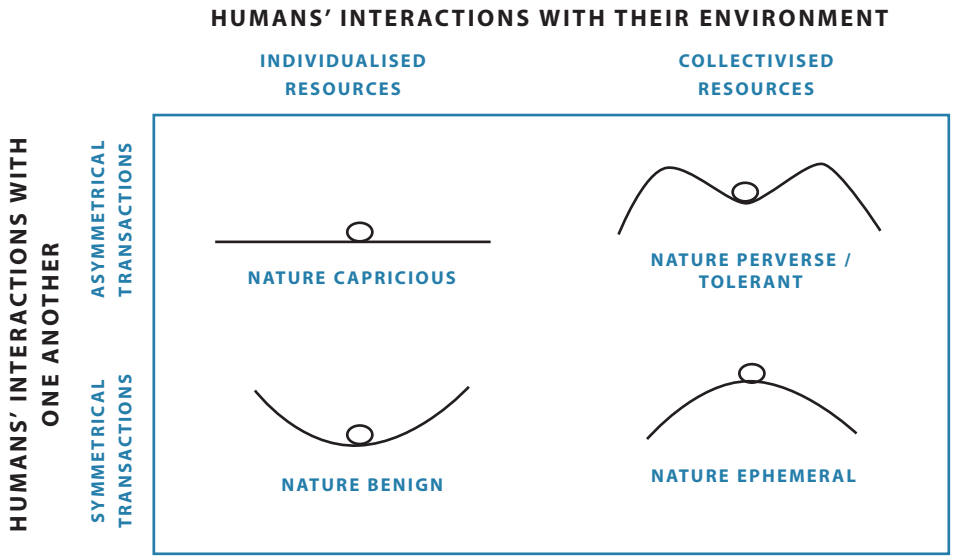

***Fig 1.** The Myths of Nature and their associated ways of organizing. These pictures represent the cultural (ie implicit and largely unquestioned) assumptions that underlie different management strategies. Nature Benign justifies an individualistic laissez-faire approach. Nature Ephemeral, which states that the world is an unforgiving place, requires us to 'treat lightly on the Earth': the egalitarian precautionary principle. Nature Perverse/Tolerant directs us towards hierarchical approaches of statutory regulation and sustainable development. Finally, Nature Capricious highlights the good sense of fatalists: of not wasting time and money on things about we can do nothing.*

claim to the forest resources that are vital to Himalayan farming systems. One very effective response to this external threat has been the Chipko Movement. This is a grassroots and highly *egalitarian* social movement, in which women, who are largely responsible both for fodder gathering and fuel wood collection, predominate. "Chipko" means "to stick", and the Gandhian strategy is to physically hug the trees, thereby preventing them from being appropriated. More aggressive villagers actually chase the logging contractors out of the forest with their *kukris* (long curved knives). As far as these threatening external transactions are concerned, it is certainly not a case of "plenty more fish in the sea", nor is there even a "safe limit" within which the commercial extraction of timber would be sustainable. *All* external predation is seen as catastrophic in its consequences. Hence the spectacularly uncompromising collectivist response of the tree-huggers, whose idea of nature is one in which any perturbation of the present low-key regime is likely to result in irreversible and dramatic collapse: **Nature Ephemeral** (Fig. 1).

Finally, in every village there will always be people who sneak produce from the forest, or who cannot go off on trading expeditions and manage not to be around when it's all hands to the tree-hugging. These are the *fatalists*: people whose transactions are dictated by the organisational efforts of those who are not themselves fatalists. They live in a world that is always doing things to them – sometimes pleasant, sometimes unpleasant – and in which nothing that they do seems to make much difference. "Why bother?" is their not unreasonable response. In this world learning is not possible and even if it were, there would be no way of benefiting from it. The idea of nature is one in which things operate without rhyme or reason: **Nature Capricious** (Fig. 1).

Completing the typology with these two solidarities – egalitarianism and fatalism – makes some important differences. Change, in the conventional theory, is deterministic. If you're knocked out of hierarchy you'll end up in the market, and *vice versa*. But add in the other two solidarities and change becomes indeterministic. Conventional theory treats human systems as *simple* (linear, deterministic, insensitive to initial conditions, equilibrium seeking and predictable); ours treats them as *complex* (non-linear, indeterministic, sensitive to initial conditions, far-from-equilibrium, and unpredictable).

Simple systems are *manageable* because once we understand enough about them, we can define some desirable state of affairs – "sustainable development" is the current favourite – and then steer the totality towards it. But this is not possible if the system is complex.

The interaction of human and natural systems, our Himalayan village example suggests, is *complex*: ordered (the four forms of social solidarity and their associated styles of management spring eternal) but unpredictable (the failure of any one of these styles inevitably results in the success of one of the other three, but there is no way of knowing which of those three it will be). If the system was *simple*, you could write the relevant differential equations and solve them for equilibrium conditions, but you cannot do this with complex systems, because there *are* no equilibria in them!

Treating what is in fact a complex system as a simple one – by ignoring at least two of the solidarities, and then using that model as a management guide – is therefore a recipe for disaster or, at the very least, for surprises. Just because conventional modelling is not the way to go, it does not follow that there is nothing useful we can do. We can make ourselves

A SWISS VILLAGER'S DAY

➤ **During the growing season, a villager may,** on one day, milk his cows, cut hay, thin saplings, maintain an avalanche control structure and wash dishes in a restaurant. The cows, though privately-owned, are grazed on pasture owned by long-established families; the hay is on his own private field; the saplings are part of a forest owned by another set of families; the avalanche control structure is on private land but maintained by the village; and the restaurant is owned by a multinational hotel chain.

This framework is fairly stable from season to season, but the individual has a very different pattern of activity in the winter, when the cows live in his private byre, and land is snow-covered and barely used, unless the valley includes a ski resort. If it does, he has opportunities for work without leaving the valley; if not, he may leave to work elsewhere.

Thus, in winter, the human ecosystem centred on the valley is concurrently simpler and wider. So our Swiss villager has a "portfolio" of transactions and management styles that fluctuates with the seasons and also with the longer-term dynamics. Like his Himalayan counterpart, he owns his hayfields and cows. These are private property; he can buy or sell them, acting as an individualist and subscribing to the myth of **Nature Benign.**

Coming from an old-established family, he is a member of a forest cooperative that gives him specific rights to cut trees and imposes a duty to maintain the forest. He is also a member of a pasture cooperative, which annually decides the grazing season and the number of animals he may graze, and requires him to contribute to the cowherd's upkeep. These are small-scale hierarchical institutions, which have developed over the generations in response to the limitations as well as the opportunities imposed by the natural environment: **Nature Perverse/Tolerant.**

As a voting member of the commune, he also has a duty to maintain resources that contribute to its survival, such as the avalanche control structures. This tends to be an egalitarian involvement which recognizes that, when it comes to these sorts of hazards, all the members of the community are in the same boat and that each should contribute his equal share: **Nature Ephemeral.**

Finally, as a dishwasher in a multinationally owned restaurant, he is effectively a replaceable fatalist. His involvement is necessary if the enterprise is to continue, but he has no interest in its future, nor it in his, and he can be paid off at any time: **Nature Capricious.**

clumsy, and we will now try to explain, with the help of an additional example, a Swiss village, what clumsiness is, and what is entailed in achieving it.

A SWISS EXAMPLE

Moving from the Himalaya to the Alps, we find much the same fourfold allocation of transactions, with agricultural land being privately owned, and grazing land and sometimes the forests being communally owned. The Swiss forests, unlike those of the Himalayan villagers, are physically sandwiched between the high pastures (communally owned) and the valley floor (privately owned fields, houses and hotels). Over the centuries that the Davos valley, to take a specific locality, has been settled, both the fields and the grazing land have expanded at the expense of the forest. However, the trees on the steeper slopes have stayed in place, acting both as a source of timber and as a barrier against avalanches. It is difficult to achieve both these functions simultaneously and in managing the forest for timber production, the Davosers have often set in train changes in the forest's age structure. Decades later, these have resulted in exceptional avalanches reaching the valley floor and threatening the destruction of the entire community.

Every time this unpleasant surprise has befallen them, the Davosers have responded by switching their forest management onto the all-in-the-same-boat, egalitarian style. Later, it sometimes shifted to the hierarchist style, and often to the individualist style, with farmers owning long thin strips of forest running all the way from valley floor to alpine pasture. Sometimes it also shifted to the fatalist style, e.g., when the avalanche danger was clearly perceived yet extraction continued in response to demands of mining booms and, in more recent years, for ski runs.

Surely, you might think, they would have got it right by now. But this is to assume that there is *one* right way, and that, our fourfold scheme shows us, is not the case. There is no way of ever getting it right, because managing one way inevitably changes the forest to the point where that way of managing is no longer appropriate. This would happen even if there were no exogenous changes like the mining and tourist booms. Viability can only be achieved therefore by "covering all the bases": by the villagers, ensuring that they have the full fourfold repertoire of management styles; and by their being prepared to try a different style whenever the one they are relying on shows signs of no longer being appropriate (see Box: A Swiss Villager's Day). The clumsy Davosers, like their Himalayan counterparts, have been in their valley for more than 700 years, without destroying either themselves or their valley in the process; an achievement that would not have been possible if they had opted for just one management style, or even for the two that the prevalent orthodoxy allows!

THIS ARTICLE is based on M.F. Price and M. Thompson (1997) The Complex Life: Human Land Uses in Mountain Ecosystems, *Global Ecology and Biogeography Letters*.

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PAPUA NEW GUINEA:

DISADVANTAGED COMMUNITIES IN THE HIGHLANDS

An Australian research project analyses human-environment relationships in Papua New Guinea and paints a powerful picture of people's disadvantage and vulnerability | BY LUKE HANSON

➤ **Next time you gaze over a world** atlas, run your finger from Southeast Asia to the South Pacific. Midway along this line and just south of the equator is the nation of Papua New Guinea (PNG). If your atlas shows altitude, then you'll notice the dominance of an unusually high mountain range. With numerous peaks over 4000 meters and an equatorial glacier in nearby Irian Jaya, this is the second highest mountain range in the Southern hemisphere after the Andes. Commonly referred to as the highlands of PNG, the area is also one of the cradles of human-environment relationships with several thousand years of human settlement, cultural development and agricultural innovation.

Foto: L.W. Hanson

Population pressure in some highland valleys is forcing people into remote uninhabited areas to make gardens

Today, there are over two million people living in the highland valleys. The majority are semi-subsistence farmers who survive on garden produce such as sweet potato. Most people are very poor. Sales of Arabica coffee and fresh food earn an average of 50 Kina (15 US dollars) per person per year. Health, education and information services are limited and infrastructure has been in gradual decay since PNG gained independence in 1975. The population has doubled over the same period, leading to rapid agricultural intensification and environmental degradation in many areas. The problems continue. Increased tribal fighting, a decline in law and order, land tenure disputes, political corruption and administrative incompetence offer grim prospects for the future. The highlands of PNG remain an important hotspot for international assistance.

A five-year research project funded by the Australian Agency for International Development and the Australian Centre for International Agricultural Research has recently developed methods that analyse a range of human-environment relationships throughout PNG. The research builds on three nationwide field surveys – one of land use practices and population, one of environmental resources and one of child malnutrition. By combining selected data from these three surveys, the project developed methods to assess and map variations in land potential, agricultural pressure on land, cash income, access to services and child malnutrition. When this information is aggregated, it provides a powerful picture of human disadvantage and vulnerability. Further comparisons with data on population change add a useful predictive capability.

The complexity of the work is best demonstrated by the method to assess agricultural pressure on land. The first stage determines land potential through the classification of data on annual rainfall, rainfall seasonality, temperature, light, slope gradient and soil type. The second stage modifies land potential values according to the type of agricultural practices that are used to improve productivity. These range from low-input practices such as natural bush fallows and burning, to high-input practices such as improved fallows, legume rotations, composting, mounding, drainage, soil-retention barriers and tillage. The third stage determines agricultural intensity according to the number of crops planted and the length of the fallow period. The final stage identifies mismatches between modified land potential and agricultural intensity. Areas with strong agricultural pressure are those where very high intensity agriculture is practised on low potential land, leading to various forms of environmental degradation, declining crop yields, food shortages and high levels of child malnutrition. In the worst cases, people in such areas are further constrained by severe poverty and thus have few opportunities to improve their livelihoods.

There is a positive side. The highlands of PNG contain some of the most productive land in the Asia-Pacific region. The mountain valleys are inhabited by people with a competitive work-oriented outlook, and they are located on the doorstep of major Asian population centres. This creates many opportunities for long-term agricultural development, should there be a combined effort to make it happen.

The results of these methods have recently been published in the Papua New Guinea Rural Development Handbook (**http://rspas-bookshop.anu.edu.au/**). The book is designed to assist international donors and non-government organizations with the identification of issues, development of policy and prioritisation of rural development activities. While the information presented in the book is specific to PNG, the methods are generic and can be applied to other countries.

▼

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REHABILITATION OF DEGRADED LAND

Land-use and land-cover change impacts and strategies in the Indian Himalaya Mountains

BY R.K. MAIKHURI AND K.S. RAO

➤ **The Himalaya Mountains are extremely rich in biological** and cultural diversity, inhabited by traditional societies and faced with serious threats of environmental degradation. An increase in population pressure on this mountain region has contributed to major changes in land-use and land-cover patterns and a rapid depletion of natural resources.

People's participation in an ecological restoration of degraded lands or wastelands in the Himalaya is important for sustainable development at a local, national, regional and global level (Maikhuri *et al.*, 1997a,b; Rao *et al.*, 1999). Although numerous land restoration projects have been implemented in the Himalaya Mountains, their impacts have been modest because of lack of appropriate technologies, policies and implementation mechanisms.

Forestry on community managed degraded lands is reported to have succeeded in some parts of Nepal [1], where the policy permits economic benefits from timber. There are also examples of local initiatives to improve tree cover without any financial support. Such responses are likely when forest resources are extremely scarce, and people do not want to move away for social, cultural and political reasons. In the Indian Central Himalaya, outmigration to urban and industrial areas due to resource scarcity is common. In some villages 76% of the families migrated during the last few years [2, 3].

The failure of afforestation and reforestation efforts to develop degraded lands in the Himalaya Mountains could be attributed largely to the ignorance of people's essential needs and hence their non-cooperation. People's participation is now considered as a prerequisite to success of any land rehabilitation effort in the Himalaya. A reconciliation of the interests of local communities (immediate tangible benefits) and the global concern for the ecology and biodiversity of the region (long-term intangible benefits) is of utmost importance for a sustainable rehabilitation of degraded lands.

➤ **The Indian Himalaya Mountains** extend over 2800 km and are inhabited by 70 million people and 49 million livestock. Forests cover only 17.8 million ha to meet their increasing demands. Deforestation and unsustainable land use are causing extensive land degradation, affecting about half of the region. The Indian Himalaya encompasses 59 million ha of land, of which 7.3 million ha is degraded community land, 13.5 million ha are degraded government forests, and 1.2 million ha are abandoned private agricultural lands. Remote sensing surveys indicate that closed forests cover only 11% of the country, and only 40% of the Indian Central Himalaya is forested. Land degradation not only threatens the biodiversity of the Himalaya, one of the global biodiversity hot spots, but also has far reaching effects on the regional/global climate and hydrological process.

The development of agro-forestry on degraded community lands is one way to achieve land rehabilitation. Over a period of 10 years, covering villages of the Central Himalaya Mountains at a mid and high altitude (1200 m and 2200-2500 m), the ecological restoration of degraded community and forest lands was developed and implemented on a small scale, using plots of 6 and 8 ha. This was evaluated in terms of economic and ecological costs and benefits and built on people's traditional knowledge.

The rehabilitation framework and strategies comprised: **i)** a survey of local perception and indigenous knowledge related to degraded forest land rehabilitation; **ii)** analysing people's perceptions from the perspectives of other stakeholders and their concerns; **iii)** discussing these perceptions with the people and identifying possibilities for improvement based on scientific knowledge; **iv)** facilitating consensus for an enhanced rehabilitation framework, and its implementation monitoring.

Afforestation and restoration can succeed where scarcity of tree-based products threatens the livelihood of local communities, or where a policy provides monetary benefits to the local communities. In the sparsely populated high altitude villages and areas of the Indian Himalaya, where food, fodder and fuelwood are not scarce, local communities are granted rights to use forest products for subsistence. However, the policy does not allow profits from timber trade. Introducing non-timber forest products that provide monetary benefits over short periods of time, such as temperate bamboo and medicinal herbs, together with locally valued multipurpose trees could be another rehabilitation option that would be ecologically sound and acceptable to the people [4]. Fodder, fuelwood and timber from degraded community lands would reduce the threats of degradation to existing forests, improve the livelihood of the local communities and bring global environmental benefits.

The practice and framework we developed for degraded land rehabilitation is now widely accepted, particularly by the locals. It has also been accepted as a major source of inspiration for the Forest Department, policy makers, NGOs, environmentalists, village institutions and other government departments involved in development. More research is required to develop and cultivate species that are ecologically and socio-economically appropriate to further improve the rehabilitation framework presented here. Considering the diversity of ecosystems, indigenous knowledge, and socio-economic conditions in the mountains, a rehabilitation strategy has to be location-specific. There is a need for developing rehabilitation models suited to diverse sets of ecological and socio-economic conditions in the Himalaya Mountains.

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REFERENCES to this article are included in the electronic version of Update 01/02 on the IHDP website at **www.ihdp.org/update0102/references.htm**

▼

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GECHS SSC MEETS IN CANADA

BY MIKE BRKLACICH AND ANN ZURBRIGG

➤ **In early December 2001 the Scientific Steering** Committee (SSC) of the IHDP Project on Global Environmental Change and Human Security (GECHS) met in Victoria, Canada, to set priorities for the coming year. Most importantly, the SSC confirmed its commitment to proceed with several signature projects and established its endorsement guidelines for GECHS projects. These guidelines will be posted on the GECHS website at **www.gechs.org** and will engage GECHS in new and expanded collaborative research.

Signature Projects: the SSC agreed to develop a project proposal on "Environment and Human Security in Russia: New Dimensions of Insecurity During a Transition Period" into a signature project, to explore the potential for an associated workshop in Moscow and to pursue funding opportunities. Briefings in Washington and Ottawa will take place in Spring 2002. Several SSC members have been involved in discussions and workshops on initiatives on human security and vulnerability to global environmental change. The development of a signature project will focus on strengthening the conceptual framework and exploring the potential for a workshop in late 2002 or early 2003. Funding sources for this project were discussed and will be pursued. In addition, the GECHS Project will collaborate with the International Peace Research Institute (PRIO) in the development of a signature project on the role of natural resources in civil conflicts as part of PRIO's proposal for a Centre of Excellence on Civil War.

GECHS will move forward in expanding its network through a variety of approaches, including workshops and endorsement of research projects. In addition to the workshops associated with the signature projects, an intensive workshop focusing on one or more GECHS themes remains on the agenda but was deferred until 2003 or 2004. With the appointment of Mike Brklacich (based at Carleton University in Ottawa) as Chair of the GECHS-SSC, the decision was taken to move the International Project Office to Ottawa in mid-2002. The next SSC meeting will be held in late October or early November 2002 in Moscow.

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IDGEC NETWORK INITIATIVE

BY SYMA ALEXI EBBIN

➤ **Over 470 individuals from 55 different countries comprise the** Network of the IHDP Project on the Institutional Dimensions of Global Environmental Change (IDGEC). As Executive Officer of IDGEC I have long wondered how best to catalyze this community to enhance this mutually beneficial relationship between Network members and the Project.

Since I began my job with IDGEC, I have undertaken several initiatives to facilitate these objectives. I believe, however, that there is more that we can do to enhance the relationship between the IDGEC Project and the Network. To this end, the International Project Office (IPO) of IDGEC is developing an initiative to provide our Network members with more tangible benefits and at the same time derive benefits from the Network's substantial expertise and cutting-edge research.

The IPO has begun to develop some ideas on how to achieve these aims:

➤ Have competitive calls for papers for our flagship workshops. Papers could be selected on a competitive basis for presentation at the flagship workshops; this would include travel expenses for the presenter(s) selected.

➤ Establish an IDGEC summer fellowship, sponsoring a summer fellow (pre- or post-doctoral) for a few weeks/months at the IPO.

➤ Develop a summer short course on IDGEC. The short course could include various speakers and activities and perhaps conclude with a publishable manuscript. Participants could be selected on a competitive basis.

➤ Develop a curriculum, textbook, teaching materials, instructor's items, etc. for a university course on IDGEC that could be adopted and adapted at interested institutions.

➤ Convene IDGEC panels and workshops at various professional conferences, such as the International Association for the Study of Common Property (IASCP).

➤ Convene an IDGEC Open Science Conference.

➤ Develop thematically linked networks associated with the flagship activities and crosscutting themes, such as has been done with the Global Change and Terrestrial Ecosystems (GCTE) project of IGBP. The Network's function is to develop common protocols, rapid transfer of information among the various groups and projects in the Networks and organize workshops.

➤ Engage more actively with national research councils/global change committees to mobilize relevant communities.

➤ Engage the policy community more in IDGEC endeavors by inviting them to IDGEC workshops.

The IDGEC Network Initiative is still in the development phase, and we are seeking input from Network members. If you have any thoughts on these ideas or other views on how to enhance this relationship, please contact us at the IDGEC IPO.

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THE GLOBAL CARBON PROJECT

BY ORAN R. YOUNG AND DEBRA MEYER WEFERING

➤ **The Scientific Steering Committee (SSC) of the Global** Carbon Project (GCP) held its first meeting in December 2001 in San Francisco. The project's name has been selected to replace what was formerly referred to as the "Carbon Joint Project". The SSC set a high standard for new research on the global carbon cycle, integrating the contributions of numerous disciplines through this shared partnership between IHDP, the International Geosphere-Biosphere Programme (IGBP) and the World Climate Research Programme (WCRP). The challenge of charting a course for the work of this crosscutting project over the next several years was achieved. It will require intensive efforts on the part of all concerned.

Photos: D. Meyer Wefering

Composed of fifteen members, equally representing the three Global Environmental Change Programmes, the SSC includes a mix of ecosystem scientists focusing on terrestrial systems, physical scientists working on atmospheric and marine systems, and social scientists concerned with the human dimensions of the global carbon cycle. For the first time, these communities found themselves represented by leading scientists interacting on an equal basis. All participants are committed to the call of the GCP Prospectus for research that accepts that "humans and their activities are an integral part of the carbon cycle, and that the human-environment system is a single, highly linked and interactive system that drives the dynamics of the carbon cycle" (see "The Carbon Challenge: An IGBP-IHDP-WCRP Joint Project," Stockholm: International Geosphere-Biosphere Programme, June 2001, 4).

The major achievement of the San Francisco meeting was the development of a set of core or flagship activities for the GCP. The group reached agreement on four thematic activities:

➤ **Improving Understanding of Space-Time Patterns in the Contemporary Carbon Cycle** – an effort to improve our understanding of patterns and variability by focusing on regional sinks and sources;

➤ **Carbon Cycle Consequences of Regional Development Pathways** – a study of variability in human-induced changes in the carbon cycle;

➤ **Emergent Properties of the Coupled Human/Carbon/Climate System** – a programme of modelling aimed at identifying instabilities, thresholds, and surprises in coupled human/natural systems;

➤ **Carbon 21: Evolution of Carbon Sources and Sinks in the 21st Century** – an assessment of carbon futures incorporating human responses as well as anthropogenic drivers.

A framework document for internationally coordinated research on the global carbon cycle is nearing completion. Scheduled for publication in May 2002, this document will set forth the scientific basis for the approach adopted in the GCP Prospectus and include an implementation plan for moving forward with the Project's flagship activities. Plans are evolving rapidly for a distributed network of project offices to carry out and coordinate the work of the GCP. Offices are intended to open during 2002 in Australia, Japan, and the United States. A fourth office, to be located in Europe, is currently under discussion.

The SSC also realised the importance of devising a mechanism to interact with multiple stakeholders, including not only the research community but also funding agencies, assessment and policy communities, and national and regional carbon programmes. Particularly important is the need to maximize coordination between the research community and those engaged in long-term carbon observations. To this end, the Committee approved the creation of a single Strategic Advisory Committee (SAC) whose function will be to provide input from a broad range of stakeholders to the GCP and the Integrated Global Carbon Observations (IGCO) programme.

Specific updates and documents on all GCP activities are available at the official website of the joint project: **http://gaim.sr.unh.edu/cjp/index.html**

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NORWAY'S GLOBAL CHANGE RESEARCH

BY NINA GORNITZKA

ORGANISING GLOBAL CHANGE RESEARCH – FROM COMMITTEE TO ADVISORY PANEL

In 1997 the Research Council of Norway (RCN) established a Norwegian Global Change Committee. Its main task was to stimulate and co-ordinate Norwegian research related to global environmental change and serve as a broker between national and international research activities. Special emphasis was given to co-operation with the international global environmental change programmes and the International Institute for Applied Systems Analysis (IIASA). In 2002, the Committee was reorganised into an interdisciplinary advisory panel. Its tasks remain much the same, but include the possibility of taking on new areas of responsibility.

INVENTORY OF GLOBAL CHANGE RESEARCH

In 2001 the Norwegian Committee compiled an inventory of projects on global change research (GCR) that are funded by the Research Council of Norway. GCR was defined as research that can be considered relevant to the science agenda of the four major international global environmental change programmes, DIVERSITAS, IGBP, IHDP and WCRP. Projects of relevance to IHDP made up 23 % (or about US$ 2.0 million) of the total amount spent by the Research Council on GCR in 2001. The majority of these projects were in the social sciences, mostly in the area of Industrial Transformation (IT); other projects are related to Institutional Dimensions of Global Environmental Change (IDGEC) and to Global Environmental Change and Human Security (GECHS). Only few research activities of relevance to Land-Use and Land-Cover Change (LUCC) were identified. The findings of the inventory will assist the Council in its efforts to increase Norwegian participation in the international GEC programme activities.

GLOBAL CHANGE AND FOOD PROVISION – OSLO WORKSHOP

In November 2001, a workshop organised by the Global Change Committee on *Global environmental and climate change – consequences for food provision: international research challenges for Norwegian research* attracted much attention. It will hopefully lead to new collaborative research related to food production and climate change. John Ingram from the NERC Centre for Ecology and Hydrology, UK, and Executive Officer of the Joint Project on Global Environmental Change and Food Systems (GECAFS), gave a very interesting presentation on GECAFS and the many challenges that lie ahead in implementing the project plan. Günther Fischer and Mahendra Shah, both from IIASA, presented the IIASA report *Global Agro-ecolocical Assessment for Agriculture in the 21st century*, its main results and implications for national and global policy formulation in this area. The Norwegian participants, mostly researchers, but also representatives from the Norwegian Agency for Development Cooperation (NORAD) and some NGOs, were invited to comment on how their own work might relate to GECAFS and the IIASA project. International workshops, such as this one, are a very useful mechanism to stimulate and increase participation by national research groups in international collaborative research.

CHALLENGES AHEAD

Much interesting research is underway in Norway that would be highly relevant to IHDP, but there are no links to any of the IHDP core projects. This issue was discussed in June last year at a joint meeting of the Global Change Committee and representatives of programme committees in charge of national GEC-relevant programmes of the NRC. It was agreed to develop more systematic relationships among the Global Change Committee and the national programmes, and also among the Research Council's programmes, to ensure cooperation between national and international research initiatives and enhance funding possibilities for interdisciplinary GEC research projects. As a priority in 2002, mechanisms to implement this new agreement will be developed. We are very interested in learning from other National Committees about their experiences: how do they succeed in stimulating successful links between their own research and funding systems and IHDP's research activities?

▼

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DIRECTORY OF HD RESEARCH AVAILABLE NOW!

➤ This Directory includes final reports from seven National Human Dimensions Committees, ie in Bolivia, Bulgaria, India, Ivory Coast, Mexico and Vietnam, who received financial support within the IHDP "Seed Grant" initiative to help them identify "who is doing what?" in human dimensions research in their countries. IHDP funds a small grants programme, which provides awards (limited to US$ 2,000 per country) to groups of researchers from developing countries and transition economies to help establish a formal National HD Committee, or to existing National HD Committees in developing countries and countries with economies in transition, in order to further build HD research. The purpose is to facilitate the creation of new research networks, convening of national workshops and specific national human dimensions research initiatives.
Free copies of the directory can be ordered from the IHDP Secretariat, **staff.ihdp@uni-bonn.de**; for more information about the IHDP Seed Grant, visit **www.ihdp.org/ihdp/NCs/HTML-Dateien/SeedMoney.html**

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Directory of Human Dimensions Research Activities, IHDP Seed Grant Programme, Final Reports 1999-2000, edited by P. Pommerening, R.V. Shaw and M. Gardner; IHDP, Bonn, Germany, October 2001.

IHDP SCIENTIFIC COMMITTEE

➤ IHDP's sponsoring organisations, ICSU and ISSC, have extended the terms of **Arild Underdal** (Norway) as Chair of the IHDP Scientific Committee (SC), and of **Anne V. Whyte** (Canada) as Vice-Chair of the IHDP-SC, to 30 June 2002. The term of SC member and Past Chair **Eckart Ehlers** (Germany) has been extended to 31 December 2002.

Effective January 2002, **Carl Folke** (Sweden) has been appointed as a member of the IHDP Scientific Committee for a period of three years. The SC guides IHDP's work and research activities.

Carl Folke is based at Stockholm University, Sweden, where he is the Director of the transdisciplinary Centre for Research on Natural Resources and the Environment (CNM) and Professor and Head of the Natural Resource Management Division at the Department of Systems Ecology. Carl has extensive experience in interdisciplinary collaboration between natural and social scientists, and has worked with the social and economic dimension of ecosystem management and proactive measures to avoid loss of resilience. He has served as adviser to the Swedish Government on environmental issues and collaborated with several UN organisations on issues like biodiversity, freshwater management, and sustainable cities. He is also a scientific advisor to the Millennium Ecosystem Assessment.


Photo: C. Folke

IHDP AT BONN'S SALON INTERNATIONAL

➤ What do we know about the causes and consequences of global environmental change? Why is a coordinated international research programme necessary? Interested in hearing answers to these important questions, some 70 guests followed an invitation by the City of Bonn and the IHDP Secretariat and, on 29 January 2002, attended the *Salon International*. This is a monthly event organised by the Office of the Lord Mayor of Bonn and held at Bonn's spectacular art museum, to facilitate communication and information exchange between the Bonn and the international communities.

IHDP Executive Director Jill Jäger and all members of the Secretariat team welcomed representatives from government institutions, academia, the press and general public. In a short presentation on "Humans and the Environment: Causes and Consequences", Jill Jäger described how IHDP is responding to these challenges and introduced key research activities. The following lively discussions and the many questions asked by the audience were a clear indication of the interest in IHDP's work. The event led to a better understanding of the important issues addressed in IHDP's research; it contributed to increasing IHDP's visibility and establishing numerous contacts with the Bonn communities.


Photos: E. Dyck

In Memorian: Verónica Mera-Orcés (1965-2002 †)

Deeply saddened we learned that Verónica Mera-Orcés (Ecuador) died in an airline crash on January 28, 2002 at the border of Columbia and Ecuador. She was a researcher at the International Center for Tropical Agriculture in Quito, Ecuador.

Verónica was a participant in the International Human Dimensions Workshop in 2000 and since then had been one of our most active young scientists in the IHDP network.

Our sympathies go to her family and friends.

MEETING CALENDAR

19-23 March – Los Angeles, California

98th Association of the American Geographers 2002 Annual Meeting

"Landscape Fragmentation and the Analysis of Land-Use/Land-Cover Change: From Pattern to Process" – Session sponsored by the Spatial Analysis and Modelling, and the Remote Sensing Specialty Groups

Contact: Darla Munroe, dmunroe@indiana.edu

19-20 April – Müncheberg, Germany

International Workshop on Sustainable Development of Multifunctional Landscapes

Contact: www.zalf.de/landtom/meeting/workshop.htm

21 – 25 May – Bridgetown, Barbados

Conference and Workshop on Climate Variability and Change and their Health Effects in the Caribbean

Contact: www.cpc.paho.org

3-14 June – Bonn, Germany ***by invitation***

3rd International Human Dimensions Workshop: Human Dimensions of Urbanisation and the Transition to Sustainability

Contact: Maarit Thiem, thiem.ihdp@uni-bonn.de
www.ihdp.org

June 5-7, 2002 – Wageningen University, The Netherlands

Conference on Risk and Uncertainty in Environmental and Resource Economics

Sponsored by the Netherlands HD Committee

Contact: www.sls.wageningen-ur.nl/me/conference.html

1-5 July – Moshi, Tanzania

International Conference to Mark the International Year Of Mountains (IYM 2002)

organised by African Mountains Association

Contact: Prof. S. B. Misana: smisana@ud.co.tz

26 August – 4 September – Johannesburg, South Africa

World Summit on Sustainable Development (WSSD)

Contact: Johannesburg Summit Secretariat, United Nations, dsd@un.org, www.johannesburgsummit.org

29 August – 2 September – London, UK

International Conference on Environmental Catastrophes and Recovery in the Holocene

Sponsored by PAGES and INQUA

Contact: www.brunel.ac.uk/depts/geo/Catastrophes/

29 October – 4 November – Bishkek, Kyrgyzstan

Bishkek Global Mountain Summit (BGMS)

The International Advisory Board of the BGMS is co-chaired by the Government of Kyrgyzstan and FAO; UNEP has been designated the international technical secretariat and is working closely with the Government of Kyrgyzstan to organise the conference.

Contact: www.mediantics.com/mountainsummit/

PUBLICATION | NEW BOOKS

Environmental Regime Effectiveness: Confronting Theory with Evidence
by Edward L. Miles, Arild Underdal, Steinar Andresen, Jørgen Wettestad, Jon Birger Skjærseth, and Elaine M. Carlin; MIT Press, Nov. 2001; 530 pp.
cloth ISBN 0-262-13394-6; paper ISBN 0-262-63241-1

This book examines why some international environmental regimes succeed while others fail. Confronting theory with evidence, and combining qualitative and quantitative analysis, it compares fourteen case studies of international regimes. It considers what effectiveness in a regime would look like, what factors might contribute to effectiveness, and how to measure the variables. It determines that environmental regimes actually do better than the collective model of the book predicts. More information at **http://mitpress.mit.edu/0262133946**

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Ecology and Sustainable Development
by P.S Ramakrishnan, National Book Trust, New Delhi, India, 2001; 198 pp.

This book looks at the emerging paradigms in ecology in the context of natural resource management that is based on maintaining heterogeneity in the landscape. Since traditional ecological knowledge plays an important role, its integration into modern science has become a necessity for ensuring community participation in natural resource management in the developing tropics.

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AVISO – a policy bulletin on Global Environmental Change and Human Security supported by the U.S. Agency for International Development, Office of Population; through a cooperative agreement with the University of Michigan, Population Fellows Program; the Woodrow Wilson Center, Environmental Change and Security Project; the Canadian International Development Agency; and with support from the University of Victoria.

RECENT ISSUES:

AVISO No. 10 (July 2001): "Environmental Stress and Human Security in Northern Pakistan" by R.A. Matthew;
AVISO No. 9 (June 2001): "Russia: New Dimensions of Environmental Insecurity" by V. Kotov and E. Nikitina; available in English and Russian;
AVISO No. 8 (June 2001): "Infectious Diseases and Global Change: Threats to Human Health and Security" by J. Eyles and R. Sharma.

Funding is now in place for Phase II of the ***AVISO*** bulletin with forthcoming issues on:

- Urbanization and global environmental change
- Environment, development and human rights
- Energy and human security.

AVISO is available at the GECHS website (**www.gechs.org**) or from the GECHS Intern. Project Office, University of Victoria, P.O.Box 1700, Victoria, BC, Canada V8W 2Y2.

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