

# Measures taken relating to mountain biodiversity and their impacts

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## I CONSERVATION, SUSTAINABLE USE AND BENEFIT SHARING (DESCRIPTION OF MEASURES AND ASSESSMENT OF THEIR EFFECTIVENESS)

### 1. Ecosystem approach

1. Ecosystems are dynamic complexes of plant, animal and microorganism communities and their non-living environment interacting as functional units. Ecosystems, as defined under the Convention, are functional units at any spatial scale with humans being an integral part in many instances (anthropogenic ecosystems). This definition lays the foundation for an inclusive stakeholder approach as opposed to early 'fencing off' approaches of conservation centred management.

2. The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way, reflecting the three objectives of the Convention: conservation; sustainable use; and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

3. To ensure the successful application of the ecosystem approach the Convention recommended: (1) a focus on functional relationships and processes within ecosystems; (2) enhance benefit-sharing; (3) the use of adaptive management practices; (4) the implementation of management actions at the scale appropriate for the issue being addressed, with decentralization to lowest level, as appropriate; and (5) to ensure inter-sectoral co-operation.

4. A recent review of the state and specific requirements of ecosystem approach in forest management in the European Alps is provided by (Krauchi et al., 2000). The authors embrace a holistic approach (*sensu* Bruenig 2002) whereby forest ecosystems are managed sustainably. Accordingly, the primary purpose is not sustained timber yield but protection (slope, watershed integrity, biodiversity), silvicultural operations are minimised and timber is extracted only where it can be done without incurring an environmental cost. Some approaches (e.g. Botkin and Talbot 1992), go further and advocate maintaining the forest's natural integrity with regard to biological diversity (structure and species composition), ecological processes and environmental services. They represent an ecologicistic swing away from the utilitarian approach of the past and, unless appropriate policy measures are taken, may not be realistic especially in third world countries.

5. The adoption of ecosystem approach in practice requires the existence / establishment of a management system. In many montane / alpine regions of the world, where traditional land use systems are largely in transition as a result of increased population pressure and external economic and societal interests, the widespread large-scale adoption of an ecosystem approach appears far away in practice (see several accounts in Koerner and Spehn 2002).

6. There are moves, however, by WWF for conservation-centred eco-region (bioregion) level implementation of the ecosystem approach (e.g. Krever et al., 2001); see also Section I.7).

## 2. Protected areas

7. Whilst the ecosystem approach provides the fabric of philosophy to the protection of biological diversity, the establishment and management of protected areas is part of the overall practical framework of conservation and management. Protected areas are to be established where special measures are required to conserve biological diversity. These areas are selected using established guidelines (e.g. represent areas of high species diversity and high species turnover; for high mountains the elevation gradient in vegetation needs to be represented as well as latitude and longitude coverage; protected areas should be connected by corridors; minimum protected area size determined on the basis of species turnover etc.) and their management is to be with a view to ecosystem approach, i.e. to provide conservation, sustainable use, and benefit sharing.

8. Aspects identified by CBD as of high importance protected area management include methods and approaches to deal with protected areas; ecosystem and bioregional approaches to protected area management and sustainable use of biological diversity; mechanisms to enhance stakeholder involvement; methods for developing systems plans and integrating biological diversity considerations into sectoral strategies and plans; and transboundary protected areas (Secretariat of the Convention on Biological Diversity 2001).

9. Protected areas are important in the conservation of biological diversity of forest, dry and sub-humid land, inland waters, and marine and coastal environments of CBD thematic programmes. They are equally important in many alpine areas of the world (Hamilton 2002).

10. UNESCO World Heritage Areas comprise (1) 'natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view', (2) 'geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation', and (3) 'natural sites or precisely delineated areas of outstanding universal value from the point of view of science, conservation or natural beauty'. World Heritage and MAB Biosphere Reserves are shown in map (available at UNESCO web site 'UNESCO in the mountains of the world' <http://valhalla.unep-wcmc.org/unesco/world.htm>).

11. Designated protected areas often only exist in name and are not managed according to the designation criteria. (Vasconez 1995) noted that in 1995 there were 12 of 18 areas protected areas in Ecuador which contained montane forests. They had no adequate inventory or management. The few successful examples of NGO run reserves with tropical montane forests include La Selva in Costa Rica and La Planada in Colombia (Churchill et al., 1995). The UNU co-ordinated People, Land Management and Environmental Change strives to amalgamate traditional farming and biodiversity conservation and its results have relevance for some agriculture transformed montane forest ecosystems, but not for high mountain areas. The Global Environment Facility is currently funding biodiversity conservation projects in mountain areas in some 21 countries (FAO 2000). The relevance of these projects to the current document cannot be established because of the lack of availability of detailed information. In line with the ecosystem approach and bioregional management, a Meso-American Biotic Corridor linking protected areas in the mountains of seven countries in this region is being planned by the Central American Commission on Environment and Development (CCAD). A further initiative is being implemented to develop a biological link corridor from Tierra del Fuego to Alaska along the mountain chains of South and North America to connect the existing series of protected areas (Hamilton 2002).

### **3. Restoration, rehabilitation of degraded ecosystems and recovery of species**

12. The substantial loss of habitats and the increasing fragmentation and isolation of those which remain necessitate the rehabilitation or re-establishment of habitats. The main causes of degradation are associated with the direct uses of the resources (e.g. mining, unsustainable timber harvesting, agricultural overuse). The main aim of rehabilitation is to restore degraded ecosystems and promote the recovery of threatened species (Secretariat of the Convention on Biological Diversity 2001). The key elements in habitat rehabilitation are the reinstatement of traditional management, the reduction of pressures causing degradation, the control of invasive alien species and habitat repair after damaging activities (Anderson 1995). Hagen (2002) reported the use of arctic and alpine species with high germination and rooting ability in an extended restoration experiment in Svalbard and the Dovre Mts, Norway. (Sarmiento 1995)

13. Habitat restoration is an integral part of each of the thematic work programmes of the CBD (e.g. conservation and sustainable use of pollinators for agricultural biological diversity and dry and sub-humid lands, Secretariat of the Convention on Biological Diversity 2001) and it should be implemented in a whole watershed context as an integral part of watershed restoration, (e.g. Petersen 1999). The most notable of all restoration work is probably that being carried out in China as a result of its implementation plan of Agenda 21 with

regard to land allocation (Anonymous 2002).  
{WCMC restoration statistics}

#### **4. Management of invasive and alien species**

14. The impact of biological invasions by non-native species has been best documented on agriculture, forestry, fisheries, and other industries, as well as on human health. Their impact on native ecosystems and species is less well understood. However, from a review by (Simberloff 1981) of more than 850 plant and animal species introductions it emerged that (1) less than 10% of all introductions led to local extinction of species, (2) islands appeared particularly susceptible to extinctions, and (3) where extinction occurred predation was by far the most important factor, followed by habitat change and competition. Recent initiatives set up to systematically collect information on invasive alien resulted in a major international effort, with a major input by CBD, and led by the Global Invasive Species Programme (GISP). As a result of the efforts of GISP a manual on invasive alien species management has been published recently (Wittenberg and Cock 2001). Wittenberg and Cock (2001), in line with the interim guiding principles drawn up by CBD for the prevention, introduction and mitigation of impact of alien species (Secretariat of the Convention on Biological Diversity 2001), highlighted priority actions in managing alien species in the order of prevention, early detection and eradication if feasible, and control if eradication is unfeasible. Invasive species is a crosscutting issue and as such is dealt with in existing CBD thematic programmes.

15. The case studies presented in Wittenberg and Cock (2001), emphasised again the susceptibility of native island (especially small island) species to invasion. However, it may be that because the study of the ecology of invasions have concentrated on islands continental ecosystems are under represented, as Tokeshi (1999) warned. Some islands with a large proportion of mountain areas (e.g. Hawaii, Madagascar) are among those which have been most affected by invasion of alien species. Mountains on the continental landmasses have been far less affected, with the alpine zone of the high mountains rarely containing non-native species.

#### **5. Traditional knowledge of local and indigenous communities**

16. Much of the world's natural heritage today bears the impact of centuries long management by local and indigenous communities. These management practices, the embodiment of traditional knowledge, are regarded as more environmentally sustainable than modern large-scale equivalents or substitutes. In appreciation of this, the CBD has been promoting the maintenance of traditional management practices including the full recognition of the importance for such practices the use of traditional knowledge. Traditional knowledge, as a crosscutting issue, forms an integral part of the

implementation of all CBD thematic programmes (Secretariat of the Convention on Biological Diversity 2001). It is closely related to issues on access and benefit sharing, as indigenous communities are the main users of biological resources for food and medicine (and as such are likely to be targeted by bioprospecting agents). Traditional knowledge is likely to be best preserved and relied on in remote small communities (see examples of the use of medicinal and other ethnobotanical plants in some Andean villages in Churchill et al., 1995). For example, CONDESAN reported a good agreement between indigenous and scientific soil classification (also Sandor and Furbee 1996) and weather forecasting in the Andes. A collection of recorded indigenous knowledge is being archived (for local databases in the Andean region see <http://www.condesan.org/links.htm>).

17. Information from other parts of the world e.g. Himalayas is available (ICIMOD various) and see also e.g. Samant and Dhar (1997) and Posey (1999).

18. Mountains have played an important role in indigenous communities' lives as many mountains have been held in great respect and considered as sacred. This has had implications for use or non-use and the kind of practices. Changing traditional forms of life can cause large changes in how sacred mountains are regarded and managed in the future. Tourist and industrial developments should take into consideration their impacts on traditional cultures and land uses.

19. There is an ongoing UN process on the 'Declaration on the Rights of Indigenous Peoples

## **6. Options for sustainable use including sustainable tourism**

20. There is a common feature in the resource use of humankind: until a resource is perceived to have become strategically low or limiting, its use is based on exploitation with little regard for conservation. An enlightened understanding of the problems and political goodwill (or political expediency) may make policy makers to propose legislation to protect resources, however, legislation cannot tackle the phenomenon where one of the main underlying causes is population growth. Terms such as 'sustainable' become rapidly corrupted and used indiscriminately (see Rio +10), bearing little relevance its definition by CBD (Secretariat of the Convention on Biological Diversity 2001).

21. The use of mountains involves fundamentally different perspectives in the developing world from those in countries with a high GDP. In developing countries, mountain use is largely of direct extractive nature for subsistence of local communities and for large-scale agricultural or forestry practised by private or state authorities. These are most often practised at the expense of protection functions of ecosystems. Sustainable use to most therefore means

sustained expansion in economic activities, dictated by need created by a rapidly expanding population and by way of private interest (greed).

22. Traditional uses are often advocated as sustainable. However, ecological sustainability (or limited damage to overall ecosystem functioning) depends on the scales of extractive uses and as such, traditional low intensity uses at high population density do also become ecologically unsustainable. Traditional uses have, however, strong implications for cultural identity.

23. As it is, sustainability for humans is mostly associated with economic sustainability, as opposed to sustainable resource use with due consideration for future demand. Demand for resources at low population densities is low enough (in many cases) not to raise the issue of ecological sustainability. At high resource demand (e.g. high population density), ecological sustainability becomes a side issue as economic growth (or existence) becomes the main concern. Remedial action to counter the degradation caused by land use is taken to conserve or increase land productivity. Such remedial measures usually have a positive impact on biological diversity also.

24. As opposed to developing countries, in developed countries, there has been a sustained population decline in rural and remote areas, such as mountains. Remaining use there is based on, a usually subsidised, 'right to live a traditional mountain farmer's life', which has proved sustainable in the long run and has had beneficial facets for biological diversity (e.g. transhumance which increased botanical richness in the alpine grasslands). Today's existence, however, in practice, is largely dictated by demands arising from the recreational needs of a mostly urban-dwelling population. This demand has been embraced by those living in the mountains to transform their economies from agriculture based ones to those of service industries. A change is perceptible in mountain use where conservationists have been persuaded to allow tourist developments in protected mountain areas. For example, there exists a European Charter for Sustainable Tourism in Protected Areas (much in tune with CBD's criteria for sustainable tourism) which has 10 corner points (1. Respect the limits of carrying capacity; 2. Contribute to heritage conservation and enhancement; 3. Preserve natural resources; 4. Support the local economy; 5. Promote the involvement of local residents; 6. Develop appropriate high quality tourism; 7. Make protected areas accessible to everyone; 8. Develop new forms of employment; 9. Encourage behaviour that respects the environment; 10. Serve as a model for other economic sectors and influence their practices). The Charter is to help the protected areas, tourist service providers and tour operators manage tourism in a sustainable way. Once parties voluntarily enter the Charter, they commit themselves to respecting the principles of sustainable tourism. The protected area is committed to a strategy and a 5-year action plan, developed together with local tourist businesses and local residents. Tourist businesses have to define a strategy and a 1-year action plan whereby they undertake to adopt

management methods, which respect the environment, value the natural and cultural heritage and make their customers environmentally aware. Of the 18 National and Nature Parks that have signed the Charter to date, many of them are in mountain areas including the Hohe Tauern NP in Austria, the Abruzzi and Alpi Marittime NPs in Italy (Sustainable tourism and Natura 2000 (2001). These areas are experiencing a thought out way of development - still an experiment, rather than an accomplishment. Unfortunately, negative examples of non-sustainable development in mountain areas abound (see for example (Godde et al., 2000)). The Alpine Convention (with its Protocol on Tourism, 1991) provides a legal framework for addressing tourism in the high mountains in the countries of the signatory parties.

## **7. Bioregional management**

25. Bioregions have been proposed as regional units for sustainable natural resource management. A bioregion is an area of land and water whose limits are defined not by political boundaries, but by the geographical limits of human communities and ecological systems (WRI <http://www.wri.org/wri/biodiv/bioregio.html>). A bioregion characteristically is defined as an area which accommodates, and can maintain the integrity of, the region's biological communities, habitats, and ecosystems and ensures their proper functioning, meet the habitat requirements of keystone and indicator species, and include the local (indigenous) communities who manage the resources.

26. As a bioregion is to have some cultural identity, bioregional planning allows to provide an all-encompassing, integrative framework for sustainable management which includes land use (mining, agriculture, forestry, fisheries), conservation (designated protection areas, ecosystem restoration) and socio-economic objectives (Brunckhorst 2000). There is a dedicated institute, the UNESCO Institute for Bioregional Resource Management, University of New England, Australia which is a leading force worldwide in bioregional matters. Bioregional management opens up a way to sustainable management, however, its viability and uncompromised 'sustainability' in the current climate of globalisation is perhaps doubtful.

27. Bioregion and ecoregion are sometimes used interchangeably. Ecoregions are units based on ecological criteria and may contain one or more bioregions. The 867 recognised ecoregions of the world are shown in <http://www.nationalgeographic.com/wildworld/terrestrial.html>. Ecoregions may form the basis for regional nature conservation and regional co-ordination of bioregional management as an integral part (extension) of the ecosystem approach.

28. The lack such an approach in the past has been criticised for the shortcomings of biological data collection (e.g. Jenik 1998) and management



deficiencies in an ecoregion divided up by political borders. Accounts on European high mountains in a forthcoming assessment of alpine biodiversity in Europe specifically recognised this issue (Nagy et al., 2003). Recent international initiatives in mountain areas include WWF Ecoregion Initiatives such those in the Carpathians, the Caucasus, or the Altai-Sayan.

## **8. Access and benefit sharing**

29. Access and benefit sharing is one of the major issues of the CBD and has proved probably the most controversial. Guidelines for practical implementation have been proposed by CBD (<http://www.biodiv.org/programmes/socio-eco/benefit/ab-wg-01.asp>). (See section I.5)

## **II ASSESSMENT AND MONITORING**

### **1. Classification**

30. The criteria and indicators of sustainable development in mountain areas enlist the maintenance of biological diversity. Indicators have been developed by many groups, however, as it is the montane zone of the mountains where most land use takes place, most indicators have been developed to assess the sustainability of forested mountain areas (e.g. UM, CIFOR).

31. The assessment of sustainable ecosystem management below is summarised according to elevation zones, i.e. montane forest and alpine ecosystems. Two examples are used, both of which are based a system using 'principles, criteria, indicators and verifiers'. The fundamental difference is that the example for the forests, developed by CIFOR and primarily aimed at tropical forest, is an all-inclusive framework to cover policy, ecology, social environment, and production of goods and services. The other example is from the upper montane and alpine zones of Scotland to assess and monitor the status of protected sites which form part of the European Community Natura 2000 network. It therefore focuses on ecology alone.

32. The system for forests developed by CIFOR (after tests in three tropical countries and in Austria) is not specific to montane forests, however, it is fully applicable there (Table 1). The criteria related to the ecology of the forest are assessed using a large number of indicators. For example, for the 'processes that maintain biodiversity' criterion there are indicators relating to landscape patterns (11 in total), changes in the diversity of habitats (7), community guild structures (7), richness/diversity of selected groups of organisms (8), population size and demography (5), nutrient cycling (8), and hydrology (4). These are important and generic indicators which can be adopted to carry out

assessments at a range of scales in montane forests, and after appropriate modifications, in alpine ecosystems. (It is clear from a cursory examination of the policy criteria how far the reality of sustainable ecosystem management is in most developing world countries).

Table 1. Extract from the CIFOR Criteria and Indicators Generic Template (<http://www.cifor.cgiar.org/cimatweb/doc/toolbox-2c.pdf>)

Principles	Criteria
Policy: Policy, planning and institutional framework are conducive to sustainable forest management	There is sustained and adequate funding for the management of forests
	Precautionary economic policies exist
	Non forestry policies do not distort forest management
	A functioning buffer zone exists
	Legal framework protects access to forest and forest resources
	Demonstrated reinvestment in forest-use options
Ecology: Maintenance of Ecosystem Integrity	The processes that maintain biodiversity in managed forests are conserved.
	Ecosystem function is maintained
	Conservation of the processes that maintain genetic variation

33. A system based on assessing certain pre-selected attributes (indicators) is being developed in European countries for monitoring the state of protected areas. The main features of such a system developed for upper montane and alpine habitats in Scotland include attributes and targets, which can be readily assessed with consistency and economy of effort (A. MacDonald pers. comm.). It takes into account locally distinctive species or characteristics, uses a generic maximum limit for undesirable characteristics for assessing management impacts, and it endeavours to maximise the repeatability of and utility of the results over several monitoring cycles.

## 2. Identification of categories named in Annex I of the CBD

Table 2. Ecosystems and habitats in the montane and alpine zones according to CBD requirements of identification and monitoring

sa0 sa0 lt1	Tropics	Subtropics	Temperate	Boreal
Am	XXX	XX	XX	X
Aa	XX	XX	XX	X

Bm			X	X
Ba			X	X
Cm	XXX	XXX	XXX	XXX
Ca	XXX	X	X	X
Dm	XXX	X	X	X
Da	XXX	X	X	X

34. A, containing high diversity, large numbers of endemic or threatened species, or wilderness; B, required by migratory species; C of social, economic, cultural or scientific importance; D which are representative, unique or associated with key evolutionary or other biological processes; a, alpine; m, montane. For the European alpine region 100 habitats were identified as needing protection (<http://www.europa.eu.int/comm/environment/nature/alpine.pdf>); habitat lists for the atlantic, boreal, continental and Mediterranean regions of Europe contain habitats pertaining to the montane zone.

Table 3. Species and communities in the montane and alpine zones according to CBD requirements of identification and monitoring

sb0sb0lt1	Tropics	Subtropics	Temperate	Boreal
Am	X	X	X	X
Aa	X	X	X	X
Bm	X	X		
Ba	X	X		
Cm	X	X		
Ca	X	X	X	X
Dm	X	X	X	X
Da	X	X	X	X
Em	X	X	X	X
Ea	X	X	X	X

35. A, threatened; B, wild relatives of domesticated or cultivated species; C, of medicinal, agricultural or other economic value; D, social, scientific or cultural importance; E, importance for research into the conservation and sustainable use of biological diversity, such as indicator species; a, alpine; m, montane. For the European alpine 165 species were identified as needing protection <http://www.europa.eu.int/comm/environment/nature/alpine.pdf>; species list for the atlantic, boreal, continental and Mediterranean regions of Europe contain species pertaining to the montane zone.

Table 4. Described genomes and genes of social, scientific or economic importance.

lt1	Tropics	Subtropics	Temperate	Boreal
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M	?	?	?	?
A	?	?	?	?

### III ENABLING ENVIRONMENT

36. A compilation of countries' submissions to the 5th Session of the United Nations Commission on Sustainable Development, April 1997, in relation to agenda 21, on mountain issues is available at (<http://www.un.org/esa/agenda21/natlinfo/agenda21/issue/natur.htm#mount>). Individual country submissions provide information on the legal, policy, strategy, projects, status, challenges, capacity building and education, and co-operation aspects in the mountains. The list unfortunately does not include many countries with high mountain areas. The existing submissions are often very patchy, however, there are detailed accounts also (e.g. Austria and Norway). Further information on mountain issues by countries is available in (FAO 1997, pp. 75-89). Some recent and current networks and (umbrella) organisations are listed in Table 5.

Table 5. An incomplete list of research, development and management initiatives with deliverables in mountain areas. The main places of activities are indicated in altitude zones.

R & D Initiatives	LM	MM	UM*	Alpine	Notes
ALPNET			x	x	Biodiversity assessment 1998-2000 (Europe)
GMBA			x	x	Biodiversity assessment; role of land use (Global)
GLORIA			x**	x	Climate change indication, plants (Europe & global)
MRI		x?	x	x	Climate change, process modelling, watersheds
AHI***	?	?	?		Integrated programme of management, restoration and conservation (E Africa)
CONDESAN***		?	x	x	Integrated programme of management, restoration and conservation + traditional knowledge (Andes)
ICIMOD***		X	?	?	Integrated programme of management, restoration and conservation (Hindu-kush Himalaya)
CIP		X	x?	x?	Lead of CGIAR GMP
GEF	?	?	?	?	Conservation (global)
Alpine Convention	x	X	x	x	Integrated development supported by legislation (countries of European Alps)

*LM, lower montane; MM, mid montane; UM, upper montane (\*, including the treeline ecotone); \*\*, treeline ecotone only, not upper montane forest; \*\*\*, part of CGIAR Global Mountain Programme;*

37. Other networks and (umbrella) organisations with a stated interest in mountain issues include the Mountain Forum, DIVERSITAS, various UN organisations such as FAO and UNU in collaboration with the Centre for Development and Environment, Berne, Switzerland (Table 5). The spectrum is complemented by organisations such as the Mountain Institute or the Panos Institute.

## 1. Research and Training

38. There are a large number of individuals engaged in research on alpine biodiversity related issues worldwide. They form research or information exchange networks such as GLORIA, ALPNET, GMBA, and MRI (Table 5). The number of dedicated institutes for basic and applied research in the alpine and montane zones is less numerous; ICIMOD is an outstanding example in Asia, CONDESAN in South America and the African Highlands Initiative in Eastern and

Central Africa. The MRI is a mountain research umbrella organization with a work programme for climate change impacts in high mountains; many other umbrella organizations enlist mountain research initiatives (e.g. DIVERSITAS). A current European research consortium is evaluating silviculture and policy measures in mountainous areas (<http://www.forst.uni-muenchen.de/EXT/LST/WALDB/mufoma/mufoma.html>). Other EU funded research or network programmes addressed the ecology of land use in mountains (EUROMONT) and monitoring changes at ecotones in the boreal and arctic (SCANTRAN).

39. The Global Mountain Fellowship Programme is part of the CGIAR Global Mountain Programme. It has been used to provide training for more than 200 people in the Andes and the Himalayas and funded post-graduate (M.Sc. or Ph.D.) for over 20. CONDESAN has contributed to establishing undergraduate programmes in integrated natural resource management at local universities (<http://www.cipotato.org/GMP/index.htm>). Various NGOs, local initiatives and aid or development programmes have research and training elements (e.g. Darwin Initiative - project on 'The Effect of an Invasive Tree Species on Biodiversity in Primary Montane Rainforests in Jamaica').

## **2. Legal and regulatory framework, including incentives**

40. 'Each Contracting Party shall, as far as possible and as appropriate, adopt economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biological diversity.' (Secretariat of the Convention on Biological Diversity 2001)

41. No global or regional - other than the Alpine Convention - legally binding treaty deals with mountain issues. (The Alpine Convention is briefly discussed under sustainable development). Conventions modelled on the Alpine Convention are being discussed for the Altai-Sayan range, the Caucasus and the Carpathians within the UNEP European Mountain Initiative ([www.unep.ch/roe/emi.htm](http://www.unep.ch/roe/emi.htm)).

42. It is perceived that without an adequate legal framework and implementation, the relevant provisions of Agenda 21 cannot be ensured (Commission on Sustainable Development 2000). An overview of national legislation in relation to mountains lists seven countries that have passed mountain development and protection specific laws, and another four which are about to (Villeneuve et al., 2002). The existing laws cover conceptual, institutional, economic (agriculture, tourism, local produce), social (infrastructure and communications; culture, education and health), and environmental aspects. In other countries, such as Austria, where no mountain dedicated 'mountain' law exists, several laws and regulations deal with various aspects of protection and sustainable development in mountainous areas.

43. At the Pan European level, there is consultation among European countries on biodiversity issues ([www.strategyguide.org](http://www.strategyguide.org)); at the European community level, there exists a hierarchy of instruments - directives, regulations, decisions, declarations, etc (for full details see <http://biodiversity-chm.eea.eu.int/convention/cbd/ec/legislation>) that can be used as incentives for environmental sustainability. Although not mountain specific, the EU nature conservation affects 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 EU policies such as agriculture, regional development and transport ([www.europa.eu.int/comm/environment/nature/home.htm](http://www.europa.eu.int/comm/environment/nature/home.htm)).

44. The number of 'mountain' charters or declarations (e.g. Draft European Charter of Mountain Regions ([www.mtnforum.org/resources/library/clrae95a.htm](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) illustrate that in concerned circles there is a favourable climate for developing a wider legislative framework for mountain areas.

### **3. Education and public awareness**

45. One major aim of declaring by the UN 2002 the International Year of the Mountains was to create a platform for raising awareness. This platform has been used by FAO (the official co-ordinator) and many local governments and organisations to promote their mountain agenda. All major mountain initiatives (e.g. CONDESAN, ICIMOD, AHI) contain a substantial element of education and raising public awareness (at the local community level) related to biodiversity and sustainable management. National Parks and Nature Reserves undertake education via interpretive displays, publications and guided tours aimed at tourists. Nature conservancy organisations and NGOs have been active in raising public awareness. Badly needed is the adequate environmental education of junior school age children to lay the foundations for future action. (See also Sect. III.1.)

46. The United Nations University has been a vehicle to the formulation of Chapter 13 of Agenda 21. Its programme (The Mountain Ecology and Sustainable Development), projects and publications (e.g. (Messerli and Ives 1997) have contributed to research, education and raising public awareness.

### **4. International co-operation**

47. 'At an institutional level, the way in which chapter 13 has been organized and the mechanisms that have developed over recent years to promote collaboration and cooperation in achieving its objectives, have been an important means of integrating a variety of sectoral concerns and approaches,

as well as different types of institutions, including NGOs, governments and intergovernmental organizations. Improved cross-sectoral cooperation and inter-institutional collaboration have resulted in many initiatives that address both conservation and development concerns together.' (extract from Task Manager's report, FAO, 2000)

48. The activities listed in the preceding Sections all involve various degrees of bi- or multi-lateral regional and international co-operation in the fields of bioregional management, protected areas and others. Projects involving international organisations, non-governmental organisations and country aid and development agencies have components dedicated to technology transfer.

49. There are a large number of international treaties of general nature, not specifically dealing with mountain issues. Fodella and Pineschi (unpubl. ms. prepared for the Bishkek World Mountain Summit 2002) considered these as treaties which may bear relevance to mountain areas (see appended Table 6).

## **5. Technology transfer and cooperation**

50. Projects involving international organisations, non-governmental organisations and country aid and development agencies have components dedicated to technology transfer. Technology transfer (hardware and training) has been evolving into capacity building through research carried out in partnership between host and source countries. Capacity building and sustained partnerships will have an important role research and the application of the results in the field (Anonymous 2002). Inevitably, successful technology transfer is closely connected with education, training programmes, absorbing, and adopting traditional knowledge.

## **6. Sustainable development programmes in mountain areas**

51. The only legally binding regional treaty is the Alpine Convention which encompasses sustainable development over the whole Alps ecoregion. Accordingly, legislation has been developed (yet to be ratified) that would underpin regional co-operation in agriculture, nature protection and landscape conservation, land use planning and sustainable development, montane forests, tourism, soil conservation, energy, transport and dispute settlement. Other areas of co-operation are culture and populations, and air pollution control. Similar accords are being initiated for the Altai-Sayan range, the Carpathians and the Caucasus.

52. The CGIAR Global Mountain Programme, co-ordinated by the International Potato Centre, Peru operates in the Andes, Hindu-kush Himalayas and in the Ethiopian Highlands. The work is carried out at selected sites at the watershed level. In the Andes, CONDESAN, a consortium for the development of the Andean ecoregion, consisting of NGOs, universities, international research



institutions, and private companies, has been operating since 1992. Its main activities relate to pan-Andean problems, such as the management of protected areas, the creation of incentives for investment in the rural sector, the need to improve natural resource assessment and communicate this information to rural communities, the need for coordination between water providers and water users, and access to information and information technology. CONDESAN operates at six pilot sites which cover the diversity of watershed conditions in the region ("<http://www.condesan.org/principalCondesan-en.htm>").

53. In the Hindukush-Himalaya, the International Centre for Integrated Mountain Development (ICIMOD) operates to 'promote the development of an economically and environmentally sound mountain ecosystem and to improve the living standards of mountain populations'. ICIMOD's main role is to facilitate the application of applied research results in mountain development (<http://www.icimod.org/index.htm>). The results of a Canadian-Indian collaborative study on sustainability of forested mountain watersheds in Canada and in the Himalayas is available ([http://www.umanitoba.ca/institutes/natural\\_resources/mountain/book/index.html](http://www.umanitoba.ca/institutes/natural_resources/mountain/book/index.html)). The African Highland Initiative is managed by ICRAF.

54. There are broad and non-mountain specific statements relating to sustainable development in legally binding treaties such as the European community Treaty (EC Treaty Article 6: "Environmental protection requirements must be integrated into the definition and implementation of 'Community policies and activities' in particular with a view to promoting sustainable development.").

Table 6. International treaties which bear some relevance to protection of mountain areas or ecosystems (after Fodella and Pineschi, unpubl. ms. prepared for the Bishkek World Mountain Summit 2002)

#### Non-mountain Specific Treaties

UNESCO Convention for the Protection of the World Cultural and Natural Heritage (Paris, 23 November 1972)

Convention on Biological Diversity (Nairobi, 22 May 1992)

Cartagena Protocol on Biosafety to the Convention on Biological Diversity (Montreal, 29 January 2000)

Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere (Washington, 12 October 1940)

African Convention on the Conservation of Nature and Natural Resources (Algiers, 15 September 1968)

Convention of European Wildlife and Natural Habitats (Bern, 19 September 1979)

Agreement on the Conservation of Nature and Natural Resources (Association of South East Asian Nations ASEAN - Kuala Lumpur, 9 July 1985)

International Tropical Timber Agreement (Geneva, 26 January 1994)

Convention for the Conservation of Biodiversity and the Protection of Wilderness Areas in Central America (Managua, 5 June 1992)

Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington, 3 March 1973)

Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 23 June 1979)

Convention for the Protection of Birds (Paris, 18 October 1950)

Convention for the Conservation and Management of the Vicuña (Lima, 20 December 1979)

Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar, 2 February 1971)

Convention to Combat Desertification (Paris, 17 June 1994)

Protocol to the Antarctic Treaty on Environmental Protection (Madrid, 4 October 1991)

Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki, 17 March 1992)

United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses (New York, 21 May 1997)

UNECE Convention on Long Range Transboundary Air Pollution (Geneva, 13 November 1979)

Vienna Convention for the Protection of the Ozone Layer (Vienna, 22 March 1985)

Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal, 16 September 1987)

United Nations Framework Convention on Climate Change (New York, 9 May 1992)

Protocol to the United Nations Framework Convention on Climate Change (Kyoto, 10 December 1997)

Convention on the Transboundary Effects of Industrial Accidents (Helsinki, 17 March 1992)

Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 25 February 1991)

UNEP Goals and Principles of Environmental Impact Assessment (17 June 1987)

Antarctic Protocol (1991)

Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel, 22 March 1989)

IAEA Code of Conduct on the International Transboundary Movement of Radioactive Waste (21 September 1990)

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Vienna, 5 September 1997)

FAO International Code of Conduct on the Distribution and Use of Pesticides (1985)

UNEP London Guidelines for the Exchange of Information on Chemicals in International Trade

Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam, 10 September 1998)

ILO No. 169 Convention on Indigenous and Tribal Peoples in Independent Countries (Geneva, 27 June 1989)

Declaration on the Rights of Indigenous Peoples (UN ongoing)

Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Århus, 25 June 1998)

Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment (Lugano, 21 June 1993)

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