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Cover photo: *Mountains tower over Tehran, Islamic Republic of Iran, providing vital resources*

F. Giaccone

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## EDITORIAL

## International Year of Mountains – 2002

**M**ountains are landscapes of startling contrasts – beautiful but dangerous, rugged but fragile. They offer sublime spiritual inspiration but are often places of desperate poverty. Mountains are unique landscapes that harbour much of the world's biological and cultural heritage, including many species, as well as knowledge and traditions, that are found nowhere else.

To draw attention to these vital environments, their people and their needs, the United Nations General Assembly has declared 2002 as the International Year of Mountains (IYM), and invited FAO to serve as the lead agency for its observance, in collaboration with governments, other United Nations agencies and non-governmental organizations. FAO is proud to be leading such an important initiative. We see this work as an extension of our role as task manager for implementing Chapter 13 of Agenda 21, which is dedicated to sustainable mountain development.

Undoubtedly the most important message of the International Year of Mountains is that mountains are crucial to the security of both highland and lowland people. Three billion people – more than half the world's population – rely on mountains for water for drinking, irrigation, industry and electricity. The IYM is an opportunity to raise awareness of the diverse values of mountain regions for society as a whole.

In the first article of this issue of *Unasylyva* devoted to the mountains, M.F. Price and B. Messerli review the evolution of the inclusion of mountains in the global agenda since the United Nations Conference on Environment and Development (UNCED) and the emergence of sustainable mountain development as a global priority. The authors identify the central issues of the five basic pillars of the IYM: economics, environment, culture and gender, policies and legislation and risk. These pillars form a framework for the articles that follow.

Although mountains are rich in natural and cultural resources, in economic terms they tend to be among the poorest places on earth. But mountains can also provide opportunities for redressing poverty and achieving sustainable development. H.R. Mishra presents five mountain strategies for promoting food, water, environmental and employment security – for both highland and lowland populations.

Mountain environments are characterized by broad diversity, not only biophysical, but also social, economic and cultural. M. Muthoo surveys the state of some mountain environments particularly in developing regions of Asia, Africa and Central and South America. He concludes that environmental issues should not be addressed in isolation, but need to be considered in combination with economic and social dimensions.

2002 is also the International Year of Ecotourism. In both socio-economic and environmental terms, mountain tourism

and ecotourism offer both opportunities and problems. S.K. Nepal examines the Nepalese experience, which offers valuable lessons for international mountain communities.

Mountains are also places of rich cultural diversity. They are home to at least one-tenth of the world's population. Highland communities have developed cultural strategies over the centuries to sustain life in their often fragile and unforgiving environments. W.L. Mitchell and P.F. Brown describe the subsistence patterns, social organization and ideology of one traditional group of people from the high mountains, the Aymara of the Peruvian Andes, making some comparison to cultures of the Himalaya-Karakorum-Hindu Kush of Central Asia, with which the Aymara share some striking cultural similarities.

Mountain law is still in its infancy: there are few mountain-specific legal instruments currently in force at either national or international level. A. Villeneuve, P. Talla and M.A. Mekourar describe existing mountain legislation, including the Alpine Convention (the only legally binding mountain-specific international instrument), many non-binding "soft law" agreements and domestic mountain-specific legislation from the few countries that have developed it, mostly in Europe.

The contours and peaks of mountains make them highly unstable. In the mountains, people, property, infrastructure and ecosystems are threatened by various hazards and dangerous processes, which easily lead to casualties, injuries, destruction of goods and ecological damage. P.C. Zingari and G. Fiebiger discuss ways of evaluating risks and some means to mitigate them.

Statements from FAO's Director-General and the King of Nepal, profiles of mountain issues and activities from countries such as Bolivia, Italy, Kyrgyzstan and Peru, and information on mountain forests, tropical cloud forests and sacred mountains complete *Unasylyva's* foray into the mountains.

The issue closes with a grave concern: most of the armed conflicts in the world today are in mountain areas. In 1999, 23 of the 27 major armed conflicts in the world were being fought in mountain regions. When people are at war, secure food supplies cannot be guaranteed. When the future is unpredictable, people are unlikely to take steps to improve their lives or their environment. Sustainable development, food security and peace must be promoted hand in hand.

Mountains are as vital as the oceans and as essential to human well-being. All people – whether dwelling at sea level or in the highest altitudes – depend on mountains for life. We are all mountain people. This awareness is the essential foundation of long-term, effective action. ♦

# Together we can move mountains

*Dr Jacques Diouf  
Director-General*

*Food and Agriculture Organization of the United Nations*

*Statement on the official launch of the International Year of Mountains – 2002, at the headquarters of the United Nations, New York, 11 December 2001.*

*Mr Chairman, Excellencies, Honourable Delegates, Ladies and Gentlemen,*

It is a privilege to be with you today to launch the International Year of Mountains. I am honoured to be among individuals and representatives of organizations dedicated to conserving the world's fragile mountain ecosystems and enhancing the well-being of mountain people.

Just as a mountain is made from innumerable, individual particles, so too the International Year of Mountains has come about because of the painstaking efforts of many women and men. I thank all those who have already contributed so much time, energy and thought to making the International Year of Mountains a reality.

In particular, I wish to thank President Akaev of Kyrgyzstan for his original proposal to designate an International Year of Mountains. His vision will, I am certain, result in positive changes in mountain communities – changes that will extend far beyond 2002.

I also wish to thank the Austrian, Swiss, Italian and other ambassadors to the United Nations who, as members of the International Year of Mountains Focus Group, planned this launch with us and worked so diligently to make it happen.

As I look around this chamber, I am greatly encouraged to see the diversity of countries, organizations, cultures and individuals here today. It is indicative of an increased awareness that all of us – whether we dwell at sea level or in the highest altitudes – depend on mountains for life.

*Excellencies, Ladies and Gentlemen,* Mountains are not the impenetrable, unchangeable monoliths of rock as many of us may have imagined. Indeed, they are as full of life as the oceans, and as essential to our well-being as tropical rain forests. More than half of

humanity – three billion people – relies on mountains for safe, fresh water – water to grow food, to produce electricity, to sustain industries and, most importantly, water to drink. Yet, as we gather here today, mountain glaciers – the source of water for many of the world's river systems and people – are melting at unprecedented rates – a consequence, many scientists suspect, of global warming.

Mountains are also islands of biological diversity – not simply steeper or higher versions of ecosystems found in lowland areas, but home to a unique and seemingly infinite variety of plants and animals found nowhere else. Many of these species have long since disappeared from flatlands, crowded out by human settlements and activities.

Mountains are also islands of cultural diversity. Home to one-tenth of the world's population, they are keepers of languages and repositories of traditions that enrich our human experience. Mountain people are the stewards of these vertical archipelagos of human and natural variety. They live in, and care for, landscapes that encompass sharp contrasts. Mountain environments are both fragile and fierce, beautiful and brutal. In them one can find sublime spirituality amid the most degrading poverty.

Indeed, as diverse as mountains and mountain cultures may be, they are exceedingly fragile. Together, we must find a way to protect and maintain these vital environments. Together, we must strengthen mountain cultures and eliminate poverty and hunger. This is the essential challenge of the International Year of Mountains – to balance conservation and development.

I believe it can be done. The time is right. We have been building towards this moment for a long time. This special year evolved from the United Nations Conference on Environment and

**FAO Director-General Jacques Diouf speaking at the global launch of the International Year of Mountains – 2002**



Development, held in Rio de Janeiro in 1992. It was there, at the Earth Summit, that mountain issues took their place on the global workplan as the singular focus of Chapter 13 of Agenda 21, the blueprint for sustainable development.

Since the Earth Summit, much has been accomplished. Through intergovernmental consultations we have been developing strategic plans and policies for the sustainable development of mountain regions. The global Mountain Forum, founded in 1995 by people present here today, continues to grow as the network of networks, providing support, information and advocacy for mountain peoples and their environments. Further, there are dozens of research projects already well under way that will ultimately yield the knowledge we need to solve complex mountain problems.

I see 2002 as providing an extraordinary opportunity to reinforce the implementation of Chapter 13, and to move mountains even higher on the global agenda, by increasing awareness of the importance of mountain ecosystems and cultures.

And in September 2002, the World Summit on Sustainable Development in Johannesburg will offer an opportune checkpoint for taking stock, redefining issues and developing more effective approaches.

As you know, the Food and Agriculture Organization serves as the lead agency for the International Year of Mountains. We do this in collaboration with governments, UNEP, UNDP, UNESCO and other United Nations agencies, as well as non-governmental organizations. We at FAO are honoured to do this, and are proud of our role. We see this as essential work, and as an extension of our responsibilities as task manager for Chapter 13. We also believe that sustainable development of mountains will help us achieve FAO's goal of

alleviating hunger and poverty so that all people at all times have access to the food they need for active, healthy lives.

The goal of the International Year of Mountains is both simple and ambitious: to ensure the well-being of mountain peoples by promoting sustainable development of mountain ecosystems. But there are two conditions that must already be in place if nations are to achieve that goal. The first is peace. The second is food security.

Mountain areas are home to most of the armed conflicts in the world as well as to many of the world's poorest and least food-secure populations. You cannot reliably produce food in conditions of war. The needs of people who are hungry, who do not know where their next meal is coming from – or if they will live to eat it – must be addressed first if we are to achieve our goals.

Indeed, as we begin commemorating the International Year of Mountains, conflict may be the single greatest obstacle to achieving our goals. Without peace, we cannot reduce poverty. Without peace, we cannot guarantee secure food supplies. Without peace, we cannot even consider sustainable development.

Every United Nations agency and every United Nations member country has a role to play in promoting peace. Together, we can make a difference. Already, together, we have made a difference. This was affirmed in October when the Secretary General and the United Nations itself were jointly awarded the Nobel Prize for Peace.

I urge you, as individual countries and as nations united, to seek out your unique role as peacemaker. Once you establish that role, your role in sustainable development and conservation of mountains will also become clear.

On our part, the Special Programme

for Food Security (SPFS), FAO's concrete action at the level of rural poor, to assist them to produce their own food as well as generate employment and improve productivity and incomes, is already working on the ground in mountainous countries in Africa, Asia and Latin America. The SPFS, targeted mainly at low-income food-deficit countries, aims at improving household and national food security through rapid increases in food production and productivity, by reducing year-to-year variability in production on an economically and environmentally sustainable basis, and by improving people's access to food. The Programme is currently operational in 66 countries and under formulation in 17 others.

*Excellencies, Ladies and Gentlemen,*  
Wherever we may come from, however high or small the hills or mountains may be in the land of our birth, we are all mountain people. We are all dependent on mountains, connected to them, and affected by them, in ways we may never have previously imagined.

I invite you to join me today in committing ourselves to the eradication of both armed conflict and hunger as a first step in our observance of the International Year of Mountains.

Together, through this international year, we can move mountains.◆

# Message from His Majesty Gyanendra Bir Bikram Shah Dev, King of Nepal

*... on the occasion of the International  
Year of Mountains – 2002*

We are happy to learn that the year 2002 is being observed as the International Year of Mountains under the auspices of the United Nations with the objective of promoting “the conservation and sustainable development of mountain regions, thereby ensuring the well-being of mountain and lowland communities”.

Mountain areas, with their fragile ecosystems, occupy about one-fifth of the world’s land surface area. Moreover, they are also a major source of hydropower and stand as water towers of the world with over half of humanity relying on them for freshwater. While sharing the common physical attributes of steepness and ecological complexities that create natural hazards, microclimates and inaccessibility, they also possess centres of endemism where many species coexist, inhabiting true islands or terrestrial island-like habitats.

Nepal, a mountainous kingdom on the lap of the magnificent snow-capped Himalayas, is home to eight of the world’s ten highest peaks rising over 8 000 m, including Sagarmatha or Mount Everest, the world’s highest mountain. Mountains are a major source of water in our nation, having a potential of producing 83 000 megawatts of hydropower. Nepal is also uniquely privileged to be endowed with spectacular natural beauty and a diverse flora and fauna. We have, over the years, made modest efforts to conserve our fragile ecosystem and improve the well-being of the local communities, through their

participation, emphasizing the fact that no conservation programme can succeed if it is divorced from the lives of those it directly affects. Yet, much remains to be done.

First, if the problems of environmental degradation and poverty – particularly in the developing world – are to be solved, a continued and sustainable economic development is essential; but we must give due consideration to reconciling environmental protection with economic growth. Second, consensus must also be sought so as to make the application of strict environmental standards symbolic of good economic growth and a clean environment. This wise choice will then encourage innovation and promote inventiveness, efficiency and employment. Last but not least, to achieve the goals of sustainable development and a sound environment, as well as to attain a decent standard of life for all, involves very large changes in attitude.

As the International Year of Mountains holds special significance for Nepal, I hope it will play a catalytic role in promoting a global approach towards the effective conservation, efficient management and sustainable development of mountain areas around the world for the greater good of communities and inhabitants living in the regions.

I wish the International Year of Mountains – 2002 every success.



# Fostering sustainable mountain development: from Rio to the International Year of Mountains, and beyond

*M.F. Price and B. Messerli*



*The Blue Mountains, Jamaica*

*An overview of the primary mountain issues and the evolving place of mountains in the global agenda.*

**M**ountains occupy 24 percent of the Earth's land surface (Kapos *et al.*, 2000) and are home to a large part of the world's people. It is difficult to say exactly how large a part, because there is no widely accepted definition of mountains. For many years, it has been estimated that one-tenth of the world's population – about half a billion people – lives in mountain areas. Yet a recent study estimated that 26 percent of the world's population lives in or close to mountain areas. This figure includes not only remote, poor and disadvantaged people and communities, but also urban centres in and immediately outside mountain valleys, including even such mega-cities as Mexico City, Mexico and Santiago, Chile (Meybeck, Green and Vörösmarty, 2001).

However the mountains and their populations are defined, there is no doubt that mountains influence the lives of billions – not only those living there, but those in the lowlands as well (Messerli

and Ives, 1997). In particular, as the source of much of the world's water supply (for example, 80 to 100 percent of freshwater in the arid and semi-arid regions of the tropics and subtropics), mountains have a fundamental role for global food security. In some areas of the world as much as 95 percent of available freshwater is used for irrigation and food production; most of this water originates in the mountains. Thus mountains are vital to a large part of the global population.

Yet until a decade ago, mountains played but little part in global discussion on environment and development. The United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro, Brazil in 1992, presented a unique opportunity for mountains to emerge from the wings (Price, 1998). The inclusion of a specific chapter on mountains in Agenda 21, the plan for action endorsed at UNCED by the Heads of State or Government of most

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**Bruno Messerli** is Professor Emeritus, Institute of Geography, University of Berne, Switzerland.

of the world's nations, placed sustainable mountain development on a comparable footing with other major issues such as climate change, tropical deforestation and desertification. In the decade that followed UNCED, international momentum for support of mountain areas has gathered steadily, culminating in the declaration of 2002 as the International Year of Mountains (IYM).

This article considers the evolution of the inclusion of mountains in the global agenda, the emergence of sustainable mountain development as a development priority, and the primary mountain issues, considered in five basic categories of environment, culture and gender, risk, economics, and policies and legislation.

#### **MOUNTAINS IN THE GLOBAL AGENDA: FROM UNCED TO THE IYM**

At the global level, formal implementation of Chapter 13 of Agenda 21, entitled "Managing fragile ecosystems: sustainable mountain development", began in 1993, when the UN Inter-Agency Committee on Sustainable Development appointed FAO as Task Manager for

Chapter 13. In this role, FAO has convened seven meetings of an ad hoc Inter-Agency Group on Mountains (IAGM), which in spite of its name does not involve only UN agencies, but also includes bilateral donors, non-governmental organizations (NGOs) and research institutions.

Among the recommendations made by the first meeting of the IAGM was that national governments should become directly involved in the implementation of Chapter 13. A key means to this end was a series of regional intergovernmental consultations, bringing together governments (from a total of 62 countries, plus the European Union) within the regions of Africa, Asia and the Pacific, Europe and Latin America and the Caribbean between 1994 and 1996 (Price, 1999a).

The IAGM also underlined the importance of non-governmental involvement, recognizing that the process that led to Chapter 13 – in contrast with many other chapters of Agenda 21 – was driven by a relatively small number of academics and development experts, mainly from industrialized countries. In 1995, a

global NGO consultation was held in Lima, Peru, bringing together 110 participants from 40 countries. This meeting led to the establishment of the Mountain Forum, "a global network for information exchange, mutual support, and advocacy for equitable and ecologically sustainable mountain development and conservation". Organized through both global and regional structures, by the end of 2001 the Mountain Forum had over 2 700 individual and 170 organizational members in more than 100 countries. Key means of information sharing include 15 discussion lists, electronic conferences and an interactive Web site ([www.mtnforum.org](http://www.mtnforum.org)) with membership services, a calendar of events, an online library and links to other networks (Taylor, 2000).

Work in the years following UNCED has been critical in successfully transmitting the message of the global importance of mountain area resources, for example in terms of freshwater resources, biological diversity, importance for recreational activities and sensitivity to climate change. In the first

*Sustainable mountain development involves satisfying the current needs of mountain regions and populations living downstream, while seeking to ensure the availability of natural resources into the long-term future – here, a Nepalese woman plants seedlings for fodder, fuelwood and erosion control in the Himalayan foothills*



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five years after UNCED, a number of nations established national-level or subnational institutions concerned with the sustainable development of their mountain areas. Others, particularly in Europe, developed laws and policies to this end (Price, 1999a).

It was in this context of gathering momentum that the participants in the international conference “Mountain Research – Challenges for the 21st Century”, held in Bishkek, Kyrgyzstan in 1996, proposed that sustainable mountain development should be the theme of an International Year. The proposal of this idea to the UN Economic and Social Council (ECOSOC) by the Kyrgyz Ambassador to the UN in 1997 resulted in a resolution, co-sponsored by 44 member countries, requesting the Secretary-General to undertake an exploratory process. At its following session ECOSOC adopted a resolution, co-sponsored by 105 member countries, which recommended to the General Assembly that 2002 should be declared the International Year of Mountains. The UN General Assembly proclaimed the IYM at its fifty-third session in 1998, in a resolution sponsored by 130 countries.

#### THE PROCESS OF SUSTAINABLE MOUNTAIN DEVELOPMENT

The term “sustainable mountain development” appeared first in the title of Chapter 13 of Agenda 21. However, it has never been specifically defined, in spite of many documents and meetings identifying it as an objective. Indeed, there is no single definition for either of the two concepts that it unites, mountains and sustainable development.

The concept of sustainable development was introduced in the World Conservation Strategy (IUCN, 1980) and became fashionable in the 1980s, notably through the report of the World Commission on Environment and

#### Mount Kilimanjaro’s melting ice cap

**Recently... we have been observing the rapidly declining ice cap of Mount Kilimanjaro, on the Kenya-Tanzania border, which is home to at least 1 800 species of flowering plants and 35 species of mammals. Eighty percent of the ice cap has been lost since this tallest mountain of Africa was first mapped in 1912. As the ice cap and glacier melt as a result of climate change, a vital source of freshwater during dry seasons is disappearing for more than 1 million people relying on the rich volcanic soils of the mountain for farming. It is an entire ecological, economic and social balance that is jeopardized in this region, and it illustrates the dilemma facing many of the mountain regions.**

*Source:* From the statement of Adnan Amin, Director of the United Nations Environment Programme (UNEP) Liaison Office, New York, representing the Executive-Director of UNEP at the launch of the International Year of Mountains in New York, 11 December 2001.

Development (WCED) (the Brundtland Report), *Our common future*, which provided the most frequently cited definition: “development that meets the needs of, and aspirations of, the present without compromising the ability of future generations to meet their own needs” (WCED, 1987). Another commonly used definition, agreed by three major international organizations working in the field, is “development which improves the quality of life, within the carrying capacity of the earth’s life support system” (IUCN/ UNEP/WWF, 1991). Sustainable development was a key concept of UNCED and led to the establishment of the UN Commission on Sustainable Development. Yet debates about its meaning(s) continue, resulting inevitably from its appropriation by a wide range of authors and organizations in diverse cultures. However, most would agree that sustainable development is a process of ensuring that current needs are satisfied while maintaining long-term perspectives regarding the use and availability of natural (and often other) resources into the long-term future and the equitable well-being of future generations.

Given the very different characteristics

of the world’s diverse mountain regions, even on one continent, it is probably best not to propose a precise definition of sustainable mountain development, but to recognize it as “a regionally specific process of sustainable development that concerns both mountain regions and populations living downstream or otherwise dependent on these regions in various ways” (Price and Kim, 1999).

Despite the lack of an accepted definition, Sène and McGuire (1997), representing FAO in the role of Task Manager for Chapter 13, state that “the concept of sustainable mountain development has taken on new meaning” since UNCED. They also state that the time has come for a multisectoral, more comprehensive approach to addressing the problems and needs of mountain areas. The various regional inter-governmental consultations on sustainable mountain development have identified long lists of areas that are intended to contribute, or in some way are related, to sustainable mountain development (summarized by Price, 1999a). Yet it is probably appropriate that there is no attempt to prioritize them, again because of the vast differences among mountain regions.



### Indicators of progress in sustainable mountain development

The objectives of sustainable mountain development vary at different spatial scales and are likely to shift over time. However, to assist in project development and wider planning, and to evaluate success, indicators are needed. Various indicators have been proposed. At the global level, FAO (1996) has proposed pressure and state indicators, to be used in a pressure-state-response framework (OECD, 1993). Such a framework is based on the premise that human activities exert pressures (e.g. pollution emissions or land use changes) on the environment, which can induce changes in the state of the environment (e.g. changes in ambient pollutant levels, habitat diversity, water flows). Society then responds to changes in pressures or state with environmental and economic policies and programmes intended to prevent, reduce or mitigate pressures and/or environmental damage.

FAO (1996) suggested that the key pressure indicator is the population of mountain areas, to be measured in terms of population density, growth and migration. The proposed state indicators were, first, the welfare of mountain populations – to be measured in terms of nutritional anthropometry – and, second, the condition and sustainable use of natural resources in mountain areas. The latter was to be assessed qualitatively based on a composite of four subindices used to describe the state of the natural resource base of a watershed: the status of soil protection; the area of hazard zones; the extent of degraded land; and productivity. Other proposals have been made by Rieder and Wyder (1997), who, like many authors, suggest that sustainability should be measured in terms of three sets of indicators: ecological, economic and social. These indicators need to be

*Mountains are the world's water towers; as the source of most of the freshwater used for irrigated agriculture, they have a fundamental role for global food security; here, a view of the Tehri valley in Uttarakhand, India*



R. AGRAWAL

tailored to specific circumstances.

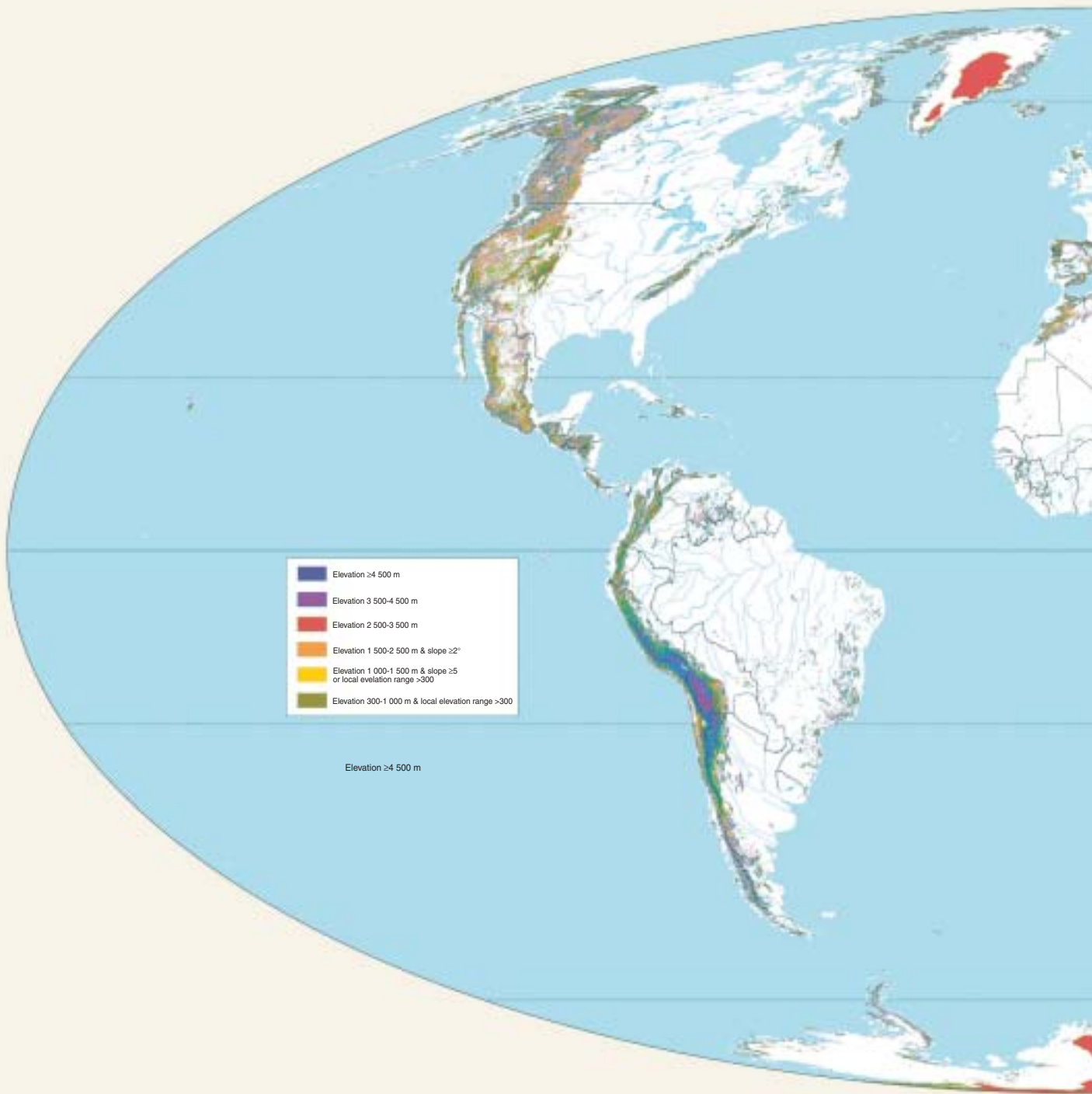
Agreement on priorities for sustainable mountain development, and how it should be measured, will not be simple. Price and Kim (1999) surveyed workers in government, NGOs and scientific organizations in 30 European countries on a set of 36 possible indicators derived from meetings on sustainable mountain development in Europe. They found that, for all respondents, ecological priorities ranked higher than socio-political or economic priorities. However, two socio-political variables were rated highly important: the empowerment of mountain communities and the need for education and training in conservation and development.

Comparable research has not been done in other parts of the world. Yet it is widely felt that indicators for sustainable mountain development have to be

appropriate to the region of concern and based on data that are measurable, available, easily understood and meaningful (Rieder and Wyder, 1997). It is in this context that the articles in this issue should be read, focusing on the five “pillars” for sustainable mountain development used as a framework for many IYM discussions: environment, culture and gender, risk, economics, and policies and legislation.

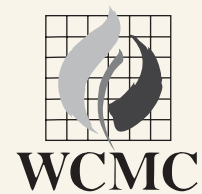
### FIVE “PILLARS” FOR SUSTAINABLE MOUNTAIN DEVELOPMENT

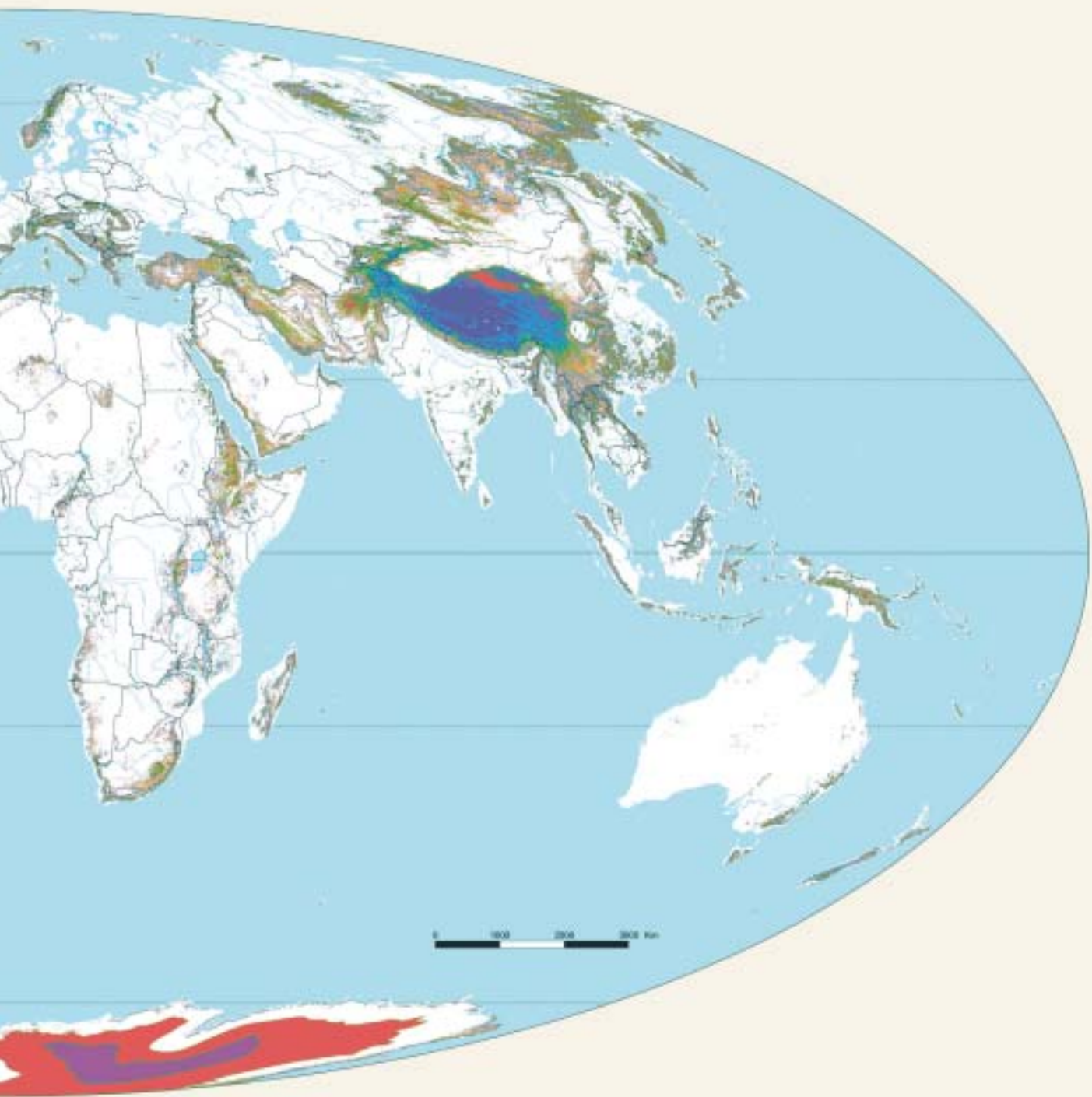
The approach of the five pillars expands the more traditional three-legged approach to sustainable development based on environmental, economic and social dimensions. The best global overview of the issues relating to sustainable mountain development is provided by Messerli and Ives (1997); a



## Mountains of the world

The map shown here is adapted from a more detailed map prepared by the United Nations Environment Programme's World Conservation Monitoring Centre (UNEP-WCMC). UNEP-WCMC designated six categories of mountain, based on altitude and slope and the environmental gradients they generate (see Table). Although these are the key components in mountain definitions, their combination is problematic. Simple altitude thresholds both exclude older and lower mountain systems and include areas of relatively high elevation that have little topographic relief and few environmental gradients. Using slope as a criterion on its own or in combination with altitude can resolve the latter problem but not the former.





Mountain area statistics by region (km<sup>2</sup>)

Region	≥4 500 m	3 500-4 500 m	2 500-3 500 m	1 500-2 500 m and slope ≥2°	1 000-1 500 m and slope ≥5° or local elevation range >300	300-1 000 m and local elevation range >300	Total
North America	197	11 417	200 830	1 092 881	1 104 529	1 840 140	4 249 994
Central America	38	968	67 127	353 586	259 367	412 215	1 093 301
Caribbean			32	2 809	5 528	38 322	46 691
South America	154 542	583 848	374 380	454 417	465 061	970 707	3 002 955
Europe		225	497 886	145 838	345 255	1 222 104	2 211 308
Africa	73	4 859	101 058	559 559	947 066	1 348 382	2 960 997
Near East	40 363	128 790	339 954	906 461	721 135	733 836	2 870 539
Russian Federation	31	1 122	31 360	360 503	947 368	2 961 976	4 302 360
Far East	1 409 259	741 876	627 342	895 837	683 221	1 329 942	5 687 477
Continental Southeast Asia	170 445	107 974	97 754	211 425	330 574	931 217	1 849 389
Insular Southeast Asia	22	4 366	34 376	120 405	157 970	599 756	916 895
Australia				385	18 718	158 645	177 748
Oceania			41	7 745	29 842	118 010	155 638
Antarctica	17	1 119 112	4 530 978	165 674	144 524	327 840	6 288 145
<b>Total</b>	<b>1 774 987</b>	<b>2 704 557</b>	<b>6 877 376</b>	<b>4 600 234</b>	<b>2 808 000</b>	<b>3 135 007</b>	<b>12 604 031</b>

Source: UNEP-WCMC, 2000 ([www.unep-wcmc.org](http://www.unep-wcmc.org))



recent summary of key issues and priorities for action may be found in the Abisko document (Royal Swedish Academy of Sciences, 2002). The following sections indicate some of the key attributes; they should be read with a view to recognizing the complex links among all elements of the mountain world – and thus among the pillars.

### **Environment**

At the global scale, two aspects of the mountain environment are of great significance, not only to highland populations but also downstream: water and biodiversity. Mountains are the source of all of the world's major rivers and many smaller ones. These "water towers" capture moisture from passing air masses and redistribute it downhill (Mountain Agenda, 1999a). When this moisture falls as snow, it is stored until it melts in the spring, providing water which is vital for agriculture, settlements and industries downstream, often in the period of lowest rainfall. In semi-arid and arid regions, over 90 percent of river flow comes from the mountains. Mountain water is also a source of hydro-electricity, most of which is used in nearby lowland areas. However, small-scale renewable hydro-energy is also a catalyst for economic development in mountain areas, and the availability of water (e.g. along irrigation channels) typically defines the upper limit of settlement and economic activities.

*Steep mountains (here, the Pamir Mountains of Tajikistan) are high-energy environments and thus at high risk of natural hazards such as avalanches, landslides and rockfalls*

Mountains are global centres of biodiversity for a variety of reasons including their isolation (they are often surrounded by a "sea" of highly modified lowland ecosystems); evolution and migration over time; and contrasting conditions at different altitudes, on different slopes and in diverse microhabitats. Apart from the intrinsic value of such diversity, it is of significant livelihood and economic value to both mountain and other people. Mountain species include many that can be eaten, including the precursors of many of the world's major food crops, as well as many medicinal plants and non-wood

forest products that have a great range of uses. The diversity of mountain ecosystems is also one of the reasons for their disproportionately high representation among the world's protected areas, and a reason for their having been chosen as a focus of the 2002 meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) of the Convention on Biological Diversity (see [www.unibas.ch/gmba/](http://www.unibas.ch/gmba/)).

### **Culture and gender**

Biological and cultural diversity are often closely linked; and mountain areas provide many excellent examples. It is

*In many agricultural societies, women are the primary agricultural workers; here, Peruvian women sow potato seeds*



FAO/THESA ODDOUT



FAO/UNEP/UNEP



**Mountains harbour many natural resources. They are compelling witness to time. They are landscape full of beauty and they powerfully reveal the force of nature. They are places of wonder, places of contemplation and places of joy.**

**It is crucial that we manage the resources of mountain regions in ways that will allow them to sustain humankind as well as nature. Human beings, whether they dwell in the mountains or the lowlands, have a common responsibility to safeguard the fragile mountain environment.**

*Source:* From the statement by Adolf Ogi, former President of Switzerland, at the launch of the International Year of Mountains in New York, 11 December 2001.

difficult to quantify mountain populations, since many statistical reporting districts include both mountain and lowland areas. However, two general trends can be recognized. In the mountains of developing countries, most populations are growing. In most mountain areas of industrialized countries, populations are typically static or shrinking, except where tourism or “amenity migration” – the movement of people into mountains because of a perceived high incidence of attractive environmental and/or cultural resources – has become important (Price, Moss and Williams, 1997). In mountains around the world, emigration from rural areas (especially by men) is a key phenomenon, decreasing the total rate of population growth in the mountains of developing countries, and leading to depopulation in those of industrialized nations.

Mountain areas are home to a large proportion of the world’s minority populations. While most of these consist of small numbers of people, some large groups exist, such as the Quechua in the Andes, the Amhars in Ethiopia, and the Tibetans and Yi in China. Unfortunately, the diversity of mountain populations, each with different values and belief systems, has been one of the primary causes of the disproportionate number of conflicts that take place in mountain regions (Libiszewski and Bächler, 1997).

Mountain areas include many sites that are sacred not only to mountain people but to billions living elsewhere (Bernbaum, 1998) (see Box on page 54). Yet the rich cultural heritage of many mountain areas is often also threatened by the influences of globalization. This is linked to the emigration of young people and the arrival of new ideas and values, often brought by tourists. At the same time, tourism can bring new awareness of this cultural heritage which, when supported by new sources of income (often brought by tourism), can lead to its renewal.

In many mountain societies, there are very clear distinctions with respect to

the roles and responsibilities of men and women. Most of the world’s mountain areas have subsistence economies, and women are the primary agricultural workers, especially when a significant proportion of men emigrate seasonally or for the long term. Women have a dominant role in transmitting local cultural knowledge and behaviour to their children. Yet they are also highly disadvantaged in comparison with both lowland women and mountain men, in terms of education, health, access to information and financial services.

#### **Risk**

Although opinions diverge on how mountains should be defined in relation to altitude, there is general consensus that they are areas with steep slopes and marked topographic relief. This means that they are high-energy environments, facing many challenges with regard to minimizing the impacts on human populations of a great range of natural hazards. Interactions of high rainfall and snowfall, great variations in temperature, steep slopes and, in many regions, tectonic movement and volcanic activity result in natural hazards such as floods,

**The mountains are the embodiment of most exquisite beauty and the source of inspiration. The Himalayas, the Andes, the Alps and the African mountains have imbued people through the ages to think big and create the beautiful in their pursuit of excellence and eternity.**

**But today these splendid and fragile mountains are under incredible stress. Global warming, increasing population, unsustainable exploitation of finite resources, growing extinction of animal and plant species, pollution of alpine routes and resorts and growing frequency of disasters have taken a heavy toll. Poverty is pervasive in inaccessible mountains. We need to address these formidable problems with a sense of urgency, so that the higher reaches and lower valleys and plains can remain vibrant with life and natural beauty. On healthy mountains depends the well-being of the entire world.**

*Source:* From the statement of Murari Raj Sharma, Acting President of the 56th session of United Nations General Assembly and Permanent Representative from Nepal to the New York UN Mission, at the launch of the International Year of Mountains in New York, 11 December 2001.

## International Year of Mountains – 2002

### Major global events

The INTERNATIONAL CONFERENCE OF MOUNTAIN CHILDREN (Uttaranchal, India, 15 to 23 May 2002) will bring together children from more than 50 mountain countries to help shape the future by contributing to a global agenda for the International Year of Mountains and beyond.

**HIGH SUMMIT 2002:** INTERNATIONAL CONFERENCE AROUND THE CONTINENTS' HIGHEST MOUNTAINS (Turin, Italy, 6 to 10 May 2002), an initiative of the Italian National Committee for the International Year of Mountains, will be centred on an interactive video conference broadcast simultaneously from places situated near some of the world's highest peaks:

- Mount Everest (8 846 m) in Nepal;
- Mount Aconcagua (6 959 m) in Argentina;
- Mount McKinley (6 194 m) in the United States;
- Mount Kilimanjaro (5 895 m) in the United Republic of Tanzania;
- Mont Blanc (4 807 m) in Italy.

Topics to be discussed include: coordination of regional and international cooperation; exchange and communication of information; and support for agreements that favour the sustainable development and protection of mountain environments.

The international gathering **CELEBRATING MOUNTAIN WOMEN** (Kathmandu, Nepal, 28 to 31 May 2002), organized by the International Centre for Integrated Mountain Development (ICIMOD) and the Mountain Forum, will focus on the positive contributions of mountain women to local and national economies and will launch a long-term programme for mountain women at ICIMOD.

The second INTERNATIONAL MEETING OF MOUNTAIN ECOSYSTEMS, "PERU, COUNTRY OF MOUNTAINS TOWARDS 2020: WATER, LIFE AND PRODUCTION" (Huaraz, Peru, 12 to 14 June 2002), organized by the National Working Group of Ecosystems of Mountains of Peru (the National Committee of Peru for the International Year of Mountains), will highlight Peru as a mountain country and the global importance of tropical mountain regions.

The Swiss Federal Office for Agriculture, in cooperation with other partners, is organizing **SUSTAINABLE AGRICULTURE AND RURAL DEVELOPMENT IN MOUNTAIN REGIONS** (Adelboden, Switzerland, 16 to 20 June 2002) which will bring together about 200 people from around the world to explore ways of enhancing cooperation in achieving the objectives of Agenda 21's Chapter 13 (Sustainable mountain development) and Chapter 14 (Sustainable agriculture and rural development).

At the second **WORLD MEETING OF MOUNTAIN POPULATIONS** (Quito, Ecuador, 20 to 24 September 2002), organized by the Association of Mountain Populations of the World (AMPW) and the Centro de Investigación de los Movimientos Sociales del Ecuador (CEDIME), representatives of 115 countries will discuss the challenges facing mountain communities worldwide.

The **BANFF MOUNTAIN SUMMIT 2002 – EXTREME LANDSCAPE: CHALLENGE AND CELEBRATION** (Banff National Park, Canada, 27 to 29 October 2002), organized by the Banff Centre for Mountain Culture, will explore how mountains shape people's lives and how people influence mountains.

The **BISHKEK GLOBAL MOUNTAIN SUMMIT** (Bishkek, Kyrgyzstan, 28 October to 1 November 2002), organized by the United Nations Environment Programme (UNEP) and the Government of Kyrgyzstan, is expected to involve about 1 000 participants and build on the results of other major International Year of Mountains events that precede it. A Bishkek declaration is proposed.

For further information on global events for the International Year of Mountains, visit: [www.mountains2002.org](http://www.mountains2002.org)



*Transport is a challenge in rugged impoverished mountains, as shown here in Afghanistan*

avalanches, landslides and rockfalls. Mountain people who have long experience of a particular area generally understand the locations and likelihoods of moderate natural hazards and take measures to control or avoid them or minimize their impacts. However, some hazards, such as glacial lake outbursts, avalanches and volcanic eruptions, are difficult to predict, let alone control.

The importance of understanding and managing all of these risks is increasing for at least four reasons. First, the total number of people living in, visiting and travelling through mountain areas is growing. Second, the density of transport and other infrastructure within mountain areas and linking mountain and lowland areas is increasing. Third, climate change is likely to be linked to a greater frequency of extreme events, higher instability of slopes and general uncertainty regarding trends. Fourth, many of these risks can have significant downstream consequences. Sophisticated technologies for predicting, minimizing and mitigating the impacts of the various risks have been developed and are increasingly applied, in combination

with targeted planning measures, in industrialized parts of the world. However, such approaches are often very costly and therefore not available for the mountains of developing countries, which include the most densely settled mountain areas and the upper watersheds of most of the world's major rivers, and are traversed by infrastructure which is vital for hundreds of millions of people.

#### **Economics**

Subsistence formed the basis of the economic system of most people living in the mountains of industrialized countries well into the twentieth century, and still does for most people living in the mountains of developing countries. Fields, grazing land and forests at different altitudes have been used in complementary ways, using infrastructure and facilitated by ownership and management patterns that have evolved over generations. External influences in such economies occurred through the discovery of minerals or the arrival of roads and railways that permitted the exploitation of natural resources, bringing benefits to some but

often negative impacts to most local people. Such externally driven economic forces often led to economies that were based on only a few activities or resources, rather than multisectoral economies whose diversity could provide reliable livelihoods in uncertain circumstances.

The world's mountains are now inextricably linked to regional and global economies, and many mountain economies have become even more uncertain or risky. Mountains are second only to coasts as destinations for tourism, the world's largest industry; perhaps 15 to 20 percent of the global tourism industry is linked to mountain tourism (Mountain Agenda, 1999b). Among the attractions of mountains to tourists are their wilderness properties. Conservation of these unmanaged landscapes also has significant downstream benefits, for instance in terms of water quality and quantity and the conservation of biodiversity. Yet in many regions, conservation efforts bring little direct financial reward.

Placing economic values on the goods and services provided by mountain

people through their stewardship of mountain ecosystems and landscapes is a major challenge. Yet there are growing numbers of efforts around the world to estimate these values as a basis for compensation to mountain people in the form of payments and other resource transfers through government agencies, water and energy companies, and tourism and conservation organizations. Equally, there are strong needs for financial instruments to promote the development of appropriate enterprises that build on the special characteristics of mountain environments and cultures and add value locally to products based on mountain resources. Such instruments are necessary to ensure that mountain people can compete equitably in regional and global markets. In addition, financial means are essential to minimize the competitive disadvantage that results from distance and difficulties of transport to markets.

### **Policies and legislation**

Mountain environments require a different approach to development compared with lowland areas. However, most mountain legislation and policies have a bias to lowland priorities and do not adequately consider and directly address the special conditions and problems of mountain regions and their inhabitants. Therefore the development of new legal and policy frameworks at all levels, but especially at national and decentralized levels, is an urgent necessity.

As mentioned above, a number of countries, mainly in Europe, have already passed laws and implemented policies that may be regarded as contributing to sustainable mountain development (Price, 1999a). Some of these are quite wide-ranging in their scope; others focus particularly on specific sectors. A key preliminary need for such instruments is to define the

mountain area concerned. In most countries, this has been done by setting a minimum altitude for mountains; in some cases, slope angle is used as an additional criterion. Both altitude and slope are used by the European Union (EU) for various instruments aimed at decreasing the challenges faced by mountain people and mountain areas in its member countries. However, legislation and policies targeted specifically at mountain areas are not the only ones that affect them; before designing new instruments to foster sustainable mountain development, it is critical to assess the direct and indirect influences of other national-level sectoral policies.

Only one regional legal instrument for mountains currently exists: the Convention on the Protection of the Alps (Alpine Convention), signed by the majority of Alpine states in 1991, and subsequently by all other Alpine states and the EU. As the IYM begins, it is noteworthy that, while the convention has been ratified by all of its signatories, none of the many thematic protocols has yet been ratified. It is hoped that the IYM will be a catalyst to ensuring the effective implementation of the convention through the ratification and application of its protocols. Discussions are under way in many other ranges, including the Altai, Andes, Carpathians, Caucasus and Himalaya, with regard to developing other regional conventions. It is to be hoped that such processes will take into account the experience from the Alpine Convention (Price, 1999b).

### **MOVING FORWARD IN THE IYM AND BEYOND**

The mission statement of the IYM, developed by FAO in its role as lead agency for the international year, is to “promote the conservation and sustainable development of mountain

regions, thereby ensuring the well-being of mountain and lowland communities”. As stated in the concept paper for the IYM, observation of the year “should provide an opportunity to initiate processes that eventually advance the development of mountain communities, and act as a ‘springboard’ or catalyst for long-term, sustained and concrete action” (FAO, 2000). As much as possible, such processes should take place “on the ground”, with full involvement of mountain people. However, the IYM should also be used as an opportunity to raise awareness, across society as a whole, of the diverse values of mountain regions to a large proportion of the global population. National committees for the IYM have consequently been established in around 50 countries, to ensure that IYM events and activities are well coordinated and effective. It is to be hoped that these committees will ensure that sustainable mountain development remains high on political agendas after 2002. Mountain issues will be raised at the World Summit for Sustainable Development (Rio+10), to be held in Johannesburg, South Africa in September 2002.

The final global event of the IYM will be the Bishkek Global Mountain Summit, to take place in Bishkek, Kyrgyzstan, at the end of October, bringing together participants from all over the world to celebrate and raise public and political awareness of the diversity of the world’s mountains and their key values to vast numbers of people.

Cooperation is one of the distinguishing characteristics of mountain societies; in such uncertain environments, it has long been recognized that sharing resources and working together are essential for long-term survival. The integration of mountain areas into regional and global economies has often decreased the effectiveness of such cooperative



structures, as outside private interests come to dominate. In many ways, mountain regions magnify the uncertainties of the modern world, of which two manifestations are effects of globalization of economies and climate change. A key indicator of the success of the IYM would be the development of successful mechanisms for reducing conflicts and increasing cooperation, both among mountain people and between them and other stakeholders concerned with the long-term security of mountain environments and the people who depend on them.

A key basis for cooperation is sharing of knowledge. An important goal of the IYM is to disseminate the global knowledge of mountains, so that people around the world will understand the truth of the IYM slogan "We are all mountain people". For the good of all, let us work together to ensure the wise management of mountain environments and the sustainable future of all those who depend on them, in 2002 and beyond. ♦



## Bibliography

- Bernbaum, E.** 1998. *Sacred mountains of the world*. Berkeley, California, USA, University of California Press.
- FAO.** 1996. *Criteria and indicators for sustainable mountain development*. Internal report. Rome.
- FAO.** 2000. *International Year of Mountains: concept paper*. Rome.
- IUCN.** 1980. *World Conservation Strategy*. Gland, Switzerland, World Conservation Union (IUCN).
- IUCN/United Nations Environment Programme (UNEP)/World Wildlife Fund (WWF).** 1991. *Caring for the Earth: a strategy for sustainable development*. Gland, Switzerland, World Conservation Union (IUCN).
- Kapos, V., Rhind, J., Edwards, M., Price, M.F. & Ravilious, C.** 2000. Developing a map of the world's mountain forests. In M.F. Price & N. Butt, eds. *Forests in sustainable mountain development: a state-of-knowledge report for 2000*, p. 4-9. IUFRO Series No. 5. Wallingford, UK, CAB International.
- Libiszewski, S. & Bächler, G.** 1997. Conflicts in mountain areas – a predicament for sustainable development. In B. Messerli & J.D. Ives, eds. *Mountains of the world: a global priority*, p. 103-130. New York, USA and Carnforth, UK, Parthenon.
- Messerli, B. & Ives, J.D., eds.** 1997. *Mountains of the world: a global priority*. New York, USA and Carnforth, UK, Parthenon.
- Meybeck, M., Green, P. & Vörösmarty, C.J.** 2001. A new typology for mountains and other relief classes: an application to global continental water resources and population distribution. *Mountain Research and Development*, 21(1): 34-45.
- Mountain Agenda.** 1999a. *Mountains of the world: water towers for the 21st century*. Berne, Switzerland.
- Mountain Agenda.** 1999b. *Mountains of the world: tourism and sustainable mountain development*. Berne, Switzerland.
- Organisation for Economic Co-operation and Development (OECD).** 1993. *OECD core set of indicators for environmental performance reviews*. OECD Environment Monograph No. 83. Paris, France.
- Price, M.F.** 1998. Mountains: globally important ecosystems. *Unasylva*, 195: 3-12.
- Price, M.F.** 1999a. *Chapter 13 in Action 1992-97 – a Task Manager's report*. Rome, FAO.
- Price, M.F.** 1999b. *Cooperation in the European mountains 1: the Alps*. IUCN European Programme Environmental Research Series 12. Gland, Switzerland and Cambridge, UK, World Conservation Union (IUCN).
- Price, M.F. & Kim, E-G.** 1999. Priorities for sustainable mountain development in Europe. *International Journal of Sustainable Development and World Ecology*, 6: 203-219.
- Price, M.F., Moss, L.A.G. & Williams, P.W.** 1997. Tourism and amenity migration. In B. Messerli & J.D. Ives, eds. *Mountains of the world: a global priority*, p. 249-280. New York, USA and Carnforth, UK, Parthenon.
- Rieder, P. & Wyder, J.** 1997. Economic and political framework for sustainability of mountain areas. In B. Messerli & J.D. Ives, eds. *Mountains of the world: a global priority*, p. 85-102. New York, USA and Carnforth, UK, Parthenon.
- Royal Swedish Academy of Sciences.** 2002. The Abisko document: research for mountain area development. *Ambio* Special Report. Stockholm, Sweden, Royal Swedish Academy of Sciences.
- Sène, E.H. & McGuire, D.** 1997. Sustainable mountain development – Chapter 13 in action. In B. Messerli & J.D. Ives, eds. *Mountains of the world: a global priority*, p. 447-453. New York, USA and Carnforth, UK, Parthenon.
- Taylor, D.A.** 2000. Mountains on the move. *Américas*, 52(4): 36-43.
- World Commission on Environment and Development (WCED).** 1987. *Our common future*. Oxford, UK, Oxford University Press. ♦