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MAIN THEME: MOUNTAIN BIOLOGICAL DIVERSITY

Measures taken for the conservation and sustainable use of mountain biological diversity

Note by the Executive Secretary

EXECUTIVE SUMMARY

At its fourth meeting, held in 1998, the Conference of the Parties (COP) in its decision IV/16, decided to consider mountain ecosystems as an in-depth item for consideration during its seventh meeting. The Subsidiary Body on Scientific, Technical, and Technological Advice (SBSTTA) decided at its seventh meeting that mountain biological diversity would be the main theme for its eighth meeting.

As part of the preparatory process for consideration of the theme by the Conference of the Parties at its seventh meeting, the Executive Secretary has prepared, for consideration at the eight meeting of SBSTTA, a review document on measures taken for the conservation and sustainable use of mountain biological diversity. The review concludes that, *inter alia*:

(a) Activities and programmes dealing with the application of the ecosystem approach, establishment of protected areas, restoration, management of invasive alien species, protection of traditional knowledge, and sustainable use of biological diversity in mountain ecosystems are taking place at global, regional, or national levels for the conservation and sustainable use of biodiversity and restoration of degraded mountains. Both the extent of implementation, and scope of these activities, vary across localities;

(b) Assessment and monitoring of the components of mountain are being carried out in many countries and by many organizations. Additional work is needed to advance the use of criteria and indicators for assessing environmental and social changes in mountain regions, particularly in the tropics;

* UNEP/CBD/SBSTTA/8 /1.

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(c) A number of enabling activities are under way at the international level, e.g. research and training in the management of mountains and education and public awareness, with regard to policy, legislative and institutional aspects, and some countries have taken measures to enable various sectors to better respond to the need for sustainable development of mountains. Through the International Year of the Mountains, information on the management of mountain ecosystems have been exchanged and public awareness of mountain issues has been enhanced. The closing event for the 2002 International Year of Mountains reaffirmed the willingness at all levels and sectors of society to further translate proposals related to mountain conservation and sustainable development into concrete actions. There is active regional and international cooperation for the conservation and sustainable use of mountain biodiversity and development and adaptation of relevant technologies;

(d) Work is still to improve the application of the ecosystem approach as it relates to mountain ecosystems. More information is needed for a deeper understanding of the role of tourism in sustainable development and conservation of mountain ecosystems. Regulations, policies, and programmes for conservation and sustainable use of mountain biological diversity need to be further integrated into national and regional regulatory instruments in many countries.

SUGGESTED RECOMMENDATIONS

Suggested recommendations on measures taken for the conservation and sustainable use of mountain biological diversity are included in the consolidated set of suggested recommendations under item 4 of the provisional agenda for the eighth meeting of SBSTTA contained in the note by the Executive Secretary on proposed elements for a programme of work on mountain biological diversity (UNEP/CBD/SBSTTA/8/7).

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I. INTRODUCTION

1. At its fourth meeting, held in 1998, the Conference of the Parties, in its decision IV/16, decided to consider mountain ecosystems as an in-depth item for consideration during its seventh meeting. SBSTTA decided at its seventh meeting that mountain biological diversity would be the main theme for its eighth meeting.

2. In its decision VI/30, the Conference of the Parties welcomed the proposals put forward by the Executive Secretary in his note on preparations for the seventh meeting of the Conference of the Parties and requested that preparation for the priority themes continue as outlined in that document (UNEP/CBD/COP/6/2).

3. Pursuant to this decision and in line with the terms of reference presented in the above-mentioned note, the Executive Secretary has prepared, *inter alia*, the present review of measures taken for the conservation and sustainable use of mountain biological diversity. This report is complemented by two other notes on, respectively, status and trends of, and threats to, mountain biological diversity (UNEP/CBD/SBSTTA/8/5) and proposed elements for a programme of work on mountain biological diversity (UNEP/CBD/SBSTTA/8/7). The document on the status and trends of mountain biodiversity emphasizes the fragility and vulnerability of mountain ecosystems and highlights the fact that the biodiversity of many mountains is threatened and sometimes critically endangered, and there is a pressing need to put in place measures for the conservation and sustainable use of mountain biodiversity and further assess the status and trends of biodiversity, particularly at high elevations.

4. The present note has been prepared to provide an overview of the measures taken for the conservation and sustainable use of mountain biological diversity. The document is organized around three elements:

- (a) Conservation, sustainable use and benefit-sharing;
- (b) Assessment and monitoring; and
- (c) Institutional and socio-economic enabling environment.

5. Part of the information derives from thematic reports ^{1/} submitted on mountain ecosystems pursuant to decision VI/25 of the Conference of the Parties.

II. CONSERVATION, SUSTAINABLE USE AND BENEFIT-SHARING

6. Article 6 of the Convention on Biological Diversity refers to general measures for conservation and sustainable use and stresses the need for Parties to develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity and to integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies. National biodiversity strategies and action plans are the main instruments at the national level for the planning and monitoring of biodiversity-related matters. In their thematic reports on mountain ecosystems, all respondent countries confirmed that their national biodiversity strategies and action plans integrate mountain issues, although at various level of development and implementation.

^{1/} To date, thematic reports have been received from the following Parties: Algeria, Canada, Colombia, Estonia, the European Community, the Netherlands Peru, Poland, Singapore, South Africa, Switzerland and The former Yugoslav Republic of Macedonia; and from one non-Party: Thailand.

7. Articles 8, 9 and 10 of the Convention on Biological Diversity deal, respectively, with *in situ* conservation, *ex situ* conservation, and sustainable use of biological diversity. Within these articles, emphasis is placed on the establishment of systems/networks of protected areas, ecosystem restoration and rehabilitation, recovery of species, prevention and control of invasive alien species, maintenance and respect of traditional knowledge and sustainable use of components of biological diversity.

8. The need for an integrated approach to the planning and management of land resources and the central importance of biological diversity to sustainable development of terrestrial ecosystems, in particular montane areas, has been recognized since the first meeting of the Conference of the Parties and followed by the approval by the Council of the Global Environment Facility (GEF) for support to mountain ecosystem programmes. SBSTTA has made several recommendations to the Conference of the Parties on aspects related to mountain ecosystems, including the consideration of mountain biodiversity within the Global Taxonomy Initiative (GTI) ^{2/} and sustainable tourism. ^{3/}

A. Ecosystem approach

9. In mountain environments, the application of the ecosystem approach is essential for the conservation, sustainable use, and sharing of benefits from biological resources, as different ecosystem types and biomes are closely interconnected in terms of uphill-downhill fluxes of energy and matter, and also in terms of socio-economic activities that, in turn, influences local and national livelihoods.

10. Some institutions and countries are analysing the application of the twelve principles of the ecosystem approach in mountain ecosystems, looking at a wide range of issues, from pollinators and medicinal plants in the Himalayas to development of organic agriculture in Germany. ^{4/} Studies ^{5/} have also been carried out that highlight the compatibility of the principles of the ecosystem approach with the implementation of the Alpine Convention. ^{6/}

11. In the thematic reports on mountain ecosystems, the following activities of relevance to mountain biodiversity were reported to have been carried out using the ecosystem approach:

- (a) Sustainable forest management in mountain areas in Canada;
- (b) Establishment of networks of protected areas in Colombia;
- (c) Management of mountain catchment areas in South Africa; and
- (d) Watershed management projects in Colombia, Peru and Poland.

12. Many other examples of application of ecosystem approach in the management of mountain ecosystems are reported in the literature, including:

^{2/} A summary of the decisions of the Conference of the Parties related to mountains, and of SBSTTA recommendations, is found in UNEP/CBD/COP/6/2, paragraphs 9-19

^{3/} UNEP/CBD/WS-Tourism/2

^{4/} International workshop on the "Further Development of the Ecosystem Approach" at the International Academy for Nature Conservation, Isle of Vilm, Germany, 9-11 October 2002; Seminar on "Biodiversity and the ecosystem approach in agriculture, forestry and fisheries" FAO, Rome, Italy, 12-13 October 2002.

^{5/} Paulsch, A., Dziedziuch, C. and Plan, T. (2002) "Applying the Ecosystem Approach in High-Mountain Ecosystems in Germany" Experiences with the Alpine Convention", Institut für Biodiversität, Regensburg, Germany, 2002; presented at the International workshop on the "Further Development of the Ecosystem Approach", Isle of Vilm, Germany, 9-11 October 2002.

^{6/} The Alpine Convention is a legally binding agreement that has been ratified by seven European alpine countries (Switzerland, France, Italy, Germany, Austria, Liechtenstein, and Slovenia) and the European Community.

(a) The watershed management programmes carried out in the Himalayas by the International Centre for Integrated Mountain Development (ICIMOD) ^{7/} with emphasis on the participation of local people in the planning and implementation of upland conservation and development activities;

(b) The management of forested mountain watersheds in Canada and in the Himalayas; ^{8/}

(c) The Mountain Research Initiative implementation plan, where two of its main activities consider spatially-explicit functional linkages between “integrated model-based studies of environmental change” and “process studies along altitudinal gradients and in associated headwater basins”; ^{9/}

(d) The Meso-American Biological Corridor initiative, which attempts to bridge protected areas across the mountains of seven countries. It is being implemented by the Central American Commission on Environment and Development under a sustainable use approach;

(e) The development of a biological corridor from the Tierra del Fuego to Alaska along the mountain chains of South and North America in order to promote the ecological connectivity of existing protected areas; ^{10/} and

(f) Work in progress to further elaborate and refine the principles of the ecosystem approach for mountain ecosystems as an integral work theme of the IUCN Commission on Ecosystem Management (CEM). ^{11/}

B. Protected areas

13. Protected-areas management may be one of the most powerful tools contributing to the conservation of the world's natural and cultural resources. Their central role in conservation and sustainable use of biological diversity has been repeatedly emphasized in decisions of the Conference of the Parties. International experience, traditional practice, and scientific principles point to the need to work at the ecosystem scale in establishing and managing protected areas. This approach places protected core areas as components of greater landscapes where agriculture, forestry, and other land uses are managed to maintain the characteristic biodiversity of the region. Protected areas in mountains are to be established where special measures are required to conserve their biological diversity, and for ensuring the continuous delivery of ecosystem goods and services. Thus, selection criteria may be biological (e.g., areas of high species diversity, to enhance biological connectivity), or strictly practical (e.g., maintenance of water supplies for urban use, prevention of downstream damage from flooding). Spiritual and cultural criteria (intrinsic value of mountains to traditional societies) are also taken into account. In their thematic reports on mountain ecosystems, all reporting Parties with mountain regions confirmed having established protected areas in such regions. In preparing for the ninth meeting of SBSTTA, Parties have been requested to submit thematic reports on protected areas.

14. While promoting the protection of outstanding natural areas, a significant number of UNESCO's World Heritage Sites are mountains, or comprise mountain areas. Ecoregion-centred approaches ^{12/} by

^{7/} <http://www.icimod.org>

^{8/} <http://www.umanitoba.ca>

^{9/} See www.mri.unibe.ch

^{10/} Hamilton LS (2002) Conserving mountain biodiversity in protected areas. In C Koerner, SE M., eds, Mountain biodiversity. A global assessment, Parthenon, London, pp 295-306

^{11/} www.iucn.org/themes/cem

^{12/} Krever V, Zazanashvili N, Jungius H, Williams L, Petelin D (2001) Biodiversity of the Caucasus ecoregion. WWF, Baku Erevan Gland Moscow Tbilisi

the WWF and the UNESCO biosphere reserves ^{13/} also embrace the ecosystem approach to protected areas in mountains. Of the currently 408 biosphere reserves existing in 94 countries, about one half are located in mountain areas.

15. Because they have been held in great respect and considered as sacred, mountains have played an important role in the life of many indigenous communities. Both UNESCO and IUCN are currently exploring the importance of natural sacred sites for biodiversity conservation, as they creation can be a means for preserving mountain ecosystems. In turn, changing traditional values and way of life can cause large changes in how sacred mountains are perceived and managed in the future.

16. The protection of natural and cultural heritages in mountains is implemented through national parks, protected areas networks, landscape parks, and other regulations such as the rural development regulation (European Union Article 33), the special accession programme for agriculture and rural development (European Community regulation 1268/99). Mountain ecosystems are specifically taken into account in the context of the Natural Forest Reserves Programme within the implementation of NATURA 2000 (the establishment of a network of protected areas according to European Union regulations). The Global Environment Facility (GEF) recently announced the granting a new project to be carried out in Peru's montane Huascarán National Park as part of the global project on participatory management of protected areas. ^{14/}

C. Restoration and rehabilitation of degraded ecosystems and recovery of threatened/endangered species

17. The ecosystem integrity of steep mountain slopes and high-elevation landscapes relies, to a large extent, on maintaining adequate soil cover and stability, which in turn depends on the degree on plant cover, and the use of suitable management practices. ^{15/} Because of the high vulnerability of fragile mountain ecosystems to degradation, the degree of resilience needed to bring back essential functional attributes after disturbance is very low; particularly, at high elevations. Restoration and rehabilitation are the two primary approaches to reverse ecosystem degradation. Key elements in ecosystem restoration and rehabilitation are the reinstatement of traditional management practices, the reduction of pressures causing the degradation itself, the control of invasive alien species, and targeted activities leading to habitat repair. ^{16/}

18. Many activities are being undertaken in order to restore the ecological functions of degraded mountain ecosystems. For example, restoration of native vegetation in mined peatlands ^{17/} and reintroduction of locally extinct mammals such as the bighorn mountain sheep are both being carried out in the United States Rocky Mountains. ^{18/} Species trials for assessing suitability for the restoration of degraded mountain lands have been also reported in Norway, ^{19/} and participatory approaches to ecosystem restoration in degraded areas of the Himalayas are also being undertaken. ^{20/} Baseline

^{13/} Benz BF, Cevallos E. J, Santana M. F, Rosales A. J, Graf M. S (2000) Losing knowledge about plant use in the Sierra de Manantlán Biosphere Reserve, Mexico. *Economic Botany* 54:183-191.

^{14/} GEF News Release, Washington, November 19, 2002.

^{15/} Koerner, C., Spehn, E., Messerli, B. (2001) "Global Mountain Biodiversity Assessment Conference 2000", Rigi-Kaltbad, Switzerland.

^{16/} Anderson P (1995) Ecological restoration and creation: A review. *Biological Journal of the Linnean Society* 56: 187-211.

^{17/} Cooper, D. J., L. H. MacDonald (2000). *Restoration Ecology* vol. 8.

^{18/} Singer, F. J., V. C Bleich, M. A. Goudon. (2000). *Restoration Ecology* vol. 8.

^{19/} Hagen D (2002) Propagation of native Arctic and alpine species with a restoration potential. *Polar Research* 21: 37-47.

^{20/} Maikhuri, R. K., K. S. Rao. (2002). Rehabilitation of degraded land. Land-use and land-cover change impacts and strategies in the Indian Himalayan Mountains. *IHDP Newsletter* no. 01/2002.

information on species suitability, and validation of protocols for restoration purposes, are also being gathered in South African ^{21/} and Mediterranean ^{22/} montane areas. In Austria, the goal of the national strategy on biodiversity explicitly addresses mountain-biodiversity issues when calling for the re-establishment of population of threatened animal species from alpine regions. Current projects are underway in Colombia for the assessment of population status and needs for species recovery plans of mountain-dwelling, threatened vertebrate species.

19. As mentioned in Article 9 of the Convention on Biological Diversity, *ex situ* conservation measures complement action for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions. Mountain ecosystems are storehouses for crop genes, and much of their genetic diversity thrives there. Through integrated natural resource management research, the International Potato Centre (CIP) and other Future Harvest Centres of the system-wide genetic resources programme (SGRP) of the Consultative Group for Agricultural Research (CGIAR) are contributing to the restoration and rehabilitation of plant genetic resources through both *in situ* and *ex situ* activities. This work is undertaken using a participatory approach, in line with the International Treaty for Plant Genetic Resources for Food and Agriculture. The SGRP germplasm collections are placed in trust for the world community under the intergovernmental authority of the Food and Agriculture Organization of the United Nations (FAO).

D. Management of invasive alien species

20. In their thematic reports on mountain ecosystems, some countries (Canada, Poland, South Africa) identified invasive alien species as one of the main causes of the degradation and loss of biodiversity in mountain ecosystems.

21. At its sixth meeting, the Conference of the Parties, in its decision VI/23 adopted guiding principles for the implementation of Article 8(h) of the Convention, which concerns the prevention of the introduction of, control and eradication of those alien species that threaten ecosystems, habitats or species. The Global Invasive Species Programme (GISP) published a toolkit for best prevention and management practices for invasive alien species (UNEP/CBD/SBSTTA/6/INF/10). Other guidelines and manuals for best management of invasive alien species have also been published. ^{23/}

22. Both the guiding principles and IUCN guidelines ^{24/} recognize that the problem of invasive species can be acute on islands and on other ecosystems which tend to be evolutionarily isolated, such as mountain tops and mountain lakes. IUCN has also provided guidance for designing legal and institutional frameworks on alien invasive species, as well as for looking at the legal and institutional implications of their introduction and control (UNEP/CBD/SBSTTA/6/INF/8).

E. Traditional knowledge of local and indigenous communities

23. The International Year of Mountains has been instrumental on increasing the awareness of the need to safeguard and build on the traditional knowledge of mountain people and to respect indigenous practices, expertise, and authorities, and on promoting networking and collaborative actions. A report on the status and trends regarding the knowledge, innovations and practices of indigenous and local communities relevant to the conservation and sustainable use of biodiversity is being prepared within the framework of the Convention on Biological Diversity and will look specifically at issues related to mountain and valley ecosystems.

^{21/} Holmes and Richardson (1999). Restoration Ecology, vol. 7

^{22/} Castro et al. (2002). Restoration Ecology, vol. 10

^{23/} Wittenberg R, Cock MJW (2001) Invasive alien species. How to address one of the greatest threats to biodiversity: a toolkit of best prevention and management practices. CAB International, Wallingford.

^{24/} <http://iucn.org/themes/ssc/pubs/policy/invasives/>

24. The thematic reports on mountain ecosystems indicate that overall measures aiming at protecting traditional knowledge for sustainable use were at various stages (from early-development to implementation) in respondent countries. They also mention that the protection of such knowledge is integrated into various laws, regulation or agreements on natural resource management such as those regarding medicinal plants, wildlife, animal genetic resources and the International Treaty on Plant Genetic Resources for Food and Agriculture.

25. The Consorcio para el Desarrollo de la Ecoregión Andina (CONDESAN), holds a collection of recorded Andean indigenous knowledge. ^{25/} Archived information from other mountains of the world e.g., the Himalayas is available from the International Centre for Integrated Mountain Development (ICIMOD). ^{26/} Bringing back traditional knowledge may also be critical for contemporary livelihoods. The project on Globally-important Ingenious Agricultural Heritage Systems (GIAHS) developed by FAO-UNDP-GEF, looks at the promotion, maintenance and in some cases, rehabilitation, of sustainable traditional land-use systems that have evolved through the adaptation of farming communities to their environment. A case-study from the Peruvian Andes (agricultural rehabilitation using the so-called *waru-waru* system developed by the Incas) shows indeed that pre-Columbian farming systems can be more productive than those currently used, which are prone to excessive erosion and overgrazing. ^{27/} A project currently financed by GEF—the interregional project on the *in situ* conservation of crop wild relatives through enhanced information management and field application—focuses on the conservation of crop wild relatives and their increased availability for crop improvement in the Andes, Caucasus, Hindu-Kush Himalayas, and Pamirs. The countries involved include Armenia, Bolivia, Madagascar, Sri Lanka and Uzbekistan. ^{28/}

F. Options for sustainable tourism and sustainable use

26. Unmanaged tourism can exert a high degree of impact on the fragile mountain environment, from effects on vegetation and fauna to waste disposal. Although examples of non-sustainable development in mountain areas abound, countries throughout the world are developing or becoming interested in tourism as a tool for sustainable use of biodiversity, for cultural conservation, and for improving the livelihoods of rural people. The UNDP-UNEP-World Bank biodiversity planning support programme provides assistance to national biodiversity conservation planners, and is undertaking a study that aims at incorporating “best practices” for integrating biodiversity into the tourism sector. It includes case-studies from mountainous countries, including Canada, Chile, Kazakhstan, Mexico, and Peru.

27. In some cases, conservationists have been persuaded to allow tourist developments in protected mountain areas. As a consequence, there exists, for example, a European Charter for Sustainable Tourism in Protected Areas. The Charter is to help the tourist service providers and tour operators to manage tourism in a sustainable way. Once parties voluntarily enter the Charter, they commit themselves to respecting the principles of sustainable tourism. Of the 18 national and nature parks that have signed the Charter to date, many of them are in mountain areas and include the Hohe Tauern National Park in Austria, and the Abruzzi and Alpi Maritime National Parks in Italy. The Alpine Convention also provides a legal framework for addressing tourism in the high mountains in parties. Mountain tourism in protected areas, however, should directly benefit conservation and the local population. Dramatic contradictions to this can be seen in Asian and African mountains, where most of the revenues are spent elsewhere, and where park maintenance is not adequately funded.

^{25/} For local databases in the Andean region see <http://www.condesan.org/links.htm>
^{26/} www.icimod.org
^{27/} www.fao.org/ag/
^{28/} GEF News Release, Washington. November 19, 2002.

28. In the thematic reports on mountain ecosystems, Canada, the European Community, Peru and Switzerland provided information on their guidelines and good practices for sustainable tourism. There is a need for long-term assessments of the impact of tourism on mountain biodiversity and cultural diversity.

III. ASSESSMENT AND MONITORING

29. Some countries that submitted thematic reports indicated that they are carrying out or have carried out some assessments of mountain biodiversity at the genetic level (Austria, Switzerland), at the species level (indicator species in Poland; and medicinal plants in Algeria) and also at the landscape scale (Switzerland). The European Community, through the launching of the NATURA 2000 network, will incorporate ecological assessments of mountain ecosystems.

30. Thematic reports also contained assessments of the vulnerability or fragility of mountain ecosystems, carried out, either locally or through internationally-recognized mechanisms such as the IUCN Red Lists, the Global Taxonomy Initiative and the Audubon Society's international bird surveys. The European Environmental Assessment provides detailed information on the biodiversity of mountain habitats and the current threats to mountain societies and ecosystems (increases in tourism, changes in land use, global climate change). Almost all the countries that submitted a thematic report indicated that they were planning or undertaking assessments of direct and indirect causes of ecosystem degradation in mountain environments. Additional work on socio-economic criteria and indicators of mountain biodiversity loss and degradation is required to facilitate further assessments and document the trend of mountain biodiversity, particularly in the tropics.

31. There are several global initiatives for monitoring and assessing mountain ecosystems. The Global Mountain Biodiversity Assessment (GMBA) of DIVERSITAS is a research network aiming at the synthesis of knowledge of the biological richness, functions, and trends at all major mountain regions of the world. ^{29/} The Global Observation Research Initiative in Alpine Environments is concerned with the establishment of a long-term observation network for detecting the effects of climate change on mountain biota on a global scale. The portfolio of the Mountain Research Initiative of the International Geosphere-Biosphere Programme (IGBP) includes long-term monitoring, process studies, and integrated modelling and sustainability issues. Another initiative is being initiated on the impact of global change on mountain environments using UNESCO Biosphere Reserves.

32. The United Nations University (UNU) in partnership with University of Bern is developing, through a working group, a comprehensive programme on sustainable mountain development. One of the objectives is to contribute to the improved understanding of the status of different mountain systems in relation to global change, the pressures these mountains are exposed to, including their consequences on different resources (human, natural, economic), and of the responses of different social groups and mountain societies to these pressures. In its decision VI/7 A, the Conference of the Parties endorsed guidelines for incorporating biodiversity-related issues into environmental-impact-assessments legislation and/or processes and strategic impact assessment and urged Parties, other Governments and organizations to apply them.

33. At the regional level, the European Community has a number of assessment and monitoring projects: MOLAR (a programme on mountain lake research), and ECOMONT (ecological effects of land use change in European terrestrial mountain ecosystems). In the Andes, under the auspices of CONDESAN, detailed maps integrating data from social-environmental and hydrological surveys have been developed in selected Andean countries. Government and non-government agencies are using these maps as a basic tool for land- and water-use planning.

^{29/} www.unibas.ch/gmba/

IV. INSTITUTIONAL AND SOCIO-ECONOMIC ENABLING ENVIRONMENT

A. *Research and training* ^{30/}

34. There are many ongoing research and training programmes relevant to mountain ecosystems. The following are just a few examples:

(a) *At the regional level:*

- (i) The Research Foundation for Alpine and Sub-Alpine Environments offers training course on ecology and geomorphology of the European Alps, with emphasis on natural hazards and risks;
- (ii) The Aga Khan Development Network, focusing in mountainous regions in Central and South Asia and Africa ^{31/} and the Andean Mountains Association, which harbours faculty and researchers from several universities in Andean countries as well as individual practitioners of sustainable mountain development and conservation; ^{32/}

(b) *At the global level:*

- (i) Many research and training activities area carried out through the global mountain fellowship programme under the CGIAR global mountain programme, which provides training and education in the Andes and the Himalayas;
- (ii) The international masters of science curriculum in mountain forestry, ^{33/} hosted by Austria, with particular attention to responding to country needs;
- (iii) A European research consortium that is evaluating natural-forest silviculture and policy measures in mountainous forested areas; ^{34/}
- (iv) UNU, through its building programme on sustainable mountain development that will enable local research institutions to develop partnerships with other institutions in their countries and abroad, thereby developing their competence and capacities. At the same time, UNU will itself function as a coordination and information centre for mountain research for the international scientific community.

35. The International Year of Mountains has enhanced the awareness of the need of interdisciplinary research and information sharing on mountain issues and stimulated the development of a global research agenda on mountain ecosystems to support their sustainable management and sustainable livelihoods.

B. *Legal and regulatory framework*

36. The thematic reports on mountain ecosystems indicate that some countries include issues related to the conservation and sustainable use of mountain biological diversity in their national and regional laws, policies or programmes. Switzerland referred to an integrated set of laws and regulations relevant to mountains on, *inter alia*, the protection of nature and the landscape, land-use planning, environmental

^{30/} This section addresses only activities at the regional and international levels).

^{31/} <http://www.akdn.org/>

^{32/} <http://www.uga.edu/clacs/>

^{33/} <http://mountainforestry.boku.ac.at/>

^{34/} <http://www.forst.uni-muenchen.de/>

impact assessment, hunting and protection of vertebrates, water pollution control, and management of watercourses. Some countries emphasized the need for decentralization of management at the municipal level (Colombia) and others referred to mountain-zoning policies as conservation strategies (South Africa).

37. An overview of national legislation in relation to mountains lists several countries that have passed mountain development and protection-specific laws.^{35/} The existing laws cover conceptual, institutional, economic social, and environmental aspects. It should be noted, however, that many legal and regulatory measures are applicable to mountain ecosystems even if mountains are not specifically mentioned.

38. In Europe, the Alpine Convention is a model for integrated transboundary development supported by legislation. It has nine protocols covering specific thematic issues such as landscape management, mountain agriculture, mountain forests, tourism, energy, and conflict resolution. Conventions modelled on the Alpine Convention are being discussed for the Altai-Sayan range, the Caucasus and the Carpathians, all within the UNEP European Mountain Initiative.^{36/}

39. The European Community nature conservation programme addresses large areas of the montane and alpine zones in Europe. Its main aim is to create a European ecological network of special areas of conservation, called NATURA 2000, and to integrate nature-protection requirements into other European Union policies on matters such as agriculture, regional development and transport.^{37/} The number of mountain charters or declarations^{38/} illustrates that there is a favourable climate for developing a wider legislative framework for mountain areas.

40. One of the major achievements of the International Year of Mountains has been the increased public awareness of: (i) the importance of mountains to the Earth's life sustaining systems; (ii) the fragility of mountain ecosystems; and (iii) the environmental and social consequences of their degradation.

41. Most of the major mountain research and training initiatives previously mentioned (e.g., CONDESAN, ICIMOD) carry out education and public awareness programmes at the local community levels, related to biodiversity and sustainable management. Although many national mountain parks and reserves undertake public education through interpretative displays, publications, and guided tours, much needed is the adequate environmental education of junior-school children to lay the foundations for future action. In 2002, the Swiss Agency for Development and Cooperation (SDC) prepared a school educational calendar on mountains with a didactic textbook in English, French and Spanish, which was distributed world-wide through the UNESCO Associated Schools Network and the Man and the Biosphere programme. UNU, which was instrumental in the formulation of chapter 13 of Agenda 21, has developed projects and publications under its programme on mountain ecology and sustainable development with contributions to research, education, and public awareness.

C. International cooperation

42. The Bishkek Global Mountain Summit, the closing event for the 2002 International Year of Mountains, reaffirmed the willingness from all levels and sectors of society to translate proposals related

^{35/} Villeneuve P, Talla P, Mekouar MA (2002) The legal framework for sustainable mountain management: an overview of mountain-specific instruments. *Unasylva* **208**: 56-65

^{36/} <http://www.unep.ch/roe/emi.htm>

^{37/} <http://www.europa.eu.int/comm/environment/nature/home.htm>

^{38/} Draft European Charter of Mountain Regions; see <http://www.mtnforum.org/resources/library/clrae95a.htm>; Draft World Charter for Mountain Populations, Paris 2000; The Declaration on Sustainable Development of Mountain Ecosystems, Cusco 2001).

to mountain conservation and sustainable development into concrete actions. Two of the most important outcomes of the Summit on international cooperation are:

(a) The Bishkek Mountain Platform, a framework for action for sustainable mountain development which includes a request to the United Nations General Assembly for a resolution on mountain sustainable development. GEF is considered as instrumental for achieving the Platform's goals; ^{39/}

(b) The International Partnership for Sustainable Development of Mountain Regions, based on the Platform and on the partnership initiative launched at the 2002 World Summit on Sustainable Development.

43. Half of the Parties that provided a thematic report on mountain ecosystems are collaborating with other countries for the conservation and sustainable use of mountain biological diversity, for example:

(a) Regional collaborative efforts are being channelled through the FAO's Mountain Programme, the Global Mountain Biodiversity Assessment, CIPRA (Commission Internationale pour la Protection des Alpes), and the Alpine Convention;

(b) The bilateral and multilateral actions being carried out between Austria and Peru through the Mountain Region Dialogue, ^{40/} the WWF Northern Andes ecoregional project (Colombia and Ecuador), and the "sister cordilleras" initiative between Andean and Himalayan regions (coordinated by Peru's La Molina National University and ICIMOD); ^{41/}

(c) Agreements on cross-border tourism in mountain areas (Poland-Czechoslovakia and Poland-Slovakia); and

(d) A bilateral agreement between South Africa and Lesotho for the management of the Maloti-Drakensberg mountain ecosystem.

D. Technology transfer

44. Examples of technologies relevant to the conservation and sustainable use of mountain biodiversity are given in the note by the Executive Secretary on the subject prepared for the eighth meeting of SBSTTA (UNEP/CBD/SBSTTA/8/7/Add.1).

45. The project on the CIP integrated natural management mountain agro-ecosystems works with institutions and communities in Latin America in soil management, farming system research, and capacity-building. CIP has also developed a geographic information system for the spatial analysis of biodiversity data. The CGIAR system-wide livestock programme (SLP) embraces a spectrum of activities aiming to enhance livestock productivity while protecting mountain ecosystems. The CGIAR centres facilitate the development of technologies to local conditions by working with local institutions and rural communities. ICIMOD has devoted extensive resources to the development, validation, dissemination, and training of mountain-related technologies for agricultural production, water management, soil management, and alternative energy-efficient sources for households in mountain regions (and their relationship to tourism development).

^{39/} See Messerli B, Ives JD (1997) Mountains of the world. A global priority. Parthenon Publishing, Carnforth.

^{40/} See www.falch.at

^{41/} See www.lamolina.edu.pe/cordillerashermanas/

42/ <http://www.condesan.org>
43/ <http://www.umanitoba.ca>