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**DRAFT GLOBAL OUTCOME-ORIENTED TARGETS FOR THE PROGRAMME OF WORK
ON MOUNTAIN BIOLOGICAL DIVERSITY**

Note by the Executive Secretary

EXECUTIVE SUMMARY

Pursuant to paragraph 10 (a) of decision VII/27 on mountain biological diversity, and paragraph 12(d) of decision VII/30, this note presents a proposal for outcome-oriented targets and indicators in relation to 2010 target for the programme of work on mountain biological diversity for consideration by the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) at its eleventh meeting.

Section II of the note considers the relationship of the programme of work on mountain biological diversity to the Millennium Development Goals (MDGs), the Plan of Implementation of the World Summit on Sustainable Development (WSSD), and the activities of other conventions, United Nations organizations, and regional and international organizations and programmes. Section III provides an overview of the vision and mission of the programme of work on mountain biological diversity and section IV presents 20 outcome-oriented targets for monitoring progress towards the 2010 biodiversity target.

* UNEP/CBD/SBSTTA/11/10.

SUGGESTED RECOMMENDATIONS

The Subsidiary Body may wish to recommend that the Conference of the Parties at its eighth meeting:

(a) *Endorses* the goals, targets and timeframes integrated into the programme of work on mountain biological diversity contained in the present note noting the relationship between these targets and those of the Plan of Implementation of the World Summit on Sustainable Development and the Millennium Development Goals;

(b) *Takes note* of the elaborated technical rationale provided in the note as guidance and suggestions for the application of targets to the programme of work on mountain biological diversity;

(c) *Emphasizes* that the targets, as applied to the programmes of work on mountain biological diversity, should be viewed as a flexible framework within which national and/or regional targets may be developed, according to national priorities and capacities, and taking into account differences in mountain biological diversity between countries;

(d) *Invites* Parties and other Governments to develop national and/or regional goals and targets, and, as appropriate, to incorporate them into relevant plans, programmes and initiatives, including national biodiversity strategies and action plans;

(e) *Emphasizes* the need for capacity-building, and adequate financial resources especially for developing countries, in particular the least developed countries and countries with economies in transition, in order to enable them to implement activities to achieve and monitor progress towards the goals and targets;

(f) *Invites* the Mountain Partnership, Global Mountain Biodiversity Assessment (GMBA) of DIVERSITAS, the Food and Agriculture Organization of the United Nations (FAO), the International Centre for Integrated Mountain Development (ICIMOD) the International Human Dimensions Programme on Global Environmental Change (IHDP) the Alpine Convention, the Carpathian Framework Convention and the World Conservation Monitoring Centre of the United Nations Environment Programme, and other relevant organizations to take note of the outcome-oriented targets for the programme of work on mountain biological diversity, and to further refine the targets and indicators to contribute to the implementation of these targets at the regional level as appropriate, and to monitor progress towards them;

(g) *Decides to integrate* the proposed global outcome-oriented targets into future reviews of implementation of the programme of work on mountain biological diversity;

(h) *Reaffirms* its support for the proposed indicators for further development as outlined in its decision VII/30, and included in the present note, so as to finalize a set of indicators whereby efforts to achieve the 2010 biodiversity target can be monitored within the framework of the programme of work on mountain biological diversity;

(i) *Emphasizes* that achieving the 2010 biodiversity target can not be considered as an end in itself but as a cornerstone for conservation and sustainable use of biological diversity and sustainable development in the long term.

I. INTRODUCTION

1. In annex II to its decision VII/30, the Conference of the Parties adopted a framework to evaluate progress towards achieving the 2010 biodiversity target. The framework includes goals and targets embedded within seven focal areas. In paragraph 12 (d) of the same decision, the Conference of the Parties requested the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) to develop recommendations for the integration of outcome-oriented targets into each of the thematic programmes of work, according to the overall framework and approach adopted in the annexes to that decision, and identifying more precise targets, including, as appropriate, quantitative elements.

2. More specifically, in paragraph 10 (a) of decision VII/27 on mountain biological diversity, the Conference of the Parties requested the Executive Secretary, in collaboration with relevant organizations, to propose outcome-oriented targets, and indicators in relation to the 2010 target for consideration by SBSTTA prior to the eighth meeting of the Conference of the Parties.

3. The indicators and targets for the programme of work on mountain biological diversity presented in the present note build on discussions held at the tenth meeting of SBSTTA regarding outcome-oriented targets for the programme of work on marine and coastal areas, and inland waters and also on the general approach for the integration of targets into the programmes of work of the Convention (decision VII/30, annex III).

II. RELATIONSHIP BETWEEN THE PROGRAMME OF WORK ON MOUNTAIN BIOLOGICAL DIVERSITY AND OTHER RELEVANT PROCESSES

A. *Millennium Development Goals*

4. Mountain ecosystems are rich in biodiversity, yet most mountain people live in poverty. According to the Food and Agriculture Organization of the United Nations (FAO), 245 million rural mountain people in developing countries obtain their living from biodiversity dependent subsistence farming, grazing and trading. The implementation of the programme of work on mountain biological diversity can directly contribute to the achievement of goal 1 (“Eradicate extreme poverty and hunger”) and goal 7 (“Ensure environmental sustainability”) of the Millennium Development Goals (MDGs). The programme of work on mountain biological diversity may also contribute indirectly to other goals including, *inter alia*, goal 4 (“Reduce child mortality”) through support for sustainable livelihoods, goal 6 (“Combat HIV/AIDS, malaria, and other diseases”) through targeted efforts to prevent the extinction of species with high potential value for medical research and species with widespread known uses as medicinal plants and animals, and goal 8 (“Develop a global partnership for development”) through activities in support of technology transfers to developing countries.

B. *Plan of Implementation of the World Summit on Sustainable Development*

5. The programme of work on mountain biological diversity directly contributes to the implementation of paragraphs 42, 44, 45 and 47 of the Plan of Implementation of the World Summit on Sustainable Development (WSSD), including on critical issues such as: poverty eradication, changing unsustainable use patterns, protecting and managing the natural resource base, and sustainable development. In particular, the programme of work on mountain biological diversity will contribute to, *inter alia*:

(a) *Paragraph 7*: reduce poverty and hunger, develop national programmes for sustainable development;

(b) *Paragraph 10 (f)*: support sustainable livelihoods for the poor through the sustainable management of natural resources;

(c) *Paragraphs 41 (c) and 44 (c)*: support synergies between the Convention on Biological Diversity, the United Nations Convention to Combat Desertification (UNCCD) and the United Nations Framework Convention on Climate Change;

(d) *Paragraph 42 (a)*: develop and promote programmes for sustainable mountain development and strengthen international cooperation;

(e) *Paragraph 42 (b)*: implement programmes to address deforestation, erosion, and disruption of water flows and retreat of glaciers;

(f) *Paragraph 42 (c)*: develop gender-sensitive programmes for mountain communities;

(g) Paragraph 42 (d): implement programmes for diversification of mountain economies and sustainable livelihoods;

(h) *Paragraph 42 (e)*: promote participation and involvement of mountain communities in decision-making integration of indigenous knowledge;

(i) *Paragraph 42 (f)*: international support for applied research and capacity-building for effective implementation of mountain ecosystems;

(j) *Paragraph 44*: the achievement by 2010 of a significant reduction in the current rate of loss of biological diversity.

C. *Other conventions, United Nations organizations, and regional and international organizations and programmes*

6. The programme of work on mountain biological diversity has been prepared taking into account in particular, chapter 13 (sustainable mountain development) of Agenda 21, paragraph 42, of the Plan of Implementation of the World Summit on Sustainable Development and the 2002 International Year of the Mountains. In addition, a number of international agreements and bodies, institutions, and programme initiatives contributed to preparation of the programme of work on mountain biological diversity. These contributors include, *inter alia*, the Convention on Wetlands, (Ramsar, Iran, 1971), the United Nations Convention to Combat Desertification (UNCCD), the United Nations Framework Convention on Climate Change (UNFCCC), the Food and Agriculture Organization of the United Nations (FAO), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Centre for Integrated Mountain Development (ICIMOD), the Mountain Partnership, the International Human Dimensions Programme on Global Environmental Change (IHDP), the Centre for Mountain Studies, the Mountain Research Initiative (MRI), the Global Mountain Biodiversity Assessment (GMBA) of DIVERSITAS, the Alpine Convention, the Carpathian Framework Convention and the United Nations Environment Programme - World Conservation Monitoring Centre (UNEP-WCMC). These bodies, especially the Global Mountain Biodiversity Assessment, provided valuable inputs for preparing the present note.

D. *Other thematic programmes of work of the Convention*

7. The other programmes of work under the Convention those are relevant to mountain biological diversity programme of work are forest biological diversity (decision VI/22), protected areas (decision VII/28, annex), biological diversity of inland water ecosystems (VII/4), and biological diversity of dry and sub-humid lands (VII/2). The outcome-oriented targets adopted under these programmes are also applicable to the corresponding areas in the programme of work on mountain biological diversity.

III. VISION, MISSION, GOALS AND TARGETS OF THE PROGRAMME OF WORK ON MOUNTAIN BIOLOGICAL DIVERSITY

A. *Vision*

8. The overall vision of the programme of work on mountain biological diversity is conservation and sustainable use of mountain biological diversity while making a significant contribution to poverty

alleviation in mountain ecosystems and in lowlands dependent on the goods and services of mountain ecosystems.

B. Mission

9. The mission of the programme of work on mountain biological diversity, consistent with the Strategic Plan of the Convention as adopted in decision VI/26 of the Conference of the Parties is to promote the implementation of the three objectives of the Convention. This mission is intended to achieve a significant reduction in the current rate of mountain biological diversity loss by the year 2010 at the global, regional and national level as a contribution to poverty alleviation and for the benefit of life on Earth.

C. Goals, targets and indicators

10. Eleven goals and 20 outcome-oriented targets are proposed. The targets are considered as a useful means for communicating the priority issues for mountain biological diversity conservation at the global level, and as a flexible framework within which national and/or regional targets may be developed, according to national priorities and capacities, and taking into account differences in mountain biological diversity between countries. The proposed targets for the programme of work on mountain biological diversity is based upon those contained in annex II of decision VII/30 (specified here as "overall targets"). The indicators presented in this note conform to those contained in annex I of decision VII/30 and also to decision VII/8, in which the Conference of the Parties welcomed the ongoing efforts on the development of biodiversity indicators and requested the Executive Secretary to continue collaborating with relevant international and regional organizations and initiatives on the further development and consolidation of indicators relevant to 2010 biodiversity target.

IV. DRAFT OUTCOME ORIENTED TARGETS FOR MONITORING PROGRESS TOWARDS THE 2010 BIODIVERSITY TARGET

A. Protect the components of biodiversity

Goal 1. Promote the conservation of biological diversity of ecosystems, habitats and biomes

Overall target 1.1: At least 10 per cent of each of the world's ecological regions effectively conserved.

Application to mountain ecosystems: At least 20 per cent of each of the world's mountain ecosystems effectively conserved.

Technical rationale

11. The 10 per cent figure in the overall target is too low for mountain ecosystems. The United Nations list of protected areas for 2003 ^{1/} shows 9,345 mountain-protected areas covering 1,735,828 km² in the "Mixed Mountain Systems" biome of Udvardy ^{2/} protecting 16 percent of this biome. However, a major weakness in the mountain protected area system is that most of the units are discrete, covering single mountains. Many mountain protected areas were established to solely protect the scenic high peaks of local or national value as cultural icons or for mountaineering and tourism, and biodiversity values were not considered. Many protected areas are too small to accommodate serious natural or human disturbance or to embrace much mountain biodiversity. The challenge is to enlarge these areas, in particular to extend them to lower elevations in order to achieve species, genetic and community conservation and to provide functional landscapes for species needing wide ranges. Linkages through a landscape of conservation corridors can effectively enlarge the mountain protected area system, providing better protection of the full suite of biodiversity. Moreover, such connectivity provides greater insurance

^{1/} Chape, S., S.Blyth, L.Fish, P Fox and M.Spalding (2003). 2003 United Nations List of Protected Areas. UNEP World Conservation Monitoring Centre and IUCN, Cambridge, UK, 44 pp.

^{2/} Udvardy, M.D.F, 1975: A classification of the biogeographical provinces of the world. Occasional Paper No. 18, IUCN, Morges, Switzerland.

for migration of species and genes in the face of climate change. A number of these corridor initiatives are now in place, such as the 3,200 km long Yellowstone-to-Yukon corridor in the United States and Canadian Rockies, and the Condor Bioserve constellation in Ecuador. The global mountain area according to UNEP WCMC, ^{3/} criteria, based on altitude and slope in combination in order to represent the environmental gradients of mountain environments, is almost 40 million km², or 27 per cent of the land Earth's surface. ^{4/} Given that mountain areas are islands of high biodiversity increasing the target for area under effective conservation may be appropriate.

Suggested indicators

12. Most relevant headline indicator includes coverage of protected areas. Parameters of particular relevance include spatial distribution of mountain-protected areas nationally, regionally and globally.

Overall target 1.2: Areas of particular importance to biodiversity protected

Application to mountain ecosystems: Areas of particular importance to mountain biological diversity effectively protected.

Technical rationale

13. The purpose of this target is to conserve areas of particular importance to mountain biodiversity, including those areas that are under particular threat. The high abundance of biodiversity in mountain areas is created by the compression of climatic zones along elevational gradients and its highly fragmented and topographically diverse terrain. ^{5/} Although richness declines with altitude, lower-elevation slopes often hold a wide range of habitat types within a relatively short distance. Isolated mountain blocks are often rich in endemics. The high diversity and high proportion of endemic species have resulted in declaring many present biodiversity "hotspots" located in mountain areas. According to the Mountain Watch Report, almost every area that is jointly important for plants, amphibians and endemic birds is located within mountains. ^{6/} By overlaying the biodiversity map with the integrated pressure dataset, the Mountain Watch Report identified the North-Western Andean moist forest and Magdalena Valley of South America, the Caucasus mixed forest ecoregion, and montane ecoregions of California as priority candidates for global conservation action in the world's mountains. Mountain areas rich in endemic species, areas harbouring threatened species, areas rich in land races, areas important for watershed protection and ecological processes require attention for protection. Ideally, all possible mountain biodiversity areas should be protected in order not to lose the great diversity of species not yet known to science (e.g. the Great Smoky Mountains National Park in North America has been open for biological investigation since its creation in 1934, but just within the last seven years an as yet unfinished intense inventory identified 3,353 species found for the first time in the Smoky Mountains and an additional 539 species never before identified by scientists). ^{7/} However, there is a need to prioritize areas using Annex I to the Convention.

Suggested indicators

14. Relevant headline indicators include trends in extent of selected mountain biomes, ecosystems and habitats, and trends in abundance and distribution of selected species. Parameters of particular relevance include extent of new areas of particular value or those under threat are protected.

Goal 2: Promote the conservation of species diversity

^{3/} Kapos, V, J.Rhind, M.Edwards, M.F.Price and C.Ravilious. 2000. Developing a map of the world's mountain forests. In M.F.Price and N. Butt (eds.) Forests in sustainable mountain development: A state-of- report for 2000.CAB International, Wallingford: 4-9.

^{4/} UNEP World Conservation Monitoring Centre: Mountain Watch, 2002.

^{5/} Millennium Ecosystem Assessment 2004 Conditions and Trends Assessment, Chapter 27: Mountain systems.

^{6/} UNEP World Conservation Monitoring Centre: Mountain Watch, 2002.

^{7/} Personal communication Eva Spehn GMBA.

Overall targets 2.1: Restore, maintain, or reduce the decline of populations of species of selected taxonomic groups

Application to mountain ecosystems: *Restore, maintain or reduce the decline of populations of species of selected mountain taxonomic groups.*

Technical rationale

15. The purpose of this target is to protect a representative cross-section of mountain species considering selected taxonomic groups within each mountain ecological region. Comprehensive data on decline of populations of mountain species are not available. The degree of endemism in mountain species is often high in a range of taxonomic groups, particularly on mountains at medium elevations in the tropics and warmer temperate zones. For some taxa, mountains appear to have acted as refuges (Mountain Gorillas in Rwanda and Uganda now numbering less than 300). Mountain species with narrow habitat tolerance, particularly higher-elevation forms and those with low-dispersal capacity are likely to be at high risk from environmental effects of climate change. In mountain environments, three categories of species are of particular importance: (i) icon species; (ii) indicator species; (iii) umbrella species (the protection of these species inevitably protect other species). Examples of icon species are large mammals such as the Mountain Gorilla, leopard, bear, panda, ibex, eagle, wolf, and lynx. Examples for umbrella species are tall late-succession tree species in mountain forests and large wide-ranging carnivores at risk from habitat fragmentation, such as pandas, tigers, takins, golden langurs, condors, and tapirs. Healthy mountain ecosystems are vital to the communities they maintain, as well as to lowland peoples. Therefore, this target is directly relevant to mountains, which contain a number of unique species groups, and there is also an opportunity through this target, to highlight and expand on a number of existing efforts to reduce the decline of umbrella species.

Suggested indicators

16. The most relevant headline indicator includes trends in abundance and distribution of selected species. Other relevant headline indicators include the change in status of threatened species.

Overall target 2.2: Status of threatened species improved.

Application to mountain ecosystems: *Status of threatened mountain species improved.*

Technical rationale

17. The purpose of this target is to improve populations of known threatened and endangered mountain species as well as to identify any threatened species for which information is not currently available. Known threatened and endangered mountain species including migratory and transboundary species and populations need to be effectively conserved. The principal source of information on threatened species is the IUCN Red List. The other sources of information include national reports, the Living Planet Index, Species Assemblage Trend Indices, and the Millennium Ecosystem Assessment. The IUCN Red List of threatened species lists 145 threatened species in mountains. Rugged topography and special features like e.g. cloud islands trigger endemism in mountain areas. The Global Strategy for Plant Conservation (decision VI/9, annex) sets the target for the protection of threatened species at: 60 per cent of the world's threatened plant species conserved in situ, and 60 per cent conserved in accessible ex situ collections, however no targets currently exist for fauna. The 60 per cent target can be directly applied to plant species in mountain ecosystems although a large number of endemics could require a higher target. The tendency of endemic species to become threatened or endangered increases with the lack of corridors among habitats.

Suggested indicators

18. The most relevant headline indicators include the change in status of threatened species. Other relevant headline indicators include trends in abundance and distribution of selected species and coverage of protected areas.

Goal 3: Promote the conservation of genetic diversity

Overall target 3.1: Genetic diversity of crops, livestock, and of harvested species of trees, fish, and wildlife and other valuable species conserved, associated indigenous and local knowledge maintained.

Application to mountain ecosystems: Genetic diversity of crops, livestock, and of harvested species of trees, fish, and wildlife and other valuable mountain species conserved, associated indigenous and local knowledge maintained.

Technical rationale

19. This is an appropriate and important target for mountain biodiversity. There are numerous widespread crops that originate from, and have a very high number of varieties cultivated in, the upper montane zones. Examples include maize, potatoes, barley, sorghum, tomatoes, apples have originated in mountains, and others have diversified in mountains. Some important domestic mammals, sheep, goats, yak, llama and alpaca originated in mountains. Genetic diversity in these resources tends to be higher in mountains, associated with cultural diversity and the extreme variation in local environmental conditions. Some high altitude communities in the Andes maintain more than 150 distinct potato varieties, and mountain farmers in central Africa cultivate beans as mixed populations of up to 30 varieties. Such genetic diversity would tend to reduce the impact of failure in any one variety, and provide adaptability for future change. The achievement of this target, derived from target 9 of the Global Strategy for Plant Conservation, will reflect the continued identification and conservation of seed stock by inter alia, FAO, ICARDA, ICRISAT, and the other CGIAR centres.

Suggested indicators

20. The most relevant headline indicators include trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socio-economic importance. Parameters of particular relevance include number of crop species on the World Information and Early Warning System for Plant Genetic Resources for Food and Agriculture List, number of threatened and endangered species on the World Watch List for Domestic Animal Diversity, number of medicinal plants classified as threatened or endangered, number of ex situ conservation facilities and number of accessions under these facilities.

B. Promote sustainable use**Goal 4: Promote sustainable use and consumption**

Overall target 4.1: Biodiversity-based products derived from sources that are sustainably managed, and production areas managed consistent with the conservation of biodiversity.

Application to mountain ecosystems: Mountain biodiversity-based products derived from sources that are sustainably managed, and production areas managed consistent with the conservation of mountain biodiversity

Technical rationale

21. The overall objective of this target is to reduce biodiversity loss resulting from over-use and inappropriate management practices while maintaining related socio-cultural and economic benefits. Extractive industries in mountain areas have often not been managed for sustainability of products or with interest in conservation of biodiversity. Outsiders expropriate the most valued mountain resources such as forests, minerals, and water, and mountain dwellers rarely profit from the resources being extracted. Many products obtained from mountain areas are harvested and processed in such a way as to be destructive to the mountain terrain (e.g. clear-cut forestry practices on slopes). Economic sustainability for both mountains and lowland populations depends on balancing uses of mountain resources, conservation of mountain ecosystem functions and maintaining traditional production systems. To achieve this target, following the Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity (decision VII/12, annex II) and the 12 principles of ecosystem approach (decision VII/11, annex I) are of paramount importance.

Suggested indicators

22. The most relevant headline indicators include area of forest, agricultural and pastures ecosystems under sustainable management. Other relevant indicators include trends in abundance and distribution of selected species. Parameters of particular relevance include quantity of products derived from certified forests.

Overall target 4.2: Unsustainable consumption, of biological resources, or that impact upon biodiversity, reduced.

Application to mountain ecosystems: Unsustainable consumption, of biological resources, or that impact upon mountain biodiversity, reduced

Technical rationale

23. The purpose of this target is to reduce unsustainable use including practices with a particular impact on mountain ecosystems. Present practices in many mountain areas impact negatively on biodiversity. Mountain forests are often severely impaired by logging and overgrazing by both game animals and livestock. Some mountain farming practices on unsuitable slopes lead to species-diversity loss, soil erosion, as well as an increased number of avalanches and landslides. Intensive use of fragile alpine areas for grazing, tourism, sports, and leisure may negatively impact biodiversity and their own sustainability. One can distinguish two different intensities of present consumption of biological resources in mountain ecosystems: (i) less intense effects but on very large land areas are logging/burning or grazing, the two most important activities considering the land area involved; fire or grazing can increase or decrease diversity, depending on frequency of burning or intensity of grazing. (ii) very intense effects but on relatively small scale are activities such as hydroelectric schemes, road building, tourism, infrastructure and mining.

Suggested indicators

24. Parameters of particular relevance include proportion of products derived from sustainable sources.

Overall target 4.3: No species of wild flora or fauna endangered by international trade.

Application to mountain ecosystems: No species of wild mountain flora or fauna endangered by international trade

Technical rationale

25. The purpose of this target is to reduce biodiversity loss as a result of legal and illegal international trade. Many mountain species listed in the CITES Appendices are illegally traded, and need further protection. Mountain tortoises, chameleons, gorillas, orchids, vicuna, Tibetan antelope, Asian black bear, Chinese yew, and green peafowl are but a few of the species affected by international trade. Regional cooperation on interdiction and management, and consumer education may be necessary steps to improve the outlook for the endangered mountain species.

Suggested indicators

26. Parameters of particular relevance include number of threatened and endangered species facing threats from international trade and from habitat conversion for production destined for international markets, and identification and protection of species not covered by CITES that are threatened directly or indirectly as a result of international trade.

Goal 5: Pressures from habitat loss, land use change and degradation, and unsustainable water use, reduced

Overall target 5.1: Rate of loss and degradation of natural habitats decreased

Application to mountain ecosystems: Rate of loss and degradation of natural mountain habitats, decreased.

Technical rationale

27. The purpose of this target is to reduce and prevent habitat loss as a result of conversion, over-use and degradation of mountain ecosystems. Comprehensive information on degradation of mountain areas is not available. In general terms, it can be said that there has been a sustained loss of biological diversity in mountain ecosystems, ^{8/} especially in developing countries. According to the Mountain Watch Report important pressures that mountain ecosystems face include: natural seismic hazards; fire; climate change; land-cover change and agricultural intensification; infrastructure development; and armed conflict. Human land use has a long history of ever-increasing proportions in the mountains worldwide. Timber, non-wood products, traditional medicines and game from forests, fish from mountain rivers and lakes, a number of domestic ungulates from grasslands, and an array of mountain crops are used by humans. Conversion from forest to crop or grazing land greatly reduces species and structural diversity, and soil over-use leads to irreversible degradation involving complete soil loss due to accelerated erosion. An example of land use change from the Andes showed that at the regional level, only 22% of original forests remain. ^{9/} Global climate change has serious impacts on mountain biota, leading to local extinction of endemic mountain species. Changes in the precipitation patterns and rising temperatures result in the shrinking of glaciers and snow covered areas, which reduce water-retention capacity of mountains and affects downstream lowlands. Deleterious impacts arising from uphill land-use changes will eventually manifest themselves downhill, both in environmental and economic terms.

Suggested indicators

28. Most relevant headline indicator includes trends in extent of selected biomes, ecosystems and habitats. Parameters of particular relevance include connectivity/fragmentation of ecosystems, incidence of human-induced ecosystem failure, and rate of deforestation with in natural mountain habitats.

Goal 6: Control threats from invasive alien species

Overall target 6.1: Pathways for major potential alien invasive species controlled.

Application to mountain ecosystems: Pathways for major potential invasive alien species in mountain ecosystems controlled.

Technical rationale

29. The purpose of this target is to reduce and prevent biodiversity loss as a result of competition and predation by invasive alien species. The high level of endemism and fragmented distribution of mountain flora and fauna make invasive species a particular threat to mountain biodiversity. Invasive alien species are mainly relevant at lower elevations of mountain terrain, but are rarely a problem at high elevations (above tree line) as specific adaptations to deal with cold and harsh climate are a prerequisite to invade these habitats. Some notable examples of mountain invasions include feral pigs (*Myrica faya* and *Myconia* spp) in Hawaii in the United States and Costa Rica, goats in Venezuela, foreign grasses in Puerto Rico and alien trout in the United States' Yellowstone National Park. Invasion of *Notofagus* forests by pine species in the southern hemisphere. The control of pathways of invasive species will need to focus on the health of the local species to maintain their viability, inspection regulations for imported plants and animals, minimization of disturbance of the natural surroundings by road construction, development, and agriculture.

^{8/} FAOSTAT <http://apps.fao.org/page/collections>.

^{9/} Etter and Villa, *Andean Forests and Farming Systems in part of the Eastern Cordillera, Colombia*. Mountain Research and Development 20:236-245.

Suggested indicators

30. Relevant headline indicator include trends in invasive alien species. Parameters of particular relevance include: (i) number and cost of invasions; (ii) extent and changes in area occupied by invasive alien species.

Overall target 6.2: Management plans in place for major alien species that threaten ecosystems, habitats or species.

Application to mountain ecosystems: Management plans in place for major alien species that threaten mountain ecosystems, habitats or species.

Technical rationale

31. The purpose of this target is to ensure that threats from invasive alien species are effectively managed so as to reduce losses to mountain biological diversity. In view of the particular vulnerability of mountain endemic species to invasive aliens, this target is very relevant to mountain ecosystems. At its seventh meeting, the Conference of the Parties established a target for management plans for invasive alien plants of at least 100 major alien species. Management plans usually require a coordinating structure, and are difficult to develop and implement in an area of small landholdings. Community and regional cooperative efforts would enable some organized plan to control invasive alien species. Such developments as the Weed Management Areas devised by the Center for Invasive Plant Management ^{10/} could serve as a model for the involvement of all stakeholders.

Suggested indicators

32. Relevant headline indicator include trends in invasive alien species. Parameters of particular relevance include: (i) number and cost of invasions; (ii) extent and changes in area occupied by invasive alien species.

GOAL 7: ADDRESS CHALLENGES TO BIODIVERSITY FROM CLIMATE CHANGE, AND POLLUTION

Overall target 7.1: Maintain and enhance resilience of the components of biodiversity to adapt to climate change

Application to mountain ecosystems: Maintain and enhance resilience of the components of mountain diversity to adapt to climate change.

Technical rationale

33. The purpose of this target is to enhance the capacity of mountain ecosystems to adapt to climate change. Biological diversity in mountains is particularly vulnerable to climate change. Distinct zones of vegetation that vary with altitude characterize most mountains. Climate change is expected to bring about range shifts for mountain species. All species are likely to suffer a decrease in available habitat as increasing temperature pushes their bioclimatic zone towards higher elevations, as the more elevated parts of a mountain have a smaller surface area. ^{11/} Changes in precipitation and temperature regimes or patterns may have significant potential effects on the distribution and abundance of plants and animals in mountains. ^{12/} Expansion and connection of protected areas from summits to lowlands and the creation of corridors is a key response to climate change. Therefore conservation/protected areas should encompass complete large-scale gradients from lowland to alpine habitats and include areas rich in

^{10/} See www.weedcenter.org

^{11/} UNEP World Conservation Monitoring Centre: Mountain Watch, 2002.

^{12/} Spehn E.M, Messerli, B., and Koerner C (2002) A global assessment of mountain biodiversity synthesis. In C Koerner, EM Spehn eds Mountain biodiversity. A global assessment, Parthenon, Boca Raton London, New York Washington, pp 325-330.

endemism. The genetic variability of a species will determine its short-term (adaptive capacity) and long-term (evolutionary potential) ability to respond to climate change.

Suggested indicators

34. Relevant headline indicators include connectivity/fragmentation of ecosystems. Parameters of particular relevance include changes in populations of indicator species, and the number of species identified as being vulnerable to negative effects of climate change.

Overall target 7.2: Reduce pollution and its impacts on biodiversity.

Application to mountain ecosystems: Reduce pollution and their impacts on mountain biodiversity.

Technical rationale

35. The purpose of this target is to reduce pollution in mountain ecosystems so as to reduce associated threats to biodiversity. This target requires both elimination of sources of pollution, e.g. untreated sewage dumped into streams, smokestack or transportation emissions, and agricultural chemicals, as well as the clean up of effects of present or former sources of pollution. Pollutants such as nitrogen and sulphur compounds, persistent organic pollutants (POPs), and metals such as mercury are deposited atmospherically in mountain areas. For semi-volatile POPs, volatilization in warmer temperatures and condensation in colder temperatures results in increased deposition at high altitudes. Organochlorines and metals are harmful to fish health and reproductive ability, and bioaccumulation transfers poisons to waterfowl, wildlife and humans. There is a high probability that, under a scenario of increasing global temperatures, glacial melt will lead to unexpectedly high concentrations of POPs in montane waters. Atmospheric deposition of acids, nutrients, organochlorines, and metals affect all components of mountain ecosystems. Deposition of sulphur and nitrogen compounds reduces soil fertility and induces changes in plant species composition, and nutrient cycling. It also affects the ability of plants to withstand stress. Endemic species, often found in oligotrophic habitats, are likely to become suppressed by more vigorous species of wider distribution.

Suggested indicators

36. Relevant headline indicators include water quality in aquatic ecosystems. Parameters of particular relevance include deposition of nitrogen, sulphur, mercury and concentration of POPs in montane waters.

C. Maintain goods and services from biodiversity to support human well-being

Goal 8: Maintain capacity of ecosystems to deliver goods and services and support livelihoods

Overall target 8.1: Capacity of ecosystems to deliver goods and services maintained.

Application to mountain ecosystems: Maintain capacity of mountain ecosystems to deliver goods and services

Technical rationale

37. This target is of particular importance to mountain ecosystems that provide goods and services to wider, more populated regions. One of the most important services of mountain ecosystems is the provision of clean water. Mountain protection and sustainable land use in the world's highlands is therefore key to the future welfare for the nearly half of mankind that depends in one way or the other on the water yielded by mountains. The interdependence of highlands and lowlands (including major metropolitan areas) calls for a lowland-highland contract. Provisioning services of mountain ecosystems include: extractive resources that primarily benefit lowland populations (water for drinking and irrigation, hydropower, timber, etc.) and ecosystem production (agricultural production for local subsistence and for export; medicinal plants and pharmaceuticals; and non-timber forest products). Regulating services of mountain ecosystems include watershed protection and hazard prevention, climate modulation, transport barriers/routes, recreational space, soil fertility, soil as a storage reservoir for water and carbon, etc.

Cultural and supporting services include: spiritual role of mountains, recreation, cultural, and ethnic diversity in mountains. These types of environmental services provided by mountains are often ignored. However, they provide greater economic benefits than extractive resource used in most cases.

Suggested indicators

38. Parameters of particular relevance include Human Development Index of mountain-dependent people.

Overall target 8.2: Biological resources that support sustainable livelihoods, local food security and health care, especially of poor people maintained.

Application to mountain ecosystems: Maintain mountain biological resources that support sustainable livelihoods, local food security and health care, especially of poor people living in mountains.

Technical rationale

39. The purpose of this target is to support sustainable livelihoods, local food security, and health care, especially considering vulnerable mountain people. The global mountain population is estimated to be over 720 million.^{13/} As such, ensuring sustainable livelihoods, increased food security, and reduced vulnerability to exogenous shocks is a particularly important component of biodiversity conservation in mountains. Mountain biological resources have been important in areas of food security and human health. In order to achieve sustainability in mountain areas it is necessary to promote the well being of mountain people by reducing poverty, to prevent deterioration of mountain natural resources and environments and to promote conservation and sustainable use of mountain biological diversity. Activities to reach this target would also include mechanisms, that return revenues generated through the sustainable use of mountain resources to the involved communities, thus providing jobs, health care, and education in line with target 10.2 below.

Suggested indicators

40. Most relevant headline indicators include health and well-being of communities who depend directly on local ecosystem goods and services. Other relevant headline indicators include biodiversity used in food and medicine.

D. Protect traditional knowledge, innovations and practices

Goal 9: Maintain socio-cultural diversity of indigenous and local communities

Overall target 9.1: Protect traditional knowledge, innovations and practices.

Application to mountain ecosystems: Protect traditional knowledge, innovations and practices associated with biological diversity of mountain ecosystems.

Overall target 9.2: Protect the rights of indigenous and local communities over their traditional knowledge, innovations and practices, including their rights to benefit sharing.

Application to mountain ecosystems: Protect the rights of indigenous and local communities over their traditional knowledge, innovations and practices, including their rights to benefit-sharing.

Combined technical rationale for target 9.1 and 9.2

41. The purpose of these targets is to ensure that biodiversity conservation activities take place within a framework of respect for, and acknowledgement of, indigenous knowledge, innovations and practices, as well as equitable sharing of benefits derived from utilizing such knowledge. The livelihood of indigenous mountain communities is often based on systems of traditional ecological knowledge, with

^{13/} Koerner C. Ohsawa, M. et al. 2005 : Mountain Systems. Chapter 24 in: Millennium Ecosystem Assessment, 2005. Current State and Trends: Findings of the Condition and trends Working Group. Ecosystems and human Well-being, vol. 1, Island Press, Washington DC.

associated beliefs, behaviours and land-management practices, expressed in their own language. Deeply dissected mountain terrain provides an important topographic foundation for the generation and maintenance of language diversity in mountains, which is highly endangered. Mountain farming systems involve multiple land-use activities and diversified production systems that adapt/amend the natural resources (e.g., through water harvesting, terracing etc.). This has resulted in diversified and context specific farming systems characterized by positive social system-ecosystem links, and in rare, adapted crop varieties. In nearly all mountain regions, non-timber forest products (NTFP) are an important adjunct to traditional agriculture, often providing the sole or major source of medicine for local communities, as well as supplying key nutritional supplements. Achievement of these targets will also benefit from ongoing work by ad hoc open-ended working groups on Article 8(j) and on access and benefit-sharing under the Convention.

Suggested indicators

42. Relevant headline indicators include the status and trends of linguistic diversity and numbers of speakers of indigenous languages. Parameters of particular relevance include number of benefit sharing agreements in place regarding the use of mountain biological diversity.

E. Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources

Goal 10: Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources.

Overall target 10.1: All transfers of genetic resources are in line with the Convention on Biological Diversity, the International Treaty on Plant Genetic Resources for Food and Agriculture and other applicable agreements.

Application to mountain ecosystems: All transfers of genetic resources derived from mountain ecosystems are in line with the Convention on Biological Diversity, the International Treaty on Plant Genetic Resources for Food and Agriculture and other applicable agreements.

Overall target 10.2: Benefits arising from the commercial and other utilization of genetic resources shared with the countries providing such resources.

Application to mountain ecosystems: Benefits arising from the commercial and other utilization of mountain genetic resources shared with the countries providing such resources.

Combined technical rationale

43. Many mountain biota have potential commercial and medicinal uses. All access to genetic resources derived from mountain biological diversity should be in line with the relevant provisions of the Convention, the Bonn Guidelines on Access to Genetic Resources and the Fair and Equitable Sharing of the Benefits Arising from their Utilization and the International Treaty on Plant Genetic Resources for Food and Agriculture. The International Treaty governs the transfer of plant genetic materials from national and international gene-banks for 35 important crops and covers several crops very important to mountain agriculture. Capacity-building in mountain areas to enhance awareness for access and benefit-sharing issues will be essential. Crucial to the implementation of these targets will be the development of a benefit sharing mechanism ensuring that benefits flow back to the mountain communities involved. Achievement of these targets will also benefit from ongoing work by Ad Hoc Open-ended Working Group on Access and Benefit-Sharing.

Suggested indicators

44. Parameters of particular importance include the number of countries with legislation in place for access and benefit-sharing in line with the Convention and the number of benefit-sharing agreements in place regarding the use of mountain biological diversity.

F. Ensure provision of adequate resources

Goal 11: Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention

Overall target 11.1: New and additional financial resources are transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with Article 20.

Application to mountain ecosystems: New and additional financial resources are transferred to developing country Parties, in accordance with Article 20, to allow for the effective implementation of their commitments under the programme of work on mountain biological diversity.

Technical rationale

45. The purpose of this target is to provide support to developing countries in order to enable them to implement the programme of work on mountain biological diversity.

Suggested indicators

46. Relevant headline indicators include official development assistance provided in support of the Convention.

Overall target 11.2: Technology is transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with its Article 20, paragraph 4.

Application to mountain ecosystems: Technology is transferred to developing country Parties, in accordance with its Article 20, paragraph 4, to allow for the effective implementation of their commitments under the programme of work on mountain biological diversity.

Technical rationale

47. The purpose of this target is to facilitate the implementation of the programme of work on mountain biological diversity by the developing countries through technical capacity-building and technology transfer. Technology transfer to developing countries is currently progressing through bilateral exchanges and international conferences on focused issues such as water, soil, emergency preparedness etc. The clearing house mechanism of the Convention can play an important role to share information on technologies appropriate for implementing the programme of work on mountain biological diversity. The note by the Executive secretary on transfer of technology and technology cooperation prepared for the seventh meeting of the Conference of the Parties (UNEP/CBD/COP/7/16) discusses enabling environments, which can help toward realizing this target.

Suggested indicators

48. Relevant headline indicator includes the number of research and extension projects and programmes under development or under implementation in mountain areas of developing countries, and the amount of environmentally sound technologies transferred to developing country Parties.
