IUCN

Ministero dell'Ambiente e della Tutela del Territorio e del Mare

Mediterranean Mountains in a Changing World

Guidelines for developing action plans

Pedro Regato & Rami Salman

IUCN-Med

Mountain Partnership

Mediterranean Mountains in a Changing World

Guidelines for developing action plans

Pedro Regato & Rami Salman

This publication has been made possible by funding from the Italian Ministry of Environment, Land and Sea.

Published by: IUCN, Gland, Switzerland and Malaga, Spain.

Citation: Regato, Pedro and Salman, Rami (2008). *Mediterranean Mountains in a Changing World: Guidelines for developing action plans*. Malaga, Spain: IUCN Centre for Mediterranean Cooperation. xii+88 pp.

Report collaborators: Alexia Baldascini; Jelena Beronia; Nora Berrahmouni; David Camacho; Jose Antonio Carreira; Sandra Cascalheira; Jorge Castro; Federico Cinquepalmi; Natasa Durakovic; Mohamed El Andalosi; Laetitia Hugot; Israel Marcos; Robert Mavsar; Douglas McGuire; George Mitri; Myriem Noussairi; Marco Pagliani; Gloria Pungetti; Carlos Sánchez; Stefano Spinetti; Corrado Teofili; Patricia Turra; Agueda Villa; Joerg Wyder; Süreyya Ýsfendiyaroðlu; Regino Zamora.

ISBN: 978-2-8317-1058-7

Legal deposit:

Design by: Chadi Abi Faraj

Cover photo by: Pedro Regato

Produced by: IUCN Centre for Mediterranean Cooperation

Printed by: Solprint, Mijas (Malaga), Spain

Available from: IUCN Centre for Mediterranean Cooperation
C/ Marie Curie 35
29590 Campanillas, Malaga, Spain
Tel: +34 952 028430 - Fax: +34 952 028145

www.iucn.org/publications

The text of this book is printed on FSC paper

Index

Foreword

Mediterranean Mountain Partnership

Conservation and sustainable development in mountain chains became a high priority since 2002, the International Year of Mountains, when several governments, international organizations, scientific and research institutions and NGOs significantly raised awareness on the importance of mountains to life and the need to improve mountain environments and the livelihoods of mountain people. Since then, mountains have been gaining an increasingly high profile on agendas at the national, regional and international levels. National committees have been set up and important international mountain cooperation frameworks have been strengthened. The Mountain Partnership was launched at the World Summit on Sustainable Development (Johannesburg, South Africa, September 2002), and a number of large-scale mountain conventions and initiatives have followed since.

The 2004 IUCN World Conservation Congress (Bangkok, Thailand) considered the outstanding biodiversity and cultural values of Mediterranean mountains, and the unique role that these systems play in ensuring the maintenance of vital resources and services to the societies and economies bordering the Mediterranean basin. The resolution 3.039 "*The Mediterranean Mountain Partnership*", approved in Bangkok, called on national, regional and local institutions to promote national and - where appropriate - trans-national plans of action, for each of the major mountain ranges of the Mediterranean basin for the conservation and improved status of their richness in biological, landscape and cultural diversity.

The Italian Ministry of Environment, Land and Sea strongly believe and sustain several initiatives on mountain issues, at national level with projects such as "Apennines Park of Europe", but also providing support to international mountain programmes like the CBD programme of work on Mountain Biodiversity. Amongst those efforts is the financial support granted to the implementation of the Bangkok resolution and to the international workshop "Mediterranean mountains in a changing world", held in Malaga in December 2007.

This resource book, moving from the workshop, gathers the outputs of the rich debate that emerged from case studies and lectures from representative examples of practical experiences in Mediterranean mountains conservation and management, also in front of the challenges of the global climate change that the countries of the region will face in the next future.

I hope that this resource book will contribute to promote further reflection and creative thinking for the development of future projects and programmes over the next years, to enhance conservation and sustainable development in mountain areas.

Aldo Cosentino
Director General for Nature Protection
of the Italian Ministry for Environment Land and Sea
and President of the Italian IUCN National Committee

Preface

At the World Conservation Congress held in Bangkok in November 2004, IUCN members approved the resolution 3.039 “The Mediterranean Mountains Partnership”, calling all concerned national, regional and local institutions to develop action plans for each of the major mountain ranges in the region, with the aim of achieving the conservation of their biological, landscape and cultural diversity, and boosting sustainable development. IUCN members expressed the wish that these action plans should be recognised as a political and institutional basis for cooperation at national and trans-national levels.

The IUCN Centre for Mediterranean Cooperation (IUCN-Med), with the support of the Italian Ministry of Environment, Land and Sea, took the task to facilitate the implementation of resolution 3.039, and initiated a consultation process with regional organisations and experts concerned with conservation and development issues in Mediterranean mountain systems. The final purpose of this exercise was to agree on a set of strategic guidelines for the development of Mediterranean Mountains Action Plans.

IUCN-Med brought together member organisations and experts in a regional workshop which took place in Malaga (Spain) on 10-12 December 2007, coinciding with the UN designated “International Mountain Day” on 11th December. During the workshop, experts from regional NGOs, research institutions, governmental and intergovernmental organizations, mountain protected areas managers, and the private sector, analysed successful practices and case studies, and discussed priority lines of work for Mediterranean mountains. To further share those experiences, part of the case studies analysed were summarised and included as boxes in this publication.

This document, which IUCN-Med is releasing as an outcome of that workshop, includes a set of strategic guidelines and key conservation and development issues grouped into eight priority themes, as a starting point towards the elaboration of action plans for the Mediterranean mountain chains.

Pedro Regato and Rami Salman

Abbreviations

AEM	European Mountain Association
AFDC	Association for Forests, Development and Conservation
APE	Apennines Park of Europe
ARC	Alliance of Religion and Conservation
BCE	Before the Current Era
BFSD	Balkan Foundation for Sustainable Development
BR	Biosphere Reserve
CAP	European Union Common Agriculture Policy
CARBOEUROPE	Assessment of the European Terrestrial Carbon Balance
CARBOMONT	Effects of land-use changes on sources, sinks and fluxes of carbon in European mountain areas
CATCHMOD	Catchment Modelling
CBD	Convention on Biological Diversity
CE	Current Era
CEDER	Rural Development Centre
CIFOR	Centre for International Forest Research
COP	Conference of Parties
CSVPA	IUCN Task Force on Cultural and Spiritual Values of Protected Areas
DAI	Dinaric Arc Initiative
DG	Directorate General
EAGGF	European Agriculture Guidance and Guarantee Fund
EAFRD	European Agriculture Fund for Rural Development
EFIMED	Mediterranean Office of the European Forest Institute
ENP	European Neighbourhood Policy
EENPI	European Neighbourhood and Partnership Instrument
EOMF	European Observatory on Mountain Forests
ESF	European Social Fund
ERDF	European Rural Development Fund
EU	European Union
EUFIRELAB	Euro-Mediterranean wildland fire laboratory
EURAC	European Academy
EUROMONT	European Mountain Areas
FAO	Food and Agriculture Organization of the United Nations
FECOF	European Federation of Local Forest Communities
FLR	Forest Landscape Restoration
FRIS	Forest Restoration Information System
FSC	Forest Stewardship Council
GEF	Global Environmental Facility

GLOCHAMORE	Global Change in Mountain Regions
HELP	Hydrology for the Environment, Life and Policy
IAGM	Inter-Agency Group on Mountains
IAM	Mediterranean Agronomic Institute
INTERACT	INTERREG Animation Cooperation and Transfer
INTERREG	Inter-Regional Cooperation between EU Countries
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
IUCN-Med	IUCN Centre for Mediterranean Cooperation
IUFRO	International Union of Forest Research Organizations
LADAMER	Land Degradation Assessment in Mediterranean Europe
LAG	Local Action Group
LEADER	Links between Development Actions and Rural Economy
LFA	Less Favourable Area
MCPFE	Ministerial Conference on the Protection of Forests in Europe
MEDALUS	Mediterranean Desertification and Land Use
MENA	Middle East and North Africa
MoU	Memorandum of Understanding
NATO	North Atlantic Treaty Organization
NGO	Non Governmental Organization
NTFP	Non Timber Forest Products
OSCE	Organization for Security and Cooperation in Europe
PES	Payments for Environmental Services
REACTION	Restoration Actions to Combat Desertification in the Northern Mediterranean
REC	Regional Environmental Centre for Central and Eastern Europe
SENPA	Spanish National Agency of Agrarian Products
SNV	Netherlands Development Organization
TNC	The Nature Conservancy
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UN/ECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO BRESCE	UNESCO Regional Bureau for Science and Culture in Europe
UNESCO MAB	Man and Biosphere
USLE	Universal Soil Loss Equation
WCED	World Commission on Environment and Development
WCMC	The World Conservation Monitoring Centre
WCPA	IUCN World Commission on Protected Areas
WFD	European Union Water Framework Directive
WMO	World Meteorological Organization
WWF	World Wide Fund For Nature

List of Boxes

Introduction: The Mountain Context

The transition between lowland terrain and mountain summits is gradual; therefore it is necessary to define criteria for establishing the lower limits of mountains. There are several definitions of mountains based on various criteria, such as topography, climate, vegetation, constraints on agriculture, or length of growing seasons (Mountain Agenda, 2002). UNEP (2002) based its definition on topographic features, such as slope, ruggedness of the terrain and absolute altitude, establishing a lower limit of 300 metres. According to this definition, mountain regions cover about 27% of the world's land surface[1], mostly in the Northern Hemisphere.

Except for the flat land surface extending from the Gulf of Gabes to Sinai (interrupted in between by the Cyrenaica highlands), mountains constitute the backbone of the whole Mediterranean region. It is often hard to draw the limit between mountains and lowlands, as where steep mountain slopes plunge sharply into the sea. This is the case on several mountainous islands (Corsica, Dalmatian Islands) and in long stretches of continental coastline. According to the UNEP definition, Mediterranean mountains cover some 1.7 million km^2. Seven Mediterranean countries are among the top 20 mountainous countries in the world, and half of the countries in the region have at least 50% of their land classified as mountain areas[2]. These percentages can change, as each country may have its own criteria for defining mountainous territories, which may differ from other international criteria.

In a broader sense, mountains form a major component of terrestrial dynamism. Large mountain ranges as much as isolated peaks are highly exposed to environmental risk and degradation, mainly due to severe climate conditions and gravitational denudation processes. Tectonism and climate are the primary external processes governing mountain landscape evolution. Tectonic uplift creates elevated terrain and provides increased potential energy to the agents of erosion, such as fluvial systems (Quigley *et al*., 2007), which are the source of most of the sediments and waters shaping and feeding lowland and coastal areas. Climate controls the spatial and temporal distribution of erosive agents (rainfall, snow, and stream flow) and the vegetative cover that protects the slopes from erosion. If this dynamic approach is adopted, mountain systems can be seen as the area of influence where gravitational processes take place within watersheds.

Mountains play a key role in the water cycle, influencing climate and precipitation regimes and modulating the runoff regime. Mountain vegetation and soils store rainfall water and regulate the gradual flow of water and sediments downstream, which fertilises lowland plains, replaces coastal sediments, and recharges groundwater aquifers in lowland areas, where the demand from population centres, agriculture and industry is high. Healthy mountain systems are therefore vital not only for their inhabitants—humans and wildlife—but also for the prevention and mitigation of risks from natural hazards, such as landslides and

Mediterranean countries	% of mountainous area within a country				
	0-10	10-25	25-50	50-75	75-100
Andorra, Bosnia & Herzegovina, Italy, Lebanon, Macedonia, Montenegro					
Albania, Greece, Morocco, Serbia, Slovenia, Turkey, Palestinian Territories					
Croatia, Cyprus, Israel, Portugal, Spain					
Algeria, France, Jordan, Syria, Tunisia					
Egypt, Libya, Malta					

Figure 1. Percentage of mountainous land within Mediterranean Countries (Data from Fé d'Ostiani, 2004 and UNEP, 2002).

[1] This figure comes from UNEP (2002).
[2] Based on UNEP (2002).

avalanches, for the maintenance of ecological processes, and for the provision of goods and services to lowland users.

The sharp altitudinal gradients of temperature and precipitation lead to the appearance of different climatic zones running along mountain elevations. This explains why habitat diversity and species richness in mountains are generally higher than in lowlands. Moreover, within mountain regions species endemism often increases with altitude, partly due to the isolation of populations and the activation of speciation processes over geological time. Thirty-two percent of all protected areas are located in mountain regions, providing habitat for rare, relict and endangered flora and fauna (UNEP, 2002), as well as corridors for migration and dispersal[3]. Moreover, 40% of the WWF Global 200 Ecoregions are mountain areas.

This outstanding ecological diversity in mountain areas is also reflected in high cultural diversity and varied land-use practices, resulting from long adaptation to the specific environmental conditions and resources. For this reason, mountains are also rich reservoirs of traditional knowledge, and cultural and spiritual values.

The socio-environmental history of Mediterranean mountains seems to be a succession of more or less

Box 1. Biodiversity in Mediterranean mountains

The Mediterranean region is the second most important *Biodiversity Hotspot* in the world in terms of endemic plant species (13,000 species). The significant number of distinct elevation belts, the high geological diversity, the sharp latitudinal gradients, the broad oceanic-continental gradients from the coastal areas to the inner mountain regions, and the frequent isolation of mountains all contribute to the high diversity of the Mediterranean mountain flora. Almost all centres of plant diversity and endemism in the Mediterranean region are continental and island high-mountain areas. Rates of endemism of above 20% occur in the Betic–Rifan complex on either side of the Strait of Gibraltar, in the Middle Atlas and High Atlas in Morocco, in the Iberian *Sistema Central*, on the islands of Corsica, Sardinia and Sicily, in the Pindos Mountains of Greece, in Crete, Cyprus, the southern mountains of Turkey (Taurus and Amanus) and the Lebanon mountain range (Medail & Quezel, 1999). According to Medail and Quezel, Mediterranean mountain pastures are highly diverse and rich in endemic plants. In the high summit pastures of Crete, for instance, 20–30% of the plants are endemic, while the rate is 10–20% in the Taurus Mountains of Turkey.

Mediterranean mountains are home to many endangered animal species, such as felines: the few viable populations of the Iberian lynx (*Lynx pardina*) are found in the mountains of south-western Spain (Sierra Morena and Montes de Toledo); the few leopards of the Middle Eastern subspecies (*Panthera pardus jarvisi*) survive in the deserts of the Judean Hills and the Negev (Israel) and in Sinai (Egypt); the Anatolian Leopard (*Panthera pardus tulliana*) persists in the western Taurus; while the last remaining specimens of the Atlas leopard (*Panthera pardus panthera*) are confined to the Atlas mountains in Morocco. Mediterranean mountains are also home to several endemic species and subspecies of large herbivores, most of which are rare or endangered: the mouflon (*Ovis orientalis*), ancestor of the domestic sheep, is represented by a number of subspecies that live in some of the most pristine forest areas of Sardinia, Corsica, Cyprus and Turkey. High mountains and rocky outcrops are home to the Nubian ibex (Egypt, Israel, Jordan), the Spanish ibex (several Spanish sierras), the Bezoar ibex (Taurus and Anti-Taurus ranges in Turkey), the Abruzzo chamois (central Italy), and the Eastern Anatolian chamois amongst others, which spend the winters in wooded areas at lower elevations.

Insect endemism is also high in Mediterranean mountains—especially in the Kabyle, Atlas, Rif, Central Iberian mountains, Pyrenees, Dinaric Alps, Pindos and Taurus—and accounts for 15–20% of the local insect fauna, a figure that may rise to 90% in some caves (Blondel & Aronson, 1999). Butterfly species richness is particularly high in the southern European mountains, with peak diversity values in the Southern Alps. Peaks in species richness vary among families of butterflies[4].

[3] Bhutan is a good example, with 9 mountainous protected areas covering 26% of its land, and a further 9% of land assigned to corridors linking protected areas, where land uses are compatible with conservation objectives.

[4] High numbers of *Pieridae* and *Hesperiidae* species occur in the Atlas Mountains; peak numbers of *Papilionidae* and *Lycaenidae* species are found in the Balkan and Iberian Mountains.

prolonged pulses of rapid land-cover changes and exploitation exceeding their carrying capacity, followed by periods of relative calm, during which the natural vegetation recovered, although the preceding state was seldom fully re-established because of soil erosion and productivity and species loss (McNeill, 1992). In parallel, Mediterranean mountain people have also experienced both expansions and contractions, in most cases with negative consequences for the environment. According to McNeill, nowhere in the Mediterranean did mountain peasants and herders practice sustainable economies in the long term except at extremely low population densities.

Historically, Mediterranean mountain forests have been crucial for the development of all civilizations and countries in the region. Most of the prehistoric populations of the Near East originated in Mediterranean mountain areas with very high plant and animal diversity, year-round water, shelter and suitable conditions for survival. In the eastern Mediterranean, which represents one of the major centres of domestication, early mountain farmer-herders evolved pastoral and cropping patterns leading to the domestication of four major livestock species—sheep, goats, cattle and swine—and many important crops, including barley and wheat (Harris, 2006). The North African mountains were also important areas of domestication for cattle and donkeys.

About 27% of the Montane belt[5] is still covered by forests, which represent the main forest reservoirs in mountainous countries where land conversion for agriculture, pasture and urbanization has significantly denuded lowland areas (Körner & Ohsawa, 2005). Much potential forest land in mountain areas has been converted to agriculture (slope terraces and valley crops) and pasture, especially for summer grazing. This also explains why the natural upper tree line in many mountains is now lower.

Box 2. The Mediterranean mountain forests through history

The well-known cedar forests of Mount Lebanon gave rise to the first substantial timber trade in the region: Lebanese cedars not only made Phoenicia a dominant sea power, but in earlier times they supplied timber for the Egyptian and Mesopotamian civilizations. The control of this mountain range has historically been disputed by several countries (Thirgood, 1981).

The use of Mediterranean mountain forest resources for different purposes has caused intense deforestation in several regions. For example, the mines of Lavrio supplied all the great Greek cultures of the Aegean between 3,000 BCE and the 4th century BCE, resulting in the complete deforestation of the Attica mountains[6]. The Venetian Senate forbade the export of cypress timber from the mountains of Crete in the 15th century CE, showing the alarm caused at the time by the disappearance of these overexploited mountain forests (Baumann, 1993). In the 16th century, Leo Africanus (1550) visited the Rif coast and reported that the flourishing shipbuilding industry of the previous century had ceased due to the scarcity of accessible, good-quality cedar trees in those mountains. At the end of the 19th century, the Taurus mountain forests provided the considerable volume of timber needed for the construction of the Suez Canal. Lead mining in the Sierra de Gador in southern Spain denuded its slopes in just a few decades to meet the First World War demand for this mineral (Mcneill, 1992).

Nevertheless, sustainable management practices have also been adopted since ancient times to prevent forest resource loss and to sustainably use mountain resources. One such example is the rotation coppice systems put in place by the Etruscans to sustain their powerful metallurgy-based economy in the 9th century BCE. Another is the historical transhumant management systems (*dehesas* or *montados* in the Iberian Peninsula) which take advantage of upland–lowland environmental flows and seasonal resources in a very efficient way. They have resulted in cultural landscapes with unique biodiversity and cultural and socio-economic values.

[5] In a simplified way, the *Millennium Ecosystem Assessment* differentiates three altitudinal vegetation zones: *Montane belt* which extends from the lower mountain limit to the upper thermal limit of forests; *Alpine belt*, which represents the treeless region between the natural climatic upper forest limit and the snow line; *Nival belt*, above the snowline, which is defined as the lowest elevation where snow is commonly present all year around.

[6] Lavrio World Heritage: http://whc.unesco.org/en/tentativelists/1789

In many parts of the world, mountains have been strategic natural reservoirs for flourishing lowland economies. In fact, half of humankind still depends on mountain resources, especially water, forest products, livestock, and minerals. Yet mountain inhabitants, who make up about 22% of the world's total population[7], are often perceived as economically backward and culturally inferior (Körner & Ohsawa, 2005).

The extraction of mountain resources hardly benefits them, and this loss of revenue often contributes to a further marginalisation of local communities. Many mountain communities live in poverty and are considered highly vulnerable to food security.

All in all, the imbalance between upland and lowland interactions and flows is high:

- Although mountains are centres of biodiversity and "castles of water", environmental constraints (steep slopes; poor, shallow soils; extreme climate conditions) are a major obstacle to the welfare of mountain communities.

- The high demand for mountain resources by lowland dwellers, and lowland-focused policies ignoring the vulnerability and disadvantaged character of mountains, often exacerbate human pressures and environmental disturbances in mountain ecosystems.

These factors have led to a growing concern for developing comprehensive national policies and strategies for the sustainable development and protection of mountain systems and their inhabitants.

[7] This number also includes nearby areas (i.e. Mexico city or Santiago de Chile city).

Strategic Guidelines for Developing Mediterranean Mountains Action Plans

Although not always specifically mentioned in their strategies, Mediterranean mountains are an essential part of the regional conservation priorities for most national and international conservation organizations dealing with terrestrial ecosystems in the region. This is especially evident in view of the fact that:

- most Mediterranean biodiversity hotspots are concentrated in mountain areas;
- Mediterranean mountain biodiversity is closely linked to traditional cultural management systems for mountain resources;
- Mediterranean mountains provide basic goods and services for the regional human population as a whole, with a critical role in scarce resources like water supply;
- the Mediterranean mountains are among the most vulnerable areas in the world to climate change.

According to the classification of mountains proposed by Pratt & Shilling (2002)[8], the Mediterranean mountain chains, especially those identified as biodiversity hotspots, should be considered of 'low to medium economic export value and high *in-situ* environmental services value'. The primary goal in this type of mountain chain is to preserve/restore resources *in situ* and manage them in a sustainable manner. These resources are:

- very high biodiversity;
- provision of important environmental services: e.g. downstream water supply, carbon sequestration, aesthetic/recreational/emotional values;
- unique cultural values linked to traditional management practices and beliefs.

The region's conservation organizations should focus their work on those mountain chains representing biodiversity hotspots. Several efforts have been made (and are still ongoing) by conservation organizations and research institutions to identify and map the Mediterranean areas where most of the region's biodiversity is concentrated, and in all cases the main mountain chains have been seen as high priority areas.

Conservation and sustainable development should be planned and implemented with a broader and more dynamic outlook, in accordance with the ecosystem approach adopted by the CBD in 2000 as the primary framework for action under the Convention, and endorsed by the World Summit on Sustainable Development (2002):

- Large mountain chains are functional landscape units which need to maintain their ecological and evolutionary processes, their species populations' requirements, and their ecosystems' resilience against major disturbances.
- Balanced upland–lowland flows and equitable opportunities for development and conservation are required over such large territories, which may spread from the top of the mountain chain to the coast, and over complete watersheds.
- Cooperation with the sharing of responsibilities and efforts at different levels (regional, transcontinental – the key level for species migration needs – cross-border, and between regions within a country) is needed to secure conservation and sustainable development in large mountain chains

Sustainable development (Box 3) is a term used in relation to mountains in the title of Chapter 13 of Agenda 21. However, it has never been specifically defined in the mountain context, in spite of many documents and meetings identifying it as an objective (Price & Messerli, 2002). Considering the very different characteristics of world mountain regions, even within the Mediterranean Region, Price & Kim (1999) propose to make specific sustainable mountain development definitions on a 'regional' basis, recognising the specificities of the interactions between very different human cultures, ecological conditions and lowland–highland flows in the world's mountain systems.

[8] This classification is based on the economic value of mountain resources, whether export commodities or *in-situ* services. To facilitate the analysis, these authors propose a simple matrix to illustrate different situations of resource availability for a given mountain: (a) richness in extractive export resources is measured along the vertical axis, and (b) richness in *in-situ* resource values is measured along the horizontal axis.

The objective of promoting sustainability is not to stop change in mountains, but to manage mountain resources in a way that provides livelihoods for their inhabitants as well as goods and services for lowland people, and to do so in ways that protect the long-term capacity of mountains to provide such goods and services (Pratt & Shilling, 2002).

In view of the huge challenges that mountain regions are facing under the ongoing trend of global change, it is urgent to apply innovative approaches that incorporate more holistic methods to implement mountain conservation and development at large spatial and temporal scales. If action plans for Mediterranean mountain chains are to be pursued according to the Ecosystem Approach principles (Box 4) and sustainable development requirements, specific guidelines will need to be developed to address priority mountain issues in the Mediterranean context. This chapter organizes priority conservation and development issues for Mediterranean mountains around a number of themes, proposes a set of preliminary guidelines to address them, and suggests a number of opportunities relating to ongoing initiatives that may represent good examples to be replicated or adapted elsewhere, or which may be expanded as valid frameworks for regional cooperation on mountains.

Box 3. Sustainable development

Sustainable development is a much-used concept introduced in the World Conservation Strategy[9] and still being debated by a wide range of authors and organizations. The three major international organizations working in this field agree on the following definition: 'development which improves the quality of life, within the carrying capacity of the earth's life support system'.

According to the World Commission on Environment and Development (WCED) report (1987), the pursuit of sustainable development requires:

- a political system that secures effective citizen participation in decision-making;
- an economic system that is able to generate surpluses and technical knowledge on a self-reliant and sustained basis;
- a social system that provides for solutions for the tensions arising from disharmonious development;
- a production system that respects the obligation to preserve the ecological base for development;
- a technological system that can search continuously for new solutions;
- an international system that fosters sustainable patterns of trade and finance;
- an administrative system that is flexible and has the capacity for self-correction.

[9] Published by IUCN, UNEP, WWF and UNESCO in 1980

Box 4. Large-scale conservation

The ***Ecosystem approach*** was adopted by the CBD in 2000 as the primary framework for action under the Convention, and it was endorsed by the World Summit on Sustainable Development (2002). It aims to manage ecosystems, based on the multiple functions that they perform and the multiple uses that are made of these functions (IUCN). The 12 principles of the Ecosystem Approach can be summarised within three main themes:

- It operates at large or 'landscape' scales: conservation should consider an ecosystem's structure, functions and dynamics; ecosystem managers should set long-term objectives while considering the effects on adjacent and other ecosystems.

- It addresses the root causes of biodiversity loss: ecosystem managers should address the economic drivers that adversely affect biodiversity, align incentives to promote an appropriate balance between and integration of conservation and sustainable use of biodiversity, and internalise costs and benefits.

- It involves the full range of relevant actors: management should be decentralized to the lowest level, and take societal choices and local knowledge into account.

Ecoregion conservation is a broad-scale approach to develop and implement a comprehensive strategy that conserves the genes, species, communities, ecosystems and landscape diversity, and the ecological aspects of biodiversity in outstanding and critically endangered ecoregions. WWF has defined a set of simple features of ecoregion conservation:

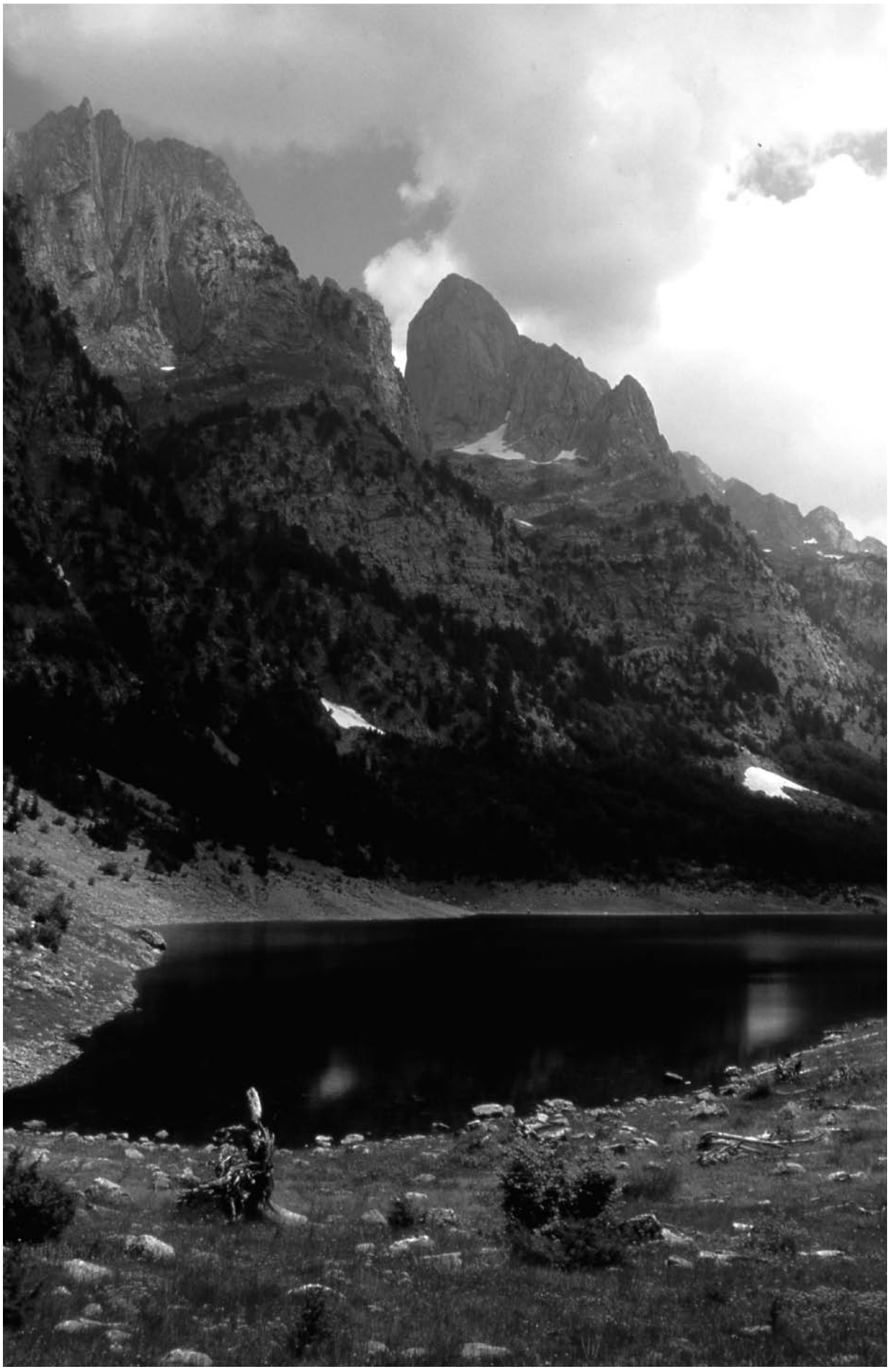
- The fundamental goal is to conserve the full range of an ecoregion's biodiversity, at a scale that will ensure its integrity and long-term survival.

- The needs of human development must be reconciled with conservation imperatives: ecoregional scales of planning and action require a thorough understanding of the interactions between social, economic and ecological factors.

- Emphasis must be placed on collaboration and developing partnerships among all individuals and institutions concerned, so as to achieve the best input and broadest commitment to both programme design and implementation, and to ensure that scarce resources are efficiently used.

- Adapting through learning: actions and strategies are continuously reshaped on the basis of previous lessons and experience.

Ecoregion conservation is implemented in a number of functional landscapes within the ecoregion, where the ecoregion's biodiversity is well represented and ecological processes and species populations' needs are secured. A ***functional landscape*** integrates a number of core areas for protection within a larger territorial matrix where socio-economic development is reconciled with conservation.



Theme 1

The Ecosystem/Ecoregional Approach in Mediterranean mountains

Viable populations of mountain flora and fauna species and sustainable human activities require healthy environmental conditions to be maintained over large territorial units or 'functional landscapes'. Both people and wildlife distribute their use of landscape elements differentially in space and time—transhumance or the traditional seasonal movement of shepherds and livestock between lowlands and highlands is a good example of wise use of landscape heterogeneity and environmental gradients. To be socially as well as ecologically sustainable, land use and environmental protection must be well integrated across the landscape, not only to preserve biodiversity but also to allow people to make a living.

IUCN is currently promoting the application of the Ecosystem Approach by applying and testing it in the field in four areas[10] outside the Mediterranean region. WWF and TNC are also implementing a number of projects worldwide to adapt and test a similar landscape-scale approach in key globally outstanding and critically endangered ecoregions.

Ecoregion conservation initiatives covering large mountain chains have been launched by WWF in the Alps, the Carpathians and the Apennines (Figures 2–3)[11]. A similar ecoregion conservation initiative called DAI[12] has recently been jointly launched by WWF, UNESCO–BRESCE, UNDP, UNEP, IUCN, the Council of Europe, FAO, Euronatur and SNV, covering the Dinaric Alps and Adriatic coast from the Italian border with Slovenia to northern Albania. Through these initiatives, broad frameworks of collaboration involving NGOs, government representatives, scientific and academic institutions, development agencies and organizations, and international donors and consultants have been created with the aim of developing long-term common visions for the conservation and sustainable development of the entire mountain chains and supporting coordinated efforts for the implementation of ecoregion conservation action plans, adding value to the ongoing programmes and activities.

Similarly, the Italian national NGO Legambiente, in partnership with a large set of conservation and development institutions from the public and private sectors, has launched an initiative called 'APE—Appennino Parco d'Europa' aiming at integrating sectoral policies dealing with nature conservation and sustainable development throughout the Apennine mountain chain, which includes more than 50% of Italy's protected land area (Figure 4). This initiative recognises the Apennines as a strategic resource, and is supporting coordinated actions by the protected areas network, the local development organizations, and the central and regional administrations, to ensure sustainable development over the whole mountain chain both inside and outside protected areas. The strategic components of APE are: improving services to secure adequate living standards and economic opportunities for mountain communities; supporting sustainable agriculture and biodiversity links; developing and restoring ecological corridors to provide connectivity among protected areas; and promoting nature trails, and socio-cultural itineraries along the Apennine chain.

WWF Mediterranean Programme Office (MedPO) has launched a *functional landscapes* conservation and development programme, known as 'Mediterranean Green Belts against Desertification', involving five Mediterranean mountain systems (the Southern Portugal Mountains on the border between Alentejo and Algarve—Figure 5; the Middle Atlas Mountains in Morocco; the Kroumerie–Mogod Mountains in north-western Tunisia; the Velebit Mountains in Croatia; and the Durmitor–Prokletije Mountain Belt in Montenegro—Figure 6), where the ecosystem approach is being applied.

Participatory design and landscape planning following *Ecoregion conservation* principles has proved to be a very valuable tool for integrating nature conservation and socio-economic objectives over large areas. It allows all stakeholders to take part in the identification of constraints and opportunities for adapting spatial

[10] Bocas del Toro, Panama; Maradi-Kano, border region between Southern Niger and Northern Nigeria; Tram Chim, Mekong delta; Papua Province, Indonesia.

[11] Further information about these Ecoregion Conservation Initiatives may be obtained from the following websites: Carpathian Ecoregion Initiative (http://www.carpates.org); the Alps Ecoregion Conservation Action Plan (http://www.thepep.org/ClearingHouse/docfiles/ecoregionconservationplanalps.pdf); the Central Mediterranean Ecoregion, including the Apennine Chain (http://www.wwf.it/mediterraneo).

[12] DAI: Dinaric Arc Initiative.

planning policies to natural rather than political boundaries and to ecological landscape functions. In the case of the Southern Portugal Green Belt, a participatory landscape planning process is supporting economically viable rural development options which help increase landscape resilience against major disturbances, like large-scale fires, and restore nature.

The IUCN World Commission on Protected Areas has developed guidelines for planning and managing mountain protected areas through a bioregional approach, in which the landscape scale (i.e. adequate shape and size covering upland–lowland links, watersheds, ecological processes, and large territories for securing viable species population needs) is recommended, as well as a zoning system (buffer zones) to properly integrate protection objectives into the larger spatial planning and management of the region. Moreover, the specific mountain human context is highlighted as a key component of mountain protection. Collaboration and communication (including capacity building, empowerment,

Box 5. Ecoregion conservation in Northern Montenegro: the Durmitor - Tara - Prokletije mountain landscape

N. Durakovic and M. Pagliani

This initiative carried out by the NGO Green Home and WWF Mediterranean Programme Office applies the ecosystem approach—or, in WWF's own language, the "ecoregional conservation" approach—to an extensive mountain landscape of approx. 5000 square kilometres. The 'Northern Montenegro Green Belt' includes a large strip of northern Montenegro, spanning from the Durmitor Massif on the border with Bosnia, through the upper Tara river basin and the Bielasica mountains, to the Prokletije Mountains on the border with Albania and Kosovo.

The long term goal of the initiative is the creation of a representative system of conservation areas (core protected areas, buffers, corridors) across the landscape, and the promotion of the sustainable use of natural resources (water, timber, NTFP, scenic landscapes etc.) by ensuring the conservation of biodiversity and ecological processes whilst supporting the livelihoods and welfare of the local communities.

In the first phase of the project, a full biodiversity and socio-economic assessment of the landscape was undertaken. The study involved field visits, interviews and meetings with local experts, the hiring of independent consultants, and data gathering. In addition, a specific assessment of the current economic value of the Tara River was carried out. Another assessment, focusing on the capacity-building needs of the main actors and stakeholders in the region, was completed by WWF experts.

In the early stages of the project, WWF and Green Home also started addressing priority conservation needs resulting from the preliminary assessments, by initiating small field demonstration activities, in partnership with local non-government organizations. These small, but concrete field actions set the basis for the development of larger conservation initiatives in key portions of the landscape, and strengthened the operational capacity of WWF's and GH's grassroots partners.

Eventually, the initiative entered its following phase, aimed at developing a full project portfolio addressing the main conservation and development needs identified through the assessment. This was again done in a participatory way, through workshops open to all project partners and stakeholders in the landscape. As an output of this process, twelve top priority projects were eventually identified, which are now in the process of being developed for submission to potential donors. Meanwhile, the project team has engaged the Montenegrin authorities and the international donor community in a dialogue, with the objective of building strategic partnerships for the implementation of the new project portfolio, and for securing an adequate policy and institutional framework that can support the achievement of the long-term conservation objectives in northern Montenegro.

The Northern Montenegro Green Belt Programme follows a methodology previously applied by WWF in other mountain landscapes of the Mediterranean region, in countries like Croatia, Portugal, Tunisia, and Morocco, and it builds on the experience gathered in those areas.

Extracted from a case study of the workshop "Mediterranean Mountains in a Changing World"

institutional development, and governance) are mentioned as basic parts of mountain protected area planning and management, together with economic incentives building on the cultural features of mountain communities and on the goods and services that mountain ecosystems provide for society as a whole. Since mountain ranges often form the boundaries between countries and between regions within countries, transboundary thinking and cooperation should prevail in mountain protected areas (Hamilton & McMillan, 2004).

Biosphere Reserves (BRs) may constitute a concrete application of the ecosystem or landscape approach advocated by the Convention on Biological Diversity and promoted by the largest international nature conservation organizations (IUCN, WWF and TNC). Some BRs are planned and managed as coherent large ecological units, sometimes across country boundaries. They may contain several legally protected areas (core zones) within their territory, surrounded by large buffer areas where 'soft' management practices help provide connectivity among core zones. Recently UNESCO has decided to encourage the establishment of transboundary BRs as a means of dealing with ecological processes and species populations that cross national boundaries and of strengthening collaboration between neighbouring states. The following list includes Mediterranean mountain BRs larger than 150,000 ha, which may constitute *functional landscape* systems:

- Southern Morocco Oasis BR: 7,185,371 ha, extending from the lowland desert oases to the High Atlas summits;
- Inter-continental Mediterranean BR: 894,135 ha, including a network of protected mountain areas in southern Andalusia and in the northern Morocco Rif chain;
- Dehesas of Sierra Morena BR: 424,400 ha of extensive and very unique sylvo-pastoral landscapes in the western mountains of Andalusia;
- Velebit BR: 200,000 ha of a mountain range parallel to the Adriatic coast in Croatia;
- Cazorla/Segura BR: 190,000 ha (Andalusia, Spain);
- Cilento & Vallo di Diano BR: 181,000 ha of coastal mountains south of Naples (Italy);
- Luberon BR: 179,600 ha in southern France;
- Sierra Nevada BR: 171,646 ha of Iberia's highest mountain range (Andalusia, Spain).

Guidelines

1.1. In accordance with CBD principles, large-scale conservation planning following the *Ecosystem Approach* should be implemented in the Mediterranean mountain chains. Conservation and development organizations acting in the region should urgently join forces to lead such planning in priority *functional mountain systems* or landscapes within the Mediterranean region—that is, mountain chains classified as biodiversity hotspots. Special attention should be paid to 'mountain-islands', where terrestrial, freshwater and marine issues are strongly interdependent and which the Intergovernmental Panel on Climate Change (IPCC) predicts will be strongly affected by climate change.

1.2. The implementation of the *Ecosystem Approach* to support large-scale conservation and sustainable development in Mediterranean mountain chains requires that it be adopted as a cross-cutting approach by the various Multilateral Environmental Agreements (MEAs) other than the CBD[13], so that environmental and socio-economic issues may be holistically addressed.

1.3. The development of ecosystem-based initiatives will provide long-term common visions to integrate conservation and sustainable development, at a scale that can ensure the integrity and the long-term survival of nature and societies. The *Ecosystem Approach* is based on a number of principles which can be summarised as follows:

- It provides global assessments and improved knowledge of the ecosystem's structure, functions and dynamics; its biodiversity values and conservation status; and its resilience against natural and human-induced disturbances.

[13] These include the UN Convention to Combat Desertification; the UN Convention on Climate Change; and the Convention on the Protection and Use of Trans-boundary Watercourses and International Lakes (The UN/ECE Water Convention).

- It provides a good understanding of the ecosystem's cultural value, as well as the value of the goods and services it supplies, and it identifies socio-economic opportunities for in-situ conservation of biodiversity, environmental services and outstanding cultural values.

- It addresses the root causes of biodiversity loss and degradation, the global socio-economic and policy drivers of such loss, and the current and future consequences for the ecosystem. This is especially relevant in the Mediterranean region, where the growing vulnerability and environmental constraints (i.e. water shortage) driven by global changes are already generating socio-political conflicts among countries and/or regions sharing mountain borders and/or mountain watersheds.

- It engages a full range of stakeholders acting in and/or affecting the mountains, with mechanisms that allow for: 1) active participation and collaboration at all levels; 2) decentralization of management to the lowest effective level; 3) consideration of societal choices and knowledge; and 4) good governance systems.

- It provides an *adaptive management* monitoring system for the whole mountain chains, meaning that: 1) actions and strategies can be reshaped on the basis of previous lessons and experience; 2) monitoring know-how is accessible to a wide range of stakeholders; 3) the habit of observing is developed through permanent 'learning by doing' actions; 4) simple sets of indicators are adapted by all social groups concerned, who may play a relevant role in monitoring global change impacts on biodiversity.

1.4. The implementation of large-scale conservation and sustainable development planning initiatives in Mediterranean mountains urgently requires a good, shared understanding of the *Ecosystem Approach* principles. International conservation organizations active in the region should play a leading role in:

- supporting their national partners to lobby central governments, so that responsibility for the implementation of the *Ecosystem Approach* is extended to all relevant ministries, and not only to the Ministries of the Environment;

- establishing partnerships with governmental institutions, intergovernmental organizations and the private sector to carry out education and awareness-raising actions at all levels—from grassroots to government—and to ensure that capacity is built and know-how is generated.

1.5. Several good examples of methodologies and case studies applied to mountain systems for putting the *Ecosystem Approach* into practice[14] are available, both within and outside the Mediterranean region. Especially relevant are those cases addressing transboundary mountain chains and shared watersheds. The international conservation organizations acting in the region should take the lead in gathering such case studies and assessing their relevance to other mountain contexts. An information hub or database for gathering such information should be created and made available to regional partners and interested organizations. While doing so, it is important to keep in mind the strong specificities of different mountain chains, which may require different or new methodologies for the *Ecosystem Approach* to be successfully implemented.

1.6. The most challenging aspect when applying the *Ecosystem Approach* in Mediterranean mountains is its social component[15]. There is a strong need to identify effective ways to engage and empower grassroots stakeholders (i.e. local communities) in processes which are transparent, equitable, inclusive (i.e. considering local people's views), and consensus-oriented[16]. A number of enabling conditions should be adopted at the very early stages, in order to secure the quantitative and qualitative levels of participation needed for the validation of the large-scale conservation and sustainable development planning required by the *Ecosystem Approach*:

---

[14] Some background documents and sources are: Abell, R, Thieme, M., Dinerstein, E., Olson, D. (2002); Jongman, Rob .H.G. and Gloria Pungetti (2004); Lassen, B. & S. Savoia (2005); Loucks, C., Springer, J, Palminteri, S., Morrison, J., Strand, H. (2004); Olson, D. M., Dinerstein, E. (2002); Shepherd, Gill. (2004); Smith, R.D. and E. Maltby. (2003); http://www.worldwildlife.org/science/ecoregions; http://www.carpathians.org; http://www.convenzionedellealpi.org

[15] Humans must be seen as a component of the mountain system and not just as an external pressure.

[16] The publication 'Engaging People in Sustainability' (Tilbury, D. and Wortman, D. 2004) by the IUCN Commission on Education and Communication, launched at the 3rd IUCN World Conservation Congress in Bangkok (17-25 November 2004) was mentioned at the IUCN Mediterranean Mountain Workshop as an important tool for addressing this challenge.

- It is very important to invest time, efforts and resources in 'social relationships', i.e. to set up multi-stakeholder groups with a broad range of institutions and individuals having different objectives, working systems, and mentalities. Participation is a long process which requires the investment of time to talk to local people and obtain their trust.

- Huge efforts are needed in terms of communication and education. The contribution of mountain peoples to the preservation of their environment should always be highlighted, and emphasis should be placed on why locals should care about mountain goods and services which are vital for society as a whole. Local societies should be enabled to understand the high value of their living in areas which entail so many environmental and social constraints, and the compensation that the whole of society owes them in recognition for this effort. Major efforts are also needed to raise awareness in the broader society of the role that healthy mountain communities play in securing vital goods and services, such as water resources, and maintaining much of the natural and cultural heritage of their country. This kind of communication will consolidate and 'brand' the mountain identity, and it will help to improve the recognition of mountain systems both economically (by increasing social demand for high-quality services and products from mountain areas) and socially (through social demand for and recognition of the high quality of life provided by mountain areas).

- It is vital to effectively demonstrate the benefits that grassroots stakeholders may obtain from large-scale conservation and the development of mountain action plans. Such plans should always highlight concrete actions to improve living standards, set up upland–lowland connectivity (for humans and products), and promote income generation. Exchange programmes and missions should be planned, so that representatives of grassroots groups can visit other areas where success stories from large-scale conservation and development initiatives following the *Ecosystem Approach* can be viewed.

- Traditional knowledge of nature resources management, especially of the strong interdependence between traditional grazing systems and biodiversity, should be taken into careful consideration and supported through *Ecosystem-based* conservation initiatives (i.e. innovative mechanisms for economically viable and socially acceptable high-natural-value farming systems).

- In spite of the fact that ecological and social connectivity are both considered an asset in the *Ecosystem Approach*, isolation in mountain systems is also the basis for the evolution of unique biodiversity and cultural values. Therefore it is important to understand when, where and how connectivity and/or isolation should be supported through conservation and development actions.

1.7. The large-scale conservation planning required by the *Ecosystem Approach* is a very complex participatory process to develop common long-term vision and goals. The long-term efforts needed to succeed in such a challenging venture require strong 'leaders' within the various stakeholder groups, especially at grassroots level. Specific leadership programmes should be made available so as to empower such leaders. The concept of 'conservation leaders' and leadership programmes are currently part of most large-scale conservation strategies. The participants at the IUCN Mediterranean Mountains Workshop expressed their interest in the ECONET 'Champions' concept[17], as a tool for implementing the Ecosystem Approach in the Mediterranean mountains.

1.8. New initiatives on large-scale conservation planning following the *Ecosystem Approach* in Mediterranean mountains should build on the ongoing collaboration frameworks and large-scale mountain initiatives within and around the region. The existing alliances, partnerships and memoranda of understanding (MoUs) among international organizations should be extended to their branch offices active in other priority *functional mountain systems* or *landscapes* within the Mediterranean region. Organizations like IUCN, WWF, FAO, UNDP, UNEP and UNESCO can play a major role in catalysing this process.

[17] 'Champions' are local people (e.g. farmers or local NGO leaders) who are aware of the problems facing nature and the environment and who have the power to help in a particularly meaningful way by building trust among local community members and arousing a desire for action (e.g. by demonstrating the value of changing bad management practices and explaining the long-term benefits).

1.9. The cooperation between *functional mountain systems* or *landscapes* sharing similar ecosystems and conservation or development problems should be strengthened through partnership frameworks, joint actions and networking, including the transfer of technology and experience. This is especially relevant for EU and Third Mediterranean (EU Neighbourhood) countries sharing mountain landscapes that have comparable environmental issues[18].

1.10. Large-scale conservation planning initiatives following the *Ecosystem Approach* make a good framework for providing coherence to donors' actions in the main Mediterranean mountain chains, prioritising conservation efforts in the most relevant mountain landscapes, and making the most of the limited available resources. Development agencies and other major donors should be involved as partners of the initiative, and may use *Ecosystem-based* large-scale mountain conservation visions and action plans as a strategic framework for the identification of priorities in terms of intervention areas, actions, and beneficiaries[19].

1.11. The *Ecosystem Approach* should help all stakeholders to look at mountains as unifying systems instead of barriers. Large-scale conservation planning initiatives in mountain chains should support integrated management of both mountains and watersheds.

[18] Two concrete examples are: (a) the Italian Apennines Ecoregion Conservation and APE initiatives, and the Dinaric Arc initiative; (b) the Southern Iberian mountains and the Rif-Atlas mountain chains, where the regional government of Andalusia and the Moroccan government, with the support of UNESCO and IUCN-Med, are already embarked on a very innovative experience for establishing a transcontinental Biosphere Reserve.

[19] They could be used as eligibility criteria in Aid Agency tenders for development programs and projects submitted by NGOs, research institutions and governments, and for monitoring the impact of funded actions.

Theme 2

Mediterranean mountain watersheds: ecosystems management, soil and water

Water is essential to all aspects of life, and mountains play a critical role in global freshwater supply (Liniger et al, 1998). In the Mediterranean region, with its more or less intense drought during the warm summer season, water stress is an intrinsic feature to which Mediterranean ecosystems and people are adapted. This specific climate feature highlights the role of mountains in storing and regulating water flow to lowland areas, and the need to maintain and restore stable and functional mountain ecosystems. Unsurprisingly, water is among the priorities in scientific, technical and economic cooperation between Europe and its Mediterranean partner countries.

Mountain watershed protection and management (addressing water quality, siltation reduction, flood prevention and flow regulation) is considered highly important by most Mediterranean countries, and has been one of the main reasons for protecting upland forests and implementing large afforestation programmes. Large-scale tree planting programmes to protect soil and water resources have very often been based (and still are in certain countries) on few fast-growing native and non-native tree species, with the use of extensive earth-moving techniques (such as mountain slope terracing) to facilitate water retention during the early stages of tree growth. Unfortunately, such soil movements have generally turned into a problem rather than a solution, affecting the (hydrological cycle and soil structure, with serious failures (trees dying or failing to thrive) and erosion problems.

Soil erosion has been monitored on a considerable number of experimental plots throughout the region. Vale Formoso (Alentejo, Portugal), part of the EU MEDALUS network[20], is the oldest such experimental site in Europe and has been applying and testing the Universal Soil Loss Equation (USLE) under local Portuguese conditions since 1960. It has demonstrated that natural vegetation cover, even scrub and pasture land, is very effective at preventing soil erosion in southern Portugal, while pine plantations and wheat crops are not. Conclusions from this and other research programmes have helped to elucidate the ability of different native plant communities (herbaceous plants, shrubs and forests) to prevent soil erosion and make efficient use of nutrients and water. This has helped to improve the old-fashioned ways of restoring mountain areas, by introducing ecological restoration principles and enhancing the value of maintaining and/or restoring the landscape heterogeneity of Mediterranean landscapes. These are characterized by a mosaic of habitat types, including grasslands and scrub, which were previously undervalued and cleared to make way for artificial tree plantations.

IUCN and WWF have jointly developed the Forest Landscape Restoration approach to promote more sustainable ways of improving diversity in forests, increasing their ecological stability, and reducing the risk of catastrophic events such as fires and pest outbreaks, while increasing opportunities for local livelihoods. A Global Partnership for Forest Landscape Restoration was launched in 2003, as a network of governments, organizations, communities and individuals who recognise the importance of forest landscape restoration and want to be part of a coordinated global effort[21]. The partners will learn from one another's experiences and identify, undertake and support forest landscape restoration activities. The Forest Restoration Information Service (FRIS), run by UNEP–WCMC, plays a critical role as an information resource and in promoting information sharing among partners and other restoration practitioners. The partnership will serve as a model of how the international forest community can move constructively from dialogue to action by linking policy and practice.

Locally adapted mountain ecosystem management is a prerequisite for watershed protection. Traditional upland grazing and sustainable systems of forest management and subsistence cropping have played an important part in enriching the mountain biota and increasing mountain diversity at all levels—gene, species, community and landscape.

The Ministerial Conference on the Protection of Forests in Europe (MCPFE) is a cooperation framework involving more than 40 countries and 30 organizations in Europe. It recognises the crucial role of mountain forests in the regulation of hydrological

[20] MEDALUS: European Union funded project on Mediterranean Desertification and Land Use, with a network of experimental plots: the Guadalentín-Segura Basin in Spain; the Agri Basin in Italy; the inner-lower Alentejo region in Portugal; and the island of Lesvos in Greece (http://www.medalus.demon.co.uk).

[21] http://www.unep-wcmc.org/forests/restoration/globalpartnership

Box. 6. Forest Landscape Restoration (FLR) in Mediterranean mountains

IUCN and WWF have jointly developed a new forest restoration approach called ***Forest Landscape Restoration (FLR)***. FLR is a planned process aiming to strengthen resilience and regain ecological integrity in forest landscapes, while securing human wellbeing. What makes FLR uniquely valuable is its inherent capacity to provide people with the opportunity not only to repair ecological damage, but also to improve their livelihoods: renew economic opportunities, rejuvenate traditional cultural practices, and focus the aspirations of local communities.

FLR is implemented at large enough territorial scales (landscapes) to make sure restoration actions re-establish the heterogeneous and dynamic nature of forest systems (i.e. by restoring viable species populations and the forest's ability to meet their requirements; and by restoring connectivity among forest patches and their ability to maintain ecological processes).

The IUCN Centre for Mediterranean Cooperation and WWF Mediterranean Programme (WWF MedPO) have organized two regional workshops on FLR for developing *ad-hoc* strategies to implement FLR in the region:

- the 2003 IUCN Expert workshop on Forest Landscape Restoration (Castellabate, Italy)[22].
- the 2003 WWF workshop on Forest Landscape Restoration in North Africa (Ifrane, Morocco)(Regato et al, 2003).

WWF MedPO has started two pilot schemes for implementing FLR in the Moroccan mountains (Middle Atlas and the Rif) and in the Southern Portugal mountains. Networks of pilot restoration sites have been established in collaboration with local NGOs, the forest administration and forest owners and users, aiming at developing good ecological restoration practices under different conditions (after fire, in abandoned agricultural land, and in degraded forest land) and at the same time supporting local development opportunities linked to restoration work. Native plant species production techniques are being developed and multi-purpose tree nurseries (producing seedlings for planting, and aromatic and medicinal plants for local marketing) have been created with a gender-oriented approach. Innovative participatory landscape-scale planning of land uses and forest restoration options to increase the landscape's resilience against large-scale fires is being tested in the Monchique mountain Natura 2000 site (southern Portugal), which was almost completely burnt in 2003.

In addition, a pilot scheme for the landscape integration of fast-growing plantations meeting adequate environmental and social standards according to the FSC certification scheme[23] has been jointly developed by WWF and the Portuguese Directorate General of Forest Resources (DGRF), through the "Cansino" project in the properties of PORTUCEL (Aliança Florestal) (Figure 7). Large-scale plantations of fast-growing tree crops (eucalyptus and pine species) have in recent decades significantly reduced the landscape diversity and heterogeneity that used to provide habitat requirements for keystone species and high resilience against major disturbances like large-scale fires, with enormous environmental and socio-economic consequences. Therefore, the landscape integration of fast-growing tree plantations will also help increase resilience against wild fires and minimize the associated environmental problems. As a result of this participatory planning process, a number of public and private organizations in the southern Portugal mountain landscape, which includes Monchique, have agreed to restore burnt forest land by the Forest Landscape Restoration approach, improving environmental value in and around fast-growing plantations while at the same time supporting sustainable agro-forestry rural development opportunities based on the natural ecosystems (i.e. cork oak woodlands, pasture and strawberry tree scrub).

[22] http://iucn.org/places/medoffice/CDForest/index.html

[23] FSC Principle 9 on High Conservation Value Forest Areas

cycles and risk containment in Europe. MCPFE developed its Resolution S4 'Adapting the management of mountain forests to new environmental conditions', as a framework for cooperation among countries. Many different actors took part in raising awareness of the important role of mountain forests in a larger territorial dimension, and sharing experiences and know-how in the identification, formulation and implementation of political, technical and scientific actions. European ministers assigned implementation of Resolution S4 to the European Observatory on Mountain Forests (EOMF), in collaboration with FAO and IUFRO. EOMF has produced the *White Book 2000 on Mountain Forest in Europe*, in which a number of priority actions are proposed (Box 7).

Biological richness is an indicator of the integrity of extensive mountain agriculture and pasture systems with the mountain environment. Studies from the region demonstrate that mountain landscapes with traditional grazing systems encompass a wide diversity in terms of plant species, plant communities and landscape heterogeneity. This is especially relevant in certain transhumant areas, like western Spain, where seasonal upland–lowland livestock movements have helped to develop extensive, highly biodiverse, multi-purpose grazing systems in upland and lowland areas (evergreen oak woodlands known as *dehesas*). Both rural abandonment in mountain areas in the northern parts of the region and overgrazing in the south are adversely affecting mountain diversity, the hydrological cycle and soil stability, as well as the socio-economy linked to mountain ecosystem management. A number of initiatives are supporting the maintenance and/or restoration of mountain grazing systems, with special consideration in some cases for transhumant upland–lowland movements (Box 8), with the aim of identifying innovative ways to sustain mountain socio-economic systems on which mountain biodiversity and environmental stability depend.

Fondo Patrimonio Natural Europeo is an NGO promoting the recovery of the north–south transhumance routes in central-western Spain, linking rural development with migratory bird conservation and the development of responsible tourism. Another Spanish NGO, Fundación Naturaleza y Hombre (FNyH), is supporting a transboundary initiative in the hilly lands between the Tagus and Duero rivers on both the Spanish and Portuguese sides, with the aims of improving conservation through research, environmental education and the implementation of good agro-forestry management practices in public and private *dehesa* land, and restoring the habitat requirements for endangered species. In eastern Spain, where high mountain massifs lie very close to

Box 7. *White Book 2000 on Mountain Forest in Europe*

In 1992 the European Federation of Local Forest Communities (FECOF) adopted a European Charter of Local Community Forest, in which Mountain forests have a central place due to their vital role in the protection of biodiversity and human activities. In 1995, aware of the ongoing degradation of mountain forests in Europe, FECOF helped establish the European Observatory of Mountain Forests (EOMF), with the mission to develop a real policy for mountain forests in Europe, based on sound scientific data and in conjunction with all stakeholders (i.e. private and public institutions, forest managers, forest owners, users, NGOs and research institutions). EOMF's mission was reinforced by Resolution S4 of the Ministerial Conference for the Protection of Forest in Europe, in which signatory countries and the European Commission mandated EOFM, in collaboration with FAO and IUFRO, to undertake monitoring and evaluation work on the sustainable management of mountain forest in Europe (EOFM, 2000). As a first step, a *White Book on Mountain Forest in Europe* was produced, based on a sound assessment of political, socio-economic and environmental issues, which proposed an initial set of actions:

- allow participation of all stakeholders in forest development;
- establish territorial contracts for the participatory management of mountain forests;
- reduce handicaps in less-favoured mountain areas through financial support (by means of various economic tools) included in the territorial contracts, and capacity-building measures giving priority to strengthening human resources (pro-active entrepreneurs and trained labour) for sound forest development;
- promote the quality of mountain forest products and services;
- define multifunctional forest management plans.

the coast, the recovery of the traditional transhumance system is being supported by the Ministry of Environment and some NGOs. Winter fodder for livestock used to be provided by lowland farmers to shepherds in a sort of bartering system (pasture for manure). The collapse of transhumance has not only adversely affected upland shepherds but also contributed to environmental degradation in lowland farmland, where chemical pollutants are having highly detrimental effects on birds. The National Agency for Agrarian Products (SENPA) is currently subsidizing the use of agro-industrial waste (e.g. from the processing of oranges, olives and almonds) as a winter fodder supplement for mountain livestock. In addition to this, the environmental NGO SEO is working to reduce chemical pollutants in lowland farmland (the Ebro Delta), by supporting organic farming and restoring winter grazing to produce natural fertilizer and control vegetation growth, which is especially important for steppe birds.

The European Union Rural Development Programmes have been instrumental in developing environmental and socio-economic goals to financially support the conservation of Mediterranean extensive agro-pastoral systems in mountain regions (Box 14).

The growing use of local, renewable sources of energy such as wind, water or solar power can ensure greater independence and safety for mountain communities

Box 8. Reviving transhumance and protecting biological diversity in the High Atlas Mountains

M. Noussairi

Transhumance is a very effective mechanism to overcome the seasonal environmental constraints of highlands (winter cold) and lowlands (summer drought). Restoring transhumance systems is a conservation-oriented approach now gaining currency. It has been shown by several environmental and development organizations as the best way to preserve biodiversity values, which are closely linked to disappearing traditional pastoral practices.

The 'Transhumance for Biodiversity Conservation in the Southern High Atlas' initiative was launched in 2000 by the national chapter of UNDP, in partnership with the Moroccan Ministry of Agriculture. The initiative focused on the High Atlas, the majestic mountains of southern Morocco, and one of the most biologically diverse mountain ranges in the southern Mediterranean. The objective of this eight-year programme was to protect the natural heritage through the revival of biodiversity-friendly transhumance and common property management.

The work was based on an innovative approach, integrating pastoral range management with biodiversity conservation in a grazing dependent ecosystem. A strong participatory approach was favoured at all stages of the initiative, ensuring the integration and involvement of a wide range of partners, with special attention to women. Activities were planned in territorial units corresponding to the domains of local ethnic groups. The project was grounded in the importance of ancestral practices and local knowledge, and it developed a script-audio-visual pastoral handbook for shepherds and transhumants.

The initiative led to the establishment and implementation of Integrated Biodiversity Conservation and sustainable Management Plans, and to the creation of incentives for biodiversity conservation and transhumance. It also succeeded in including biodiversity issues in the policy debate at provincial and national levels. On the conservation side, project activities have resulted in the establishment of a protected area in the Saghro territory (200,000 ha) as well as 9 key biodiversity hot spots. As the initiative has proved, strengthening bonds between traditional institutions and local associations, and strong support from the local authorities, can all lead to a favourable environment of dialogue and negotiation for the good management of rangelands and firewood exploitation. Ownership was acquired by linking local development activities to conservation action and to poverty alleviation activities in a coordinated manner.

On the policy side, the initiative is currently submitting a proposal to amend the law on pasture land investment. The objective of this proposal is to secure pastoral land tenure. Several exchanges of information and know-how with foreign partners have also taken place, especially with French institutions.

Extracted from a case study of the workshop "Mediterranean Mountains in a Changing World"

with respect to energy supply while pressures on mountain resources (firewood and water) are substantially reduced. A variety of systems to make use of solar energy, including special house construction, cooking devices such as cooking boxes and reflector systems, and electricity supplied by photovoltaic (solar-electric) systems, have recently been introduced. Some of these systems are especially suitable for areas with intense sunlight and low temperatures. Solar-electric stand-alone systems have proven useful in the European Alps and the Pyrenees, where there is evidence that they are an important source of sustainable energy (Schweizer-Ries, 2001).

A common set of Mediterranean water policies is being shaped by international fora dealing with water issues (the Euro-Mediterranean Turin Plan of Action; the Mediterranean Commission for Sustainable Development; the Global Water Partnership Vision; and the EU Water Framework Directive), by orienting priorities and practices towards an integrated water resource management approach. It is widely recognised that the development of effective multi-stakeholder partnerships is of major importance in responding to current water challenges. The Global Water Partnership–Mediterranean was created to respond to this demand, an initiative composed of 12 networks and institutions, including Blue Plan, which has drawn up the 'Mediterranean Vision on Water, Population and the Environment for the 21st Century' (Margat & Vallée, 2000).

The European Water Framework Directive (WFD) is a legally binding policy that requires member states to achieve good ecological status for surface and groundwater, with the obligation of establishing and implementing *ad-hoc* river basin and cross-border management plans. The WFD recognises that water systems obey natural and not political boundaries, and therefore this framework may be a good opportunity to implement Ecosystem-based conservation using river basins as functional landscape units. In fact, the WFD will play a significant role in addressing the unbalanced flows between catchment mountain areas and lowlands, and will be an important policy tool for balancing human development needs and natural resource use between lowland and upland areas. The WFD provides a concrete example of integrated watershed management that may well be

Box 9. Promoting the ecological and aesthetic value of freshwater landscapes in mountain watersheds: the Cantabrian Mountains of Northern Spain

C. Sánchez

Between 2004 and 2006, the Spanish NGO Fundación Naturaleza y Hombre carried out a project to promote the ecological and aesthetic value of water-related landscapes in the upper watersheds of a number of rivers in the eastern portion (Montaña Pasiega) of the Cantabrian Mountains in northern Spain. The project was granted funding from the European regional collaboration programme Interreg III B–Atlantic Region, as part of the WaterwaysNet Project. It involved a wide array of institutional partners including national, regional, and local authorities.

The project aimed to strengthen and support the landscape value of river ecosystems through fostering knowledge, enhancing awareness about the cultural and natural heritage of such landscapes, and promoting know-how, skills, capacity building, and research. The project work plan included the following actions: research and report production (including a blueprint for Sustainable Development); training and awareness-raising (several campaigns were carried out on the sustainable use of fire, sustainable hunting and fishing, and rural development); creation of interpretative structures (including the Fluvarium Eco-Museum); and promotion and communications (including several international workshops).

The project aimed to reduce the impact of human actions on the watersheds, and improve knowledge of the current status of these ecosystems, so that specific protection measures could be put in place. The project also sought to inform stakeholders about the problems and the social, cultural, and environmental values of the project area.

Throughout its development and implementation, the project adopted a strong participatory approach and sought the consensus and support of key local stakeholder groups, including arable and stock farmers, hunters, fishermen etc.

Extracted from a case study of the workshop "Mediterranean Mountains in a Changing World"

worth adapting for use in countries throughout the Mediterranean region.

Water systems and watersheds often act as national borders (e.g. the Duero, Tagus and Guadiana rivers between Portugal and Spain) or are shared by neighbouring countries (e.g. Lake Ohrid, shared by Albania and FYR of Macedonia; the underground karst areas between Slovenia and Italy; and the Medjerda river between Tunisia and Algeria). In such circumstances, neighbouring countries need to cooperate in the wise and equitable use of water resources to avoid transferring the effects of pollution, water scarcity (due to excessive water abstraction and aquifer depletion) or flooding (through a lack of transnational dam regulation). There is a growing trend to address shared watershed management needs through the establishment of long-term transboundary cooperation at all levels, involving not only national authorities but also local communities and the non-governmental and academic sectors (Papayannis, 2004). As an example, HELP, a joint UNESCO/WMO (World Meteorological Organization) initiative, was launched in 2002 to reinforce the implementation of watershed management. HELP aims to create a new approach to integrated catchment management by setting up a framework for water law and policy experts, water resource managers and water scientists to work together on water-related problems. The desire for this new programme to be truly 'user driven' will require the active involvement of both policy and facilitating (water and land resource managers) groups to set the policy agenda and ensure the scientific results will benefit societal needs through the revision of policy and management practices. A Mediterranean Case Study is being implemented in the Bulgarian -Greek transboundary Mesta - Nestos river basin

Guidelines

2.1. Regional organizations should make significant efforts to raise civil society's awareness of the role of mountains in securing the water resources on which life depends. The crucial role that healthy mountain ecosystems play, especially in view of global warming, should be highlighted. So far, this is not happening in most government water-saving campaigns.

2.2. The maintenance and restoration of locally adapted management practices for mountain ecosystems is a prerequisite for the protection of mountain watersheds, the regulation of hydrological cycles and risk containment. Traditional upland grazing, sustainable systems of forest management, and subsistence crops have all played a part in enriching mountain biota, increasing mountain diversity at all levels (gene, species, community and landscape), protecting soil cover and boosting the soil carbon pool —which improves soil productivity and quality through higher water retention and nutrient availability.

2.3. All stakeholders should be involved in the sustainable management of mountain forests. The European Observatory on Mountain Forests (EOMF) proposes the establishment of territorial contracts for the participatory management of mountain forests as a key issue to be supported by state forestry policies and private owners.

2.4. Major efforts should be undertaken by regional organizations to support renewable sources of energy such as wind, water or solar power, and efficient energy supply options that can reduce pressure on mountain resources. This is particularly urgent in the southern and eastern part of the Mediterranean region.

2.5. It is recommended that implementation of the EU Water Framework Directive[24] be extended to all Mediterranean countries by putting in place pilot development phases in mountain watersheds with outstanding biological diversity.

2.6. Guidelines for cooperation in internationally shared mountain watersheds may vary considerably, from the simple exchange of information to joint management. These frameworks should evolve over time through different mechanisms, which may become legally binding. Transboundary cooperation is a cost-effective solution for mountain conservation and development. It provides significant political, socio-economic and environmental benefits, and it facilitates the sharing of know-how. It allows for the joint management of resources, the adoption

[24] The WFD provides a more integrated ecological definition of water systems with a watershed approach, supports wide public participation linking upland and lowland water resource users, and offers concrete examples for integrated (cross-border) watershed management plans that may well be worth adapting for use in third countries in the region.

of joint conservation approaches (especially important for migratory species), and the setting-up of conflict resolution platforms. It also increases the effectiveness of awareness and fund-raising activities (Papayannis, 2004). Good examples of transboundary cooperation in Mediterranean mountain watersheds are:

- the trilateral protected area in the Prespa lakes, shared by Albania, Greece and the FYR of Macedonia[25];
- the Mercantour–Alpi Maritime parks straddling the border between Italy and France[26].

[25] A joint declaration for the transboundary protection of both lakes and their hydrological basin was signed in 1999 by the prime ministers of the three countries. A coordination committee has been established with representatives of the central governments, local communities, NGOs and the academic sector, which guides and organizes all cooperation actions.

[26] These protected areas occupy two slopes in the Maritime Alps, including hundreds of lakes. In 1998 both parks signed a commitment to work together on research, biodiversity conservation, nature resource management, spatial planning, sustainable development and education.

Theme 3

Mediterranean mountains' vulnerability to global change: resilience and adaptation

The earth's surface is a dynamic system of which humans are a part. Knowledge about changes to the Earth's surface, caused by climate, land use, biological invasion, global economic forces, or other sources, and the underlying processes that induce them has enormous impact on how society responds to these changes and, ultimately, the cost of responding to change. Mountain global change research activities strive to achieve a whole-system understanding of the interrelationships among mountain surface processes, ecological systems, and human activities.

Climate change models predict increased aridity and higher temperatures across large areas of Europe in coming decades, particularly affecting the Mediterranean region and mountain regions. This will likely aggravate the inherent water shortage of the Mediterranean climate and water competition between natural ecosystems and growing human demands (e. g. drinking water for coastal urbanization, and irrigation for crops and leisure activities like golf courses). There are ongoing initiatives at a regional level for sharing experiences and know-how on mitigation strategies to reduce climate change effects on Mediterranean ecosystems, based on water use efficiency, adaptation options in ecosystem management, responsible consumption and participatory planning of land uses compatible with the long-term conservation of ecologically secure water resources in Mediterranean watersheds.

One of the 2007 IPCC conclusions is that climate change will exacerbate the intensity and frequency of extreme weather events (such as intense droughts, heat waves and torrential rainfall), and their consequences (including forest dieback, large-scale fires, and soil erosion and floods, respectively)(Solomon et al, 2007). Natural disturbances affecting

Box 10. *In-situ* conservation of endangered flora in the mountains of Corsica

L. Hugot

This initiative was started in 2004 as a partnership between the Botanical Conservatory of Corsica, the Regional Natural Park of Corsica, and the French Climbing and Trekking Federation. Its objective is to promote *in-situ* conservation of rare and endemic species of the Corsican flora, namely in alpine and subalpine habitats, by establishing collaboration with the recreational users of those sites where the flora is found. At the beginning of this work, the Conservatory approached a climbing association that was active in a sensitive rock area where a very rare species (*Brassica insularis*) is found. The Botanical Conservatory and the Corsica Roc association decided to prove that climbers can act positively for the environment. They developed awareness-raising actions with schools, and eventually published information resulting from studies of rare species, including the children's drawings. The main outputs of this phase included the 'Climbing in Corsica' website, technical climbing books, leaflets, and information posters. During this period the project team also increased their collaboration with the guards and staff of the natural park.

As a next step, the Conservatory strengthened its partnership with the climbing association, and asked them to help with the counting of other species growing on rocky walls and to prospect other sites. This joint work built a legacy of trust between conservationists and scientists on one side, and amateur nature lovers and sportspeople on the other. The Conservatory is today a formal partner of the Climbing and Trekking Federation and a recognised instructor in the training of trekking guides. With the help of volunteer guides, the distribution of some threatened floral taxa has been mapped, and the partners are acting together for the preservation of subalpine and alpine ecosystems.

Although it takes time and patience to build mutual trust and to develop strong partnerships, this initiative demonstrates that conservationists and recreational users can work together towards the in-situ conservation of endangered mountain species. Partners can share and take advantage of each other's knowledge of the ecosystem and benefit from each other's skills. This initiative also demonstrates the importance of building awareness and conservation skills among recreational users of mountain spaces, such as trekkers and climbers.

Extracted from a case study of the workshop "Mediterranean Mountains in a Changing World"

Mediterranean mountain ecosystems have both a natural and a social component. The vulnerability of mountains to extreme weather events is partly determined by social factors such as population changes, government policies, water use trends, social behaviour, level of water development and/or exploitation, and water availability in general. Subsequent extreme events in the same region will have different effects, even if they are identical in intensity, duration, and spatial characteristics, because societal characteristics evolve through time.

The EU has heavily invested in research projects covering key issues for Mediterranean mountains and in promoting networking and the sharing of know-how among Mediterranean research institutions from the northern and southern shores. The following mountain-related research projects stand out:

- the MEDALUS and MEDIMONT projects on Mediterranean Desertification Processes;
- the LADAMER project on Land Degradation Assessment in Mediterranean Europe;
- the REACTION project aiming to define a suitable analytical framework, criteria, and methodology for the evaluation of restoration projects in the Mediterranean (with a database on evaluated restoration projects) and technology transfer among Mediterranean organizations and actors involved in restoration work; REACTION uses the forest landscape restoration concepts of Lamb and Gilmour (2003) and the definitions of the Society of Ecological Restoration (2002), and approaches restoration as a process of assisting the recovery of ecological integrity and enhancing human well-being in degraded ecosystems and landscapes;
- the EUFIRELAB project, a wall-less Laboratory for Wildland Fire Sciences and Technologies in the Euro-Mediterranean Region;
- the SilviStrat project, which studies adaptive management strategies to enhance carbon sequestration in European forests and to mitigate the adverse impacts of global climate change on them;
- the CARBOEUROPE Cluster, projects funded by the European Commission (DG Research) under its 'Energy, Environment and Sustainable Development' programme, which aims to develop a prototype of a reliable, consistent monitoring system for calculating the full carbon balance of Europe, including the biosphere sink, at all relevant scales; it comprises eight projects, and involves 190 scientists from a total of 69 institutions in 15 European countries;
- CARBOMONT, working on the carbon cycle of non-forest mountain ecosystems in the EU member states;
- the EUROMONT project, on climate threat to Alpine diversity in Europe;
- the GLOCHAMORE (Global Change in Mountain Regions) project, a joint initiative by UNESCO–MAB and the Mountain Research Initiative (MRI), funded by the EU[27], with the objective of detecting signals of global environmental change in mountain Biosphere Reserves across a network of observation stations, involving both natural and socio-economic systems;
- the CATCHMOD cluster, established by the European Commission, which aims at developing common harmonized modelling tools and methodologies for the integrated management of water at river basin or sub-basin scales, including the interface to the coastal zone; the CATCHMOD cluster comprises a number of EC research projects.

In addition to these regional efforts, Mediterranean countries are also implementing actions at a national level, as in the Spanish GlobiMed network[28], for instance, which analyses the impacts of intense, long-lasting droughts on forest dieback events in mountain forests within the Mediterranean biogeographical region of the country.

According to Lavorel et al. (1998), there are four priority research areas in relation to the effects of global change on Mediterranean terrestrial ecosystems: (a) future fire regimes and their effects, in terms of prediction, fire impact and fire control and mitigation; (b) the effects of land use changes on ecosystem physiology and interactions with the environment; (c) the sensitivity of ecosystems to changes in water availability and quality, and the effects of landscape change on their hydrological properties; and (d) changes in ecological (gene, species and landscape) diversity.

[27] EU Sixth Framework programme on "Global Change and Ecosystems".
[28] http://www.globimed.net

Box 11. The GLOCHAMORE (Global Change in Mountain Biosphere Reserves) project: addressing impact on people and the environment

R. Zamora

Many of the world's mountain ecosystems are undergoing important global changes which bring about climate and socio-economic changes that may affect the ability of mountain regions to provide critical goods and services to both mountain inhabitants and lowland communities. The GLOCHAMORE initiative attempts to address these environmental challenges by making it easier to detect signals of environmental change in mountain environments. Mountain Biosphere Reserves represent ideal global change laboratories for several reasons:

- Mountain biosphere reserves are widely distributed in 40 countries, making it possible to conduct comparative studies and analyses of regional differentiation of environmental change processes.

- Meteorological, hydrological, cryospheric (relating to snow and ice) and ecological conditions change rapidly over relatively short distances in mountain regions, because of steep altitudinal gradients. Thus biodiversity tends to be high, and characteristic sequences of ecosystems and cryospheric systems are found.

- The boundaries between these systems may shift, due to environmental change. This provides sensitive indicators of forcing mechanisms.

- The higher parts of many mountain biosphere reserves are not heavily affected by direct human activities, providing locations where the environmental impacts of climate change alone can be studied.

These core protected mountainous areas are usually surrounded by buffer zones and transition areas that are more influenced by human activities. Changes also occur in socio-economic conditions, land-use and land-management, resource exploitation and the appeal of mountain regions for tourism. UNESCO has joined 13 international organizations and educational institutes in an international effort to address the impact of environmental and climate change on ecosystems and people in mountain regions. In this way, mountain biosphere reserves are used as an 'early-warning' system.

The objectives of the project are to:

- detect signals of global change in mountain biosphere reserves as a template for mountains in general; the focus is on assessing change in the biophysical environment; understanding ecological and hydrological processes, with and without local human interference, along altitudinal and other gradients (e.g. land use); and developing a network of observation sites to serve as an 'early-warning' system for detecting global change impacts;

- define the consequences of global change for core mountain regions and for lowland systems depending on mountain resources, in order to better understand the consequences for people and ecosystems;

- facilitate sustainable land, water, and resource management with and for people in mountain biosphere reserves, the aim being to define responses at local and regional scales; this includes assisting policymakers by indicating the extent of degradation of key mountain resources, and by evaluating the impact of alternative resource management strategies.

Two Mediterranean mountain areas are part of the research network: the Biosphere Reserve of the Oasis du Sud Marocain (Morocco) and the Biosphere Reserve of Sierra Nevada (Spain).

Extracted from a case study of the workshop "Mediterranean Mountains in a Changing World"

Guidelines

3.1. The following are the main problems that mountains face under a global change scenario, and on which more research is needed:

- water availability (quantity and quality);
- unsustainable land use changes (due to rural abandonment, overexploitation of natural resources, and unsustainable new uses) leading to irreversible land degradation and desertification;
- bio/cultural diversity loss;
- fire risk and fire economy;
- under-valuation in economic terms of mountains goods and services, income opportunities to sustain local economies, and management systems for maintaining locally-adapted mountain ecosystems;
- intense regional conflicts (e.g. wars, cannabis cultivation);
- knowledge gaps, lack of information dissemination, and lack of people skilled in ecological functioning and resilience, and socio-economics;
- lack of good governance mechanisms, resulting in major socio-economic problems.

3.2. Regional organizations should lobby central governments in order to raise awareness and build capacity among policy makers and representatives of public administrations regarding the main problems of mountains under a global change scenario (see 3.1), and their cross-sectoral implications. The *Ecosystem Approach* is a good framework for doing so (see Theme 1).

3.3. Regional organizations like IUCN, WWF and FAO should identify research groups and NGOs with innovative field experience in ecological functioning, restoration and adaptive management of mountain ecosystems[29]. International organizations active in this domain should jointly fundraise for the establishment of learning networks for sharing experience and exchanging know-how between 'nodes of expertise' and less-favoured areas in the identification, formulation and implementation of political, technical and scientific actions on Forest Landscape Restoration (FLR). These organizations should play a major role especially in the following:

- bringing together scientists and practitioners for the sharing and transfer of know-how, and for developing a common understanding and working language;

- translating scientific knowledge on key issues (mountain vulnerability to global change) for civil society (including practitioners, mountain ecosystem users, NGOs, and decision makers), raising awareness, and identifying opportunities for adapting and testing results in other mountain contexts;

- capacity building, involving a large array of 'climate change watchers'—foresters, farmers, shepherds, etc.—who should play a key role in the implementation of monitoring programmes;

- incorporating the socio-economic component into ecological research work, and applying scientific results beyond experimental plots (at different scales, from local to landscape); the involvement of sociologists and the development of NGO experience will be crucial in this.

3.4. The design and implementation of participatory systems to monitor the effects of climate change on representative mountain ecosystems as well as their responses and adaptation needs is a high priority. The international organizations active in this field should develop partnerships with existing research networks (such as the EU-funded GLOCHAMORE programme) with the following goals:

- to help expand these networks to underrepresented parts of the region and types of ecosystems/cultural systems (through fundraising actions, working experience and partnership development)—this is especially urgent for the North African and Middle East mountain ranges, as well as the coastal Balkan Mountains.

- to provide know-how to incorporate the socio-economic and public participation dimension into ecological research work—this is often absent or undervalued in international scientific networks.

---

[29] This information may be transferred to an information hub accessible to the regional partners and interested organizations.

- to facilitate networking among mountain chain research and conservation initiatives for the sharing of experience and know-how.

3.5. It is a high priority to fill major information gaps on southern Mediterranean mountain ecosystems and fauna and flora. This should be mandatory in major biodiversity cooperation programmes in the Middle East–North Africa (MENA) region. The implementation of Ecosystem-based or Ecoregion conservation initiatives in Mediterranean mountain chains may be a good framework for achieving this. One of the main strengths of Ecosystem-based initiatives such as Ecoregion Conservation is their ability to become a common framework which can bring together a large set of actors and develop a wide range of long-term collaboration mechanisms to help fill major gaps.

- The IUCN Red Lists are an important tool for addressing major information gaps on mountain habitats and species. Special efforts are needed to cover flora data gaps. Endangered flora monitoring programmes like the Spanish one are good examples to be replicated and extended to neighbouring southern countries through cooperation frameworks.

3.6. The goals of mountain ecosystem management are closely linked to the maintenance and/or restoration of social and ecological resilience at the landscape level. This requires the establishment of long-term objectives so as to minimize the risk of large scale disturbances (e.g. fire, drought and floods), which are already exacerbated by the climate change trends. These objectives are:

- participatory planning of heterogeneous mountain landscapes, land uses and management systems that allow for higher resilience against disturbances, and can bring back landscape connectivity and the functionality of highly fragmented habitats and species populations;

- recovering and adapting local knowledge of traditional management practices to minimize risks under current and future conditions, reduce management costs and manage climate change effects (fires, flooding and drought cycles).

3.7. IUCN and WWF, as initiators of the FLR concept and the Global FLR Partnership, should help expand the existing Mediterranean FLR initiatives in mountain chains[30], and support the establishment of a regional network of FLR initiatives in a set of representative mountain landscapes[31] with outstanding biodiversity. Lobbying efforts should aim to achieve:

- the commitment of key regional public and private partners to join the Global Partnership for Forest Landscape Restoration and fundraise for pilot actions in the Mediterranean mountains;

- the adoption of FLR principles and ecological restoration protocols within the countries' policies on afforestation in mountain areas;

- the adoption of FLR principles and FSC certification standards[32] in the biodiversity policies of private pulp enterprises and mining companies acting in Mediterranean mountain areas;

- the adoption of FLR principles in the afforestation programmes supported by international cooperation agencies (including current and future afforestation in mountain areas through the Clean Development Mechanism).

3.8. The identification of climate change adaptation options at all levels—policies, conservation strategies, management systems, socio-economic factors—is a high priority for the Mediterranean mountains. It is

---

[30] For instance, the FLR initiative promoted by WWF in collaboration with a local NGO (ADPM) and Portugal's Directorate General of Forest Resources (DGRF) in the Southern Portugal mountains, addressing forest restoration, rural development and large scale fire impacts following the *Ecosystem Approach*; and the FLR initiative promoted by WWF in collaboration with forestry departments, UNDP, NGOs, forestry research institutes and international experts in the Rif and Middle Atlas (Morocco), focusing on forest and rangeland restoration, multi-purpose sylvopastoral management systems, governance problems, and overexploitation of soil and vegetation cover.

[31] These would be pilot areas for monitoring sustainable criteria and indicators for FLR.

[32] Namely, principle 9 on *High Conservation Value Forests*.

particularly important to strengthen cooperation and to share know-how among institutions from countries with the same or similar vulnerable endemic species and ecosystems.

3.9. Basic measures on climate change adaptation are linked to sustainable rural development in mountain areas. The positive experience of rural development in less-favoured areas in recent decades is very relevant, and should be transferred to the cooperation policy for neighbouring third countries. Moreover, environmentally friendly rural development policies in mountain areas will be the best tool for matching conservation and development goals, and for improving resilience against large-scale disturbances exacerbated by climate change.

- Southern European conservation organizations should assess the strengths and weaknesses of Natura 2000 sites and networks in mountain areas, and provide recommendations for developing a more effective, economically viable (requirements from the new EU rural development policy) and environmentally and socially resilient network vis-à-vis global change trends.

- Extending the Habitat Directive to the whole Mediterranean region may provide consistency in identifying Mediterranean-wide priority mountain species and habitats, in identifying geographical areas more resilient to climate change (e.g. species population refuges during past climate fluctuations), in assessing their conservation status, and in defining favourable conservation status conditions. This will help shape a consistent protected areas network in the Mediterranean mountains—with suitable locations, connections, shapes and sizes of protected areas—and identify opportunities for cooperation between mountain areas with similar ecosystems and problems.

3.10. Environmental impact assessments of large-scale (e.g. dams and roads) and medium- to small-scale (forest trails and ponds) mountain infrastructures should include climate change vulnerability analyses.

Theme 4

Partners for the conservation and development of Mediterranean mountains: finding a place for mountain people

Keeping mountain people on their land is a priority in sustainable development policies. The presence of acceptable numbers of mountain people not exceeding the carrying capacity of the system, and the maintenance of traditional agro-forestry uses are crucial to prevent biodiversity loss and environmental degradation in mountains. The culture of mountain communities needs to be kept alive in modern circumstances as well (Euromontana, 2005).

In addition to employment opportunities, the development of acceptable standards of living is essential in fighting poverty and preventing emigration from mountain areas. This will involve finding innovative ways to provide and assure a more equitable distribution between lowlands and highlands of high quality education, health and transportation services, as well as leisure opportunities.

Cohesion policies to reduce handicaps in less-favoured mountain areas should be implemented through financial support (such as compensation payments) included in territorial contracts, and capacity-building measures giving priority to strengthening human resources for sound rural development (particularly pro-active entrepreneurs

Box 12. Fighting soil erosion in mountain areas of Turkey through rural development and pasture rehabilitation

S. Ysfendiyaroolu

In 1995, TEMA Foundation started a project aimed at sustaining rural development in the village of Çamavlu in Western Turkey, by introducing innovative rangeland management strategies to prevent soil erosion.

Soil erosion is a major problem in Turkey, its root cause being increased poverty in rural areas. During the last 50 years, massive migration from the countryside to the cities, population growth and the mismanagement of the land have all led to economic, social and environmental problems in many rural areas. An additional problem is posed by the Turkish Pasture Law, which says that range lands belong to the government. Because of this, villagers tend to not consider these areas as land of their own, which leads to overuse and exploitation of the land.

TEMA Foundation believes that poverty can only be reduced by maintaining a reasonable income for rural populations. Hence, the Foundation promotes a scientific land management approach through small-scale demonstration projects, so as to generate best practices that can eventually be disseminated.

The four-year project in the Çamavlu area had the aims of improving grass productivity on range land, generating extra income for the villagers, restoring and maintaining abandoned farmland and vegetation cover, reducing soil erosion, and contributing to the agricultural knowledge and skills of the rural community. The project included four main activities: fodder crop production, pasture rehabilitation, reforestation, and education.

Although rural development was the main aim of this project, the improvement of the grassland has certainly benefited biodiversity, i.e. the flora and fauna of the area. For instance, the planting of fruit trees by the riverbanks reduced soil erosion and provided additional food for the benefit of wildlife.

TEMA Foundation believes that the reduction of poverty in rural areas is key to fighting and stopping soil erosion in mountain regions, and it strives to integrate income-generating activities into all its projects. In the case of Çamavlu, for instance, the planting of fruit trees led to a noticeable increase in local community income. One lesson learned in this respect is that the commitment of local people is stronger if they are asked to pay part of the expenses for the work done on demonstration sites.

Extracted from a case study of the workshop “Mediterranean Mountains in a Changing World”

and trained labour). A good example of this is the EU territorial cohesion aspect of the common agricultural policy (CAP)—maintaining farmers in areas threatened by depopulation and abandonment—which provides compensation payments to acknowledge the role that mountain farmers and shepherds play as managers in natural landscapes with environmental constraints. These payments are calculated per hectare and are conditional on the farmer's adoption of good farming practices.

A key to achieving sustainable mountain development is to give local people more control over mountain assets (ownership and usage rights, access to information and decision makers, and improved economic standards of living) and the means to negotiate a more equitable allocation of benefits (Pratt & Shilling, 2002) with lowland-based political institutions. Otherwise, they may not care about securing the long-term availability of resources that they cannot access, and may be forced to exploit resources irrationally based on very short-term views. Without adequate empowerment and control, they may also be unable to prevent overexploitation by others, causing mountain resource depletion with irreversible consequences. This is the case of the North African mountains, where, in addition to the huge pressures of local inhabitants on mountain resources, large herds owned by lowland people have far surpassed far the carrying capacity of the ecosystems.

Development solutions should be implemented at the local level by local actors, who should have a final say in their destinies (Euromontana, 2005). The participation of all stakeholders, especially local communities, in sharing responsibilities and promoting governance and collaborative management is crucial and has been identified as a major failing in most Mediterranean mountains.

Guidelines

4.1. The long-term conservation of highly diverse natural and cultural Mediterranean mountain landscapes depends on the maintenance, restoration and innovation of the low-intensity rural development practices and cultures on which they depend[33]. The multifunctional character of mountain ecosystem management is recognised as a key factor in integrating conservation and sustainable development needs, together with an appropriate connection between the production system and the underlying ecosystem (Gómez Sal & González García, 2007). However, the procedures for achieving such sustainability vary substantially across the various natural and human contexts of the Mediterranean mountains. A joint initiative among international conservation and development organizations and research institutions should help characterize the range of Mediterranean mountain realities, as a precondition for participatory designing and planning actions for large-scale conservation and development. This initiative may include the following actions:

- characterizing the various Mediterranean mountain systems in environmental and socio-economic terms, such as differences in problems and root causes of degradation; differences in cultures and human-nature interaction systems; or differences in social systems and economic opportunities;
- evaluating sustainable options in economic and non-market terms by taking into account multiple dimensions[34] (e.g. biophysical and socio-economic) of sustainability;
- characterizing trade-offs among the various dimensions associated with different development scenarios which are more efficient in the interface between the ecosystem and the production system[35];
- prioritizing those components or dimensions requiring greater attention in conservation and development projects;
- taking an adaptive management approach in the implementation of sustainable development options, monitoring changes over time in the ecological–productive–economic dimensions.

[33] According to the European Environmental Agency (2006), between 25% and 50% of the habitats protected by the Natura 2000 network in southern Europe depend on low intensity agricultural practices for their maintenance.

[34] Gómez Sal & González García (2007) have proposed five dimensions for evaluation: ecological, productive, economic, cultural and social.

[35] This implies the identification of land uses that can be implemented without causing environmental degradation, and supportive policies and market forces that help sustain sound agro-forestry mountain production.

4.2. Mediterranean mountains offer a wide range of traditional management systems which entail potentially sound eco-development scenarios. The maintenance and recovery of such systems are vital for securing basic goods and services. From this point of view, Mediterranean mountains represent national strategic areas which deserve a protection framework at trans-national, national and/or regional levels. Regional organizations should lobby governments to ensure that they recognise this, and classify all major mountain units as conservation areas within their protected areas system. This could be achieved by using 'soft conservation' formats such as Biosphere Reserves, or by recovering traditional communal management systems which have proved effective in the past[36]. New protection formats for mountain areas providing basic environmental services could also be established.

- Organizations like IUCN, WWF and FAO should take the lead in gathering information about different traditional systems for protecting mountain goods and services and compiling good examples in a database which could be made available to anyone interested.

4.3. IUCN should lead a regional initiative to characterize all major Mediterranean mountain types, assess conditions for sustainable scenarios, and develop a sort of *red list* system to raise awareness and highlight the mountains' divergence from healthy environmental and socio-economic conditions.

4.4. Herbivore and grazing systems are a key component of Mediterranean mountain landscapes, which become very sensitive to degradation and biodiversity loss if abandoned or overexploited. Therefore, mountain landscape action plans should be careful to identify sound management practices and innovative mechanisms to maintain or restore sustainable grazing systems. Special attention should be paid to transhumance as a part of heterogeneous mountain landscapes and land uses. The positive experience of rural development in less-favoured areas over recent decades (e.g. Leader programmes) may be very relevant to Third countries, and should be transferred through the EU Neighbourhood policy and other cooperation programmes. Moreover, the experience of mountain rural abandonment and exacerbation of natural disturbances suffered by EU Mediterranean countries can help guide southern and eastern governments in drawing up adequate policies to prevent similar problems in their territories in the future.

4.5. Regional conservation and development organizations should increase their presence in the field and work with individuals and groups in the mountain communities, providing advice on topics such as development opportunities and legislation. They should facilitate access to funding opportunities that may help improve livelihoods, and develop capacity-building programmes to support the institutional development of communal groups, with the aim of raising awareness and providing know-how on sustainable management and business practices. Special attention should be paid to the following target groups:

- young people, who have the task of maintaining traditions and values in the long term; for instance, training in new technologies such as computing is vital for such communities. International organizations should give priority to supporting local NGO projects with local employment objectives linked to natural resource use;

- women, who often suffer the highest illiteracy levels, and bear the burden of the hardest work—gathering fuel-wood at great distances, taking care of livestock, etc. Education at all levels, from basic to the provision of know-how and managerial skills for natural resource management and local business development, and the introduction of new technologies that can aid in reducing the burden of work will all help empower women and reduce poverty[37].

4.6. One of the main challenges in mountain areas is to turn isolation from a handicap into an asset. Education and awareness-raising programmes should be implemented at a national level, and mountain issues should be well represented in formal education curricula from primary schools to universities. The final aim would be to enhance the self-esteem of mountain dwellers and correct the perception that society in general has of mountain cultures.

---

[36] Old communal land management systems like the Spanish law on common land (*Montes Vecinales en Mano Común*) have in the past been very effective in protecting mountain goods and services (Personal communication from A. Gómez Sal).

[37] The OREM Declaration for Mountain Women provides a discussion and guidelines on this issue. See: http://www.mountainpartnership.org/common/files/pdf/OremDeclaration.pdf

4.7. Mountain dwellers, such as farmers and shepherds, should be proud of their profession and conscious of the added value of being the guardians of the mountain territories. However, these professions can hardly fulfil, *per se*, the social and livelihood requirements of the younger generations. Regional conservation and development organizations should lobby the EU, national and regional governments for effective cohesion policies and financial mechanisms (such as compensation payments) that can help to:

- increase and diversify job opportunities, especially for young people and women;
- improve living standards and extend the availability of basic services (such as health, education and transport) to areas that are rapidly becoming depopulated;
- support research into new technologies that can help reduce the burden of work and improve natural resource management, and subsidise the availability of innovative equipment for mountain users.

4.8. Mountain habitats and species depend on low-intensity traditional farming practices, and the EU, national and regional governments recognise their conservation value (between 25% and 50% of areas with low-intensity traditional farming systems are protected in the southern EU countries). Nevertheless, the voices and needs of the mountain people who sustain these farming practices are often ignored in decision-making processes, a fact which runs counter to the ultimate conservation goals. Tailor-made mechanisms for the participation of all stakeholders, especially mountain inhabitants, should be promoted and maintained over time in the development and implementation of Mediterranean mountain action plans. Regional organizations should play a key role in helping intergovernmental agencies and governments to develop and implement pilot schemes for testing such governance mechanisms, and to support the effective and fair involvement of rural actors (e.g. farmers' and shepherds' associations, cooperatives, and NGOs) in decision-making processes.

- This is especially urgent in the mountains of the southern and eastern part of the region. Solving issues like equitable sharing of benefits, clear rights of use, local consensus and inclusiveness of all mountain society members in decision making is vital if conservation and sustainable development goals are to be achieved.
- Lessons from pilot schemes should serve to develop fair legal frameworks with full protection of mountain inhabitants' rights, particularly those of minorities.

4.9. Regional conservation and development organizations should identify a variety of tools (such as the certification of mountains, in accordance with environmental, social, productive and economic principles and criteria) to encourage responsible mountain management systems. They should also promote capacity-building programmes to create the necessary means (such as institutional development and associative systems) and know-how among mountain societies to secure informed, organized, impartial and independent public participation.

4.10 Regional conservation and development organizations should support the Mountain Partnership Secretariat, hosted at the Food and Agriculture Organization (FAO), to promote the establishment of national mountain committees that include several government ministries in order to plan and implement activities in mountain areas in a more comprehensive (holistic and cross-sectoral) way[38]. The UN General Assembly resolutions on sustainable mountain development, which are adopted every two years, may be a good basis for such lobbying efforts.

[38] For further information on good examples of mountain committees, contact the FAO/Mountain Partnership.

Theme 5

The spiritual and cultural significance of Mediterranean mountains

Economic values are often not the only fundamental values for mountain people, who may consider their spiritual connections and cultural roots in the mountains where their ancestors have always lived to be just as important. People whose beliefs link them to nature may become good allies for conservation and sustainable development in mountain areas. A recognition of the spiritual values of mountains and support for local beliefs and cultures based on them may have a very positive effect in harnessing support for mountain conservation among local people and outsiders.

Through the work of the Task Force on Cultural and Spiritual Values of Protected Areas (CSVPA), the IUCN World Commission on Protected Areas (WCPA) can play an important role in redressing the imbalance between the emphasis given to the tangible and intangible aspects of nature conservation and management. This can be accomplished by assisting WCPA members, and interested individuals around the world, to identify and manage the cultural and spiritual attributes of conservation areas as a means of maximizing their contribution to society. The Delos Initiative[39] was launched in 2004 with the aim of

Box 13. Lebanon—Nature and spirituality: engaging religious authorities in forest conservation and rural development

G. Mitri

The Lebanese NGO AFDC (Association for Forests, Development and Conservation) approached the Maronite Church of Lebanon in 1999, and engaged the religious authorities in a dialogue over the protection of the sacred forest of Harissa. The forest of Harissa, with its high environmental and religious values, climbs steeply above the crowded town of Jounieh and its charming bay north of Beirut. Harissa has a typical Mediterranean fauna and flora and is particularly rich in oak and pine species.

The aim of this initiative is to enhance conservation and sustainable development of religiously owned forests in Lebanon, with a special focus on the Maronite church. The majority of Lebanese forests and woodlands are privately owned, and it is estimated that about 40% of these ecosystems are owned by religious authorities—Christian, Muslim and Druze.

The work in Harissa started when the site was declared a protected area, leading to conflicts of competence between the State and the Church. With the help of WWF and ARC, the Alliance for Religions and Conservation, AFDC approached the Church, which in 2000 issued a public pledge to preserve Harissa, declaring it a 'Sacred Gift to the Earth'. In 2003, the Maronite church also declared Qadisha valley (in the north of Lebanon) a Maronite protected environment. The campaign resulted in the declaration of one of the religious feasts, St. Maron John, as a day for environmental preaching. Together with AFDC, the diocese also inaugurated the first eco-religious lodge in Lebanon, in the Monastery of Mar Gerges.

So far, the partnership in Harissa has resulted in a large number of actions, including an update of the forest boundaries and identification of flora and fauna species; capacity-building sessions and workshops; implementation of a Conservation and Eco-Tourism Management Plan for the forest; implementation of a Forest Fire Management plan; building of infrastructure for the forest staff, researchers and visitors, including pilgrims' paths; production of awareness material; and management of biomass to prevent forest fires.

Following these important achievements, the Islamic faith was approached by AFDC in 2003, to expand the engagement of religious authorities in forest conservation and rural development in Lebanon.

Extracted from a case study of the workshop "Mediterranean Mountains in a Changing World"

[39] See: http://www.med-ina.org/delos/

identifying the relevance and meaning of sacred natural sites found in the developed world, and of investigating whether and how spiritual values can contribute to the conservation and wise use of significant natural areas in this part of the world. The focus of the initiative is on sites with high biodiversity and preferably with a definite protection status. Currently, a number of case studies have been selected, many of them related to outstanding Mediterranean mountain areas of Greece (Mount Athos and Meteora), Italy (Foreste Casentinesi NP), Spain (Montsant NP and Montserrat NP), and Morocco (Jabal La'lâm in the Rif mountains).

Since ancient times the Mediterranean mountains and their environmental features (such as forest stands) have included sacred places. These areas have been of particular value for nature conservation, as people have traditionally protected them because of the spiritual values they symbolise. In specific cases, as in many mountain areas of North Africa and the Middle East, sacred mountain forests are nowadays the last remnants of the primeval forests and are of extraordinary ecological value, in addition to their social and cultural value. This is the case of the North African *khaloas*, shrines with the remains of honoured local figures located in forest groves. Devotees visiting these areas have traditionally respected their natural vegetation, in accordance with pre-Islamic and pre-Christian traditions. The mountains of Northern Morocco harbour numerous *khaloas*, which in most cases form scattered forest islands with the last remnants of the original forest cover still in quite pristine condition.

Social conflicts, illegal land uses such as kif cultivation, and poverty are currently threatening these very valuable natural sites. Strengthening and promoting local traditions and spiritual approaches to nature can help protect these unique examples of the potential vegetation of the North African mountains. Nevertheless, this will only be possible if acceptable local livelihoods and living standards are guaranteed.

Guidelines

5.1. While the spiritual value of sacred sites in mountain areas is generally well recognised by people, the environmental value which sometimes goes with the spiritual character of the sites is often ignored, or damaged. In many cases, the spiritual value of the sites dates back to a time before current religious beliefs, and the people's bond with the place is both emotional and cultural. The disconnection of the cultural or spiritual value from the natural environment, the lost of old spiritual traditions, and the lack of awareness, have often caused (or are causing[40]) the degradation or destruction of these sites. Because of this, there is a need for conservation and development organizations and the relevant national public institutions to jointly undertake awareness-raising and educational actions, so as to highlight the environmental value behind the spiritual, emotional and cultural character of the sites, and to increase the environmental concern of people visiting these areas.

5.2. Regional conservation and development organizations should identify opportunities to take advantage of the beliefs and attitudes held by mountain communities about their environment, which could function as a powerful force to preserve the integrity of these places. Such values and ideals can profoundly influence people's views and attitudes in social and environmental terms. In order to be sustainable over the long term, environmental policies and programmes need to take into account, recover and enhance this type of special links between mountain communities and their environment, especially in highly threatened areas where they are still alive, as in the North African *khaloas*.

5.3. Sacred natural places in mountain areas, like the North African *khaloas*, are of extraordinary value. These sites are often found within seriously degraded regions, where they stand out as relatively pristine patches of vegetation, with particular value as reference ecosystems for mountain landscape restoration. Moreover, such forest relicts are vital vis-à-vis global change, as they constitute natural laboratories to monitor the responses and resilience of unaltered natural vegetation to climate change impacts[41]. Regional organizations should take the lead in developing pilot projects on the climate change adaptation of mountain relict forests, in some cases addressing the opportunities that spiritual value can offer to improve the environmental and socio-economic

[40] At least three *khaloas* have recently been burnt in the Al Hoceima National Park, Morocco (personal communication from Mohamed El Andalusi, AZIR NGO).

[41] These relict forests may contain unique gene pools with high phenotypic plasticity, which has allowed them to face multiple global changes in the past. They may represent very valuable areas for conservation and their species populations may have an important role to play in adaptive management strategies against climate change.

conditions of mountain biodiversity hotspot areas. This may be very useful in places undergoing accelerated degradation where social resistance to pure conservation arguments may be high, as in North Africa[42].

5.4. Sacred mountain sites and symbolic mountains and natural features (rocks, forests, monumental trees, springs, caves, etc.) with a strong emotive and cultural value, may have played a major role in conserving nature in the past, and can still play such a role in many places. Regional organizations and governmental environmental institutions should identify appropriate mechanisms to enhance the connections between mountain nature and traditional cultures, and use environmental education and awareness-raising programmes to promote the unique values of mountains. These include:

- their highly healthy environment;
- their isolation, altitude and ruggedness, which arouse strong emotions and spiritual, meditative attitudes;
- the medicinal and culinary properties of many mountain plants;
- the symbolism of biophysical features which are linked to the identity of mountain people.

5.5. Specific protection measures for mountain species and habitats with outstanding 'positive' cultural significance (e.g. species symbolising good aspects of life or bringing good luck, and medicinal species) as well as 'negative' ones (e.g. species thought to bring bad luck or to be enemies) should be established in nature protection and forestry legislations. This is particularly necessary in cases where the traditional collecting of plants and animals has lost its cultural significance, or has exceeded sustainable harvesting rates. Conversely, too strict protection measures may hinder traditional sustainable practices and contribute to the disappearance of important cultural values.

- Regional conservation and development organizations should work on the human dimension of wildlife conservation as part of their programmes in mountain areas. This is a very valuable tool for understanding people's attitudes towards mountain wildlife and designing specific awareness and education initiatives that can reverse negative attitudes and enhance positive ones[43].

5.6. Ways to enhance the spiritual and cultural values of mountain areas and mountain biophysical features include the following:

- undertaking research work to recover ancient cultural references (e.g. the reference to nature conservation in the Berber songs of transhumant shepherds in the High Atlas) and their significance for mountain conservation;
- developing good communication and education activities that help mountain people and societies in general to learn about their ancestral historical/cultural mountain references[44];
- finding new ways to tackle the spiritual concept: 'spiritual' is a very broad term with different meanings for different people, which has to be approached carefully in order to avoid hurting the sensitivities of religious communities and non-religious people alike;
- planning and carrying out effective participatory processes to solve conflicts between nature protection and spiritual/cultural traditions[45];

---

[42] The *khaloas* in Al Hoceima National Park (Morocco) represent a very good opportunity for addressing climate change adaptation in mountain forests and societies, with their outstanding and critically endangered social, cultural and environmental values (personal communication from Mohamed El Andalusi, AZIR NGO).

[43] Good examples of addressing the human dimension of wildlife conservation have been applied to large carnivore species (the Barbary deer; the wolf, the brown bear and the Iberian lynx) in a number of Mediterranean and bordering countries.

[44] The use of festivals seems to have good conservation and awareness-raising effects in the High Atlas (Morocco) according to M. Noussairi, UNDP/Morocco.

[45] An example of this is the experience of the Andalusian Regional Government in solving conflicts between religious brotherhoods and nature conservation in Doñana National Park.

- adopting a broad-focus approach to the spiritual and cultural values of mountains, looking beyond the specific buildings and/or biophysical features visited by people in mountainous areas.

5.7. Religious hierarchies and institutions often hold major nature conservation responsibilities as the owners of important natural sites in mountain areas and as spiritual leaders. NGOs can play a key role in helping religious hierarchies and institutions improve the environmental management of the land they own, which often include relatively untouched forest hotspots. The dialogue between religious institutions and conservation organizations should be enhanced, and interdisciplinary eco-religious programmes involving local communities in awareness and education programmes, as well as job creation, should be set up. The work of AFDC—a Lebanese NGO—with the Maronite Church is an excellent case study that should be visited and used as inspiration for similar initiatives elsewhere in the region. AFDC's eco-religious programmes have contributed to fostering dialogue between Muslim and Christian churches and communities in a country well known for its political conflicts.

The Delos Initiative[46], launched within the framework of the IUCN Task Force on Cultural and Spiritual Values of Protected Areas (CSVPA), is active in the Mediterranean region and has developed a set of guidelines to help understand how religion can assist nature conservation. These include:

- understanding the position of the religions and spiritual traditions found in Mediterranean countries on nature and on the sanctity of natural sites;

- assessing the relevance and importance of sacred natural sites to contemporary people and attempting to estimate the significance of their spiritual value;

- studying how this spiritual value can be maintained and enhanced and investigating whether and how these values can contribute to the conservation of sites;

- attempting to resolve any conflicts between the spiritual character and uses of sacred sites and conservation and management requirements, establishing synergies instead, where possible.

[46] http://www.med-ina.org/delos

Theme 6

Innovative rural development policies and mechanisms for investing in mountain resources to provide economically viable livelihoods

Mountain resources can be split into two broad categories (Pratt & Shilling, 2002):

- resources whose economic value is based on their extraction or exportation as commodities for lowland beneficiaries;

- resources whose economic value to local and downstream beneficiaries results from the environmental services they render by remaining intact and in place.

In order to ensure a sustainable flow of resources to national and global populations, policy makers must develop and implement mechanisms which capture and reallocate an appropriate share of benefits from resource outflows to mountain communities.

Valuing mountain goods and services

People may agree to make the efforts and bear the monetary costs required to assure sustainability in mountains if they clearly understand the value of doing so. Mountains produce goods (including timber, non-timber forest products, and water) and services (such as hydro-power, carbon storage, and recreation), the economic value of which is quite easy to measure. Historically the economic value of most resources has not been measured, and management decisions about the production priorities of mountain areas may have under-estimated the economic losses caused by intensively managing the areas for just one or two products, like timber or livestock. Moreover, the price of maintaining intact mountain ecosystems in order to secure services for downstream beneficiaries, such as water, is not being considered and mountain communities, as suppliers, do not derive appropriate benefits from diminishing their extractive activities or resource needs in order to be compatible with downstream resource demands.

The first challenge, therefore, in equitably compensating mountain communities as stewards and thus ensuring a sustainable outflow of resources, is to identify and value resources as accurately as possible. Once the values of resources are identified and recognised, mechanisms can be employed which capture this value and redirect it from downstream users to mountain communities. In addition to traditional economic tools, innovative environmental valuation techniques provide a means for attaching economic values to many of these resources which traditionally have not been measured. As an example, the EU-funded MEDMONT project aims to develop an integrated methodological framework to support and monitor investment decisions for sustainable development in Mediterranean mountain areas (Halkidiki Prefecture in Greece; Belluno Province in Italy; Corsica in France; the Aljibe mountains in southern Spain; and the Gorisko and Idrisko region in Slovenia). The Mediterranean regional office of the European Forest Institute (EFIMED)[47] is also active in modelling, valuing and managing goods and services in Mediterranean forest ecosystems.

Multiple uses of mountain natural resources

Mediterranean mountain landscapes change rapidly over short distances and have unique, highly diverse, mosaic-like vegetation cover, with varied ecosystems and rich floras. Traditional management practices have further enriched this spatial complexity, reinforcing the environmental variety and diversity of mountain landscapes (with unique and varied pastures, arable systems and managed forests) as well as their economic potential. To be ecologically sustainable and economically viable, Mediterranean mountain resource exploitation should be based on multiple uses of these heterogeneous landscapes. The ideal situation is one of local economies diversifying around several mountain products that occur in the same area, providing complementary, year-round working opportunities and all together proving to be economically viable, while guaranteeing sustainable harvesting, fair and equitable sharing of benefits, and the maintenance of healthy ecosystems.

Since 1975, the European Union has been assisting mountain regions while recognising the vulnerability and vital role of these high-quality living spaces and ecologically outstanding sensitive areas. In spite of the fact that mountains are not mentioned in the treaties of the European Union, the EU has taken into account the special circumstances of mountain economies in several wider policy frameworks addressing economic development, infrastructure and environmental issues. The aims of supporting less-favoured areas (LFAs) in general, and mountain regions more specifically, are: (a) to strengthen the

[47] http://www.efi.int/portal/efimed

agro-forestry sector and promote its multi-functional role, (b) to help maintain a viable rural community and improve the competitiveness of mountain areas, and (c) to preserve the mountain environment and natural heritage through sustainable farming systems. Under the CAP, numerous measures targeting mountain agro-forestry have been adopted:

- compensation payments recognising the role that farmers play as managers in natural landscapes with environmental constraints (LFAs); payments are calculated per hectare and are conditional on the farmer's adoption of good farming practices;

- payments for improving or maintaining suitable mountain forestry practices, aimed at enhancing the multi-functional role of forests, and for the environmental restoration of marginal agricultural land back to forest land; payments per hectare are made to landowners, associations and municipalities for afforestation, for increasing the economic, social and ecological benefits of forests, for promoting

Box 14. The EU LEADER Initiative[48]

The EU LEADER initiative (*Liens entre actions de développement de l'économie rurale*) started in 1991 and was run in three phases (LEADER I, LEADER II and LEADER +). LEADER viewed local people as the principal asset of rural areas, and aimed to find innovative and integrated or multi-sectoral solutions to rural problems, through partnerships with key public and private local development actors (local action groups, or LAGs) and by stressing the importance of national and trans-national networking and cooperation.

LEADER funding came from three Structural Funds (the European Regional Development Fund (ERDF), the European Social Fund (ESF) and the Guidance Section of the European Agriculture Guidance and Guarantee Fund (EAGGF)) and in the last phase from a single funding source, the Directorate General for Agriculture and Rural Development. Between 1991 and 2006 over 2,100 LAGs were approved with a total investment of around €4,920 million. The LEADER development themes were:

- New technologies and know-how for the competitiveness of products and areas (training and employment assistance for rural tourism, small firms, craft enterprises, local services and agri-marketing);

- Quality of life in rural areas;

- Adding value to local products;

- Making the best use of natural and cultural resources.

Particularly important LEADER projects are those that reinforced local identity and self-respect; linked local sectors such as farming and tourism; commercialised cultural and environmental assets; developed new applications of information and communication technologies; and revived unique local skills such as wool weaving and traditional cooking through the training of young people and women and job creation. Successful issues that have emerged during the various LEADER programmes are:

- the nature and success of the local partnerships, which have several roles: fund-raising; building a pool of human resources and know-how; sectoral integration, by engaging public and private actors; and building social capital through networks and trust;

- the concept of innovation, with a bottom-up approach based on the ideas of local people and the adaptation of traditional know-how;

- the notion of community involvement, with the fundamental challenge of ensuring that it is an integral part of all stages of the development project;

- the transferability of solutions among rural areas through networking.

[48] Source: Bryden (2006).

new markets, for preventing physical risks and for restoring damaged areas;

- payments for improving or maintaining suitable grazing practices and preventing the abandonment of highly diverse pastures; a supplementary premium is now to be paid to farmers in areas where goat and sheep production is of special value to the local economy and for maintaining valuable landscapes and ecological flows, such as transhumance;

- funding support for diversifying mountain farmers' incomes (by developing rural tourism, for instance) and for developing and promoting high-quality mountain products (e.g. financial incentives to take part in EU or national quality designation systems for final products and production processes, such as geographical indications);

- agri-environmental measures recognising the essential role that mountain farmers play in providing environmental services: incentive payments are made to farmers who sign up voluntarily to agri-environmental commitments for a minimum of five years, and are calculated according to the loss of income and additional costs resulting from these commitments (e.g. less fertiliser use, lower livestock densities, organic farming, upkeep of the landscape and habitats of high biodiversity value, and preservation of farm animal and plant species in danger of being lost);

- special aids for farmers in areas with specific environmental restrictions (e.g. Natura 2000 sites).

Evaluations[49] of the 2000–2006 implementation period of the EU rural development programme conclude that it had the following positive effects: better protection of the natural and cultural values of mountain landscapes, better communication between mountain and lowland realities, and some reduction in mountain population decline thanks to economic diversification and improvements in the quality of life. A fundamental element of the EU rural development policy is that local actors have a strong say in the local application and spending of the policy measures. Nevertheless, the CAP needs to refine its objectives in mountain areas, and establish better measures to fight unemployment.

The new single instrument to finance EU rural development policy for the period 2007–2013, the European Agricultural Fund for Rural Development (EAFRD), entered into force on 1 January 2007. The use of a single fund aims to improve the competitiveness of agriculture and forestry, the environment and rural land management, as well as improve quality of life and diversify the rural economy. The EAFRD will also finance local development strategies and technical assistance (Leader-type projects) relevant to mountain areas.

FAO and the Mediterranean Agronomic Institute (IAM) are jointly assessing opportunities for sustainable development in Mediterranean mountains based on the promotion and protection of local products. The FAO Mountain Products programme[50] has analysed a number of mountain products from Morocco, Algeria, Tunisia, Jordan, Syria, Lebanon and Turkey. A pilot development phase is planned in the Moroccan Anti-Atlas, based on Argan oil, olive oil and saffron.

Quality as a mountain asset

In the current global market mountains could have a clear advantage due to their unique, relatively unpolluted natural environment and cultural values, which could result in very high-quality products. EU agricultural reform includes increased payments for mountain areas under the Less-Favoured Areas scheme and aids to encourage quality food production. In the EU, only France and Italy have specific public schemes for mountain agro-food products (for example, 28 French cheeses with protected designation of origin are located in mountain areas).

New marketing opportunities for linking mountain cultural and natural goods

Supporting institutional development and skills training for mountain producers' associations not only helps to increase product quality and reduce production costs, but also provides better opportunities for developing very effective marketing and communication strategies. There are valuable examples where local producers have invested considerable effort in promoting not only high-quality products but also all the outstanding social, cultural, emotional, aesthetic and ecological values that make their forest landscapes unique. The main objective is to make local mountain products a flagship for the area, in terms of both natural and human landscapes. The region thus becomes very well known regionally, nationally and internationally on account of the good reputation of its flagship products. This has helped increase consumer demand in most cases, as people do not just look for a high-quality product but also for the added value of tradition and nature associated with it. This marketing strategy has also helped to

[49] By the European Environment Agency.

[50] http://www.mountainpartnership.org/mpp/index.html

expand and strengthen the service sector linked to the sustainable management and production of mountain resources[51].

Payments for environmental services (PES)

The survival of mountain communities depends on the recognition of the positive externalities these areas offer to the rest of the world. Innovative mechanisms are needed to protect mountain ecosystems, to provide incentives for communities to continue in their stewardship roles and, ultimately, to maintain the very resources on which national and global populations depend (Pratt & Preston, 1998). These measures should aim to generate and redirect revenue from mountain services to downstream beneficiaries to support sustainable uses of mountain resources *in situ*, as a way to ensure that the flow of environmental goods and services will be sustained. During recent years, political and institutional momentum has been building up to develop mechanisms to mobilize funding from mountain services linked to water supply and carbon sequestration. Examples from around the world already demonstrate that enterprises and governments are ready to pay for those services, and invest revenues in maintaining and restoring good management practices in mountain areas. Moreover, several countries are developing different taxation mechanisms to cover the costs of maintaining intact ecological conditions in mountain areas and compatible management practices.

In spite of the benefits that payments for environmental services can provide to mountain conservation, CIFOR scientist Sven Wunder warns that implementation of PES will present trade-offs between conservation efficiency and fairness. 'While such payments will likely serve both climate and forest-related objectives, they will present tough choices between efficiency and fairness. 'The ideal PES recipient is not the environmentally benign community too poor to do much harm to the forest, but rather the guy who had enough capital to buy a chainsaw, and is on the verge of putting it to work. Does that sound fair to you?' (Wunder, 2007).

The Croatian government has undertaken an extensive survey of local inhabitants and tourists visiting the Dalmatian coast and islands to find out how much users were willing to pay for the environmental services provided by forests. The results were very challenging, as the main reason for coming to the area for 68% of the tourists was linked to the recreational and scenic values of forests, and they were ready to pay for their maintenance[52]. As far as the local population was concerned, 72% considered that the economic value of their properties would diminish if forests burned. This has proved to be a very useful tool for spatial planning, for negotiating with the tourist sector regarding where hotels should be built and how the environment should be kept, and for taking users' needs into account in forest restoration decision making (Vuletic et al, 2000; Marusic et al, 2005).

[51] In order to take advantage of the quality of local mushroom production and boost profits for forest owners and harvesters, the comunalia members of Albereto and Borgotaro (Parma) and Pontremolli (Massa Carrara) in Italy, established the consortium "Fungo di Borgotaro" (http://www.fungodiborgotaro.com). As with many other Non Timber Forest Products (NTFPs), mushrooms are perceived as the most traditional and environmentally friendly products of the rural economy and the Borgotaro Boletus is flagship for the territory. This is why, after the Protected Geographical Indication (PGI) certification of Borgotaro mushrooms, a complementary initiative in territorial marketing was organized in 2000: an itinerary La strada del Fungo Porcino di Borgotaro (http://www.stradadelfungo.it) which connects restaurants and agro-tourism enterprises offering dishes and specialities based on the local Boletus with promotion of the whole territory. Tourists see beautiful landscape and there are restaurants offering mushroom specialities combined with other food typical of the region, like the Prosciutto of Parma. Autumn fairs and markets attract up to 50,000 people per year and provide income to restaurants, hotels, etc. As a consequence house prices are increasing and old farm houses have been saved (Pettenella & Kloehn, 2007).

[52] US$0.97/person/night.

Box 15. The value of certification in safeguarding natural capital and improving living standards in mountain landscapes: the WWF Cork Oak Landscapes Programme

N. Berrahmouni

The long-term goal of this programme is 'to restore and maintain healthy cork oak landscapes which provide sustainable livelihoods for the local population and ensure conservation of biological resources'. To achieve this goal, the programme has defined four interconnected purposes:

- good management practices, using tools such as FSC certification and Forest Landscape restoration;
- market incentives, promoting environmentally sound and socio-economically viable FSC-certified forest products from cork oak landscapes, and encouraging responsible purchasing attitudes throughout the supply chain, from the processing industries to the consumers;
- policy instruments, supporting good governance and the equitable sharing of benefits from cork oak forest products;
- capacity building and partnership, promoting cooperation and the sharing of know-how and expertise among practitioners from countries hosting cork oak forest landscapes.

Certification helps to identify those areas where improvements can be made to ensure that biological diversity is conserved together with its associated values, such as water resources, soil and ecological functions. FSC certification also helps address social issues through open, multi-stakeholder participatory processes.

This programme supports FSC certification as a tool which can help solve chronic problems associated with interrelated environmental, social and economic issues, which prevent the achievement of sustainable development goals in the North African mountain context. The programme has adopted a step-wise approach as follows:

- Lobbying the wine industry first of all to choose cork instead of non-natural substitutes (plastic or screw tops) and subsequently to choose FSC-certified cork not only helps maintain the economic sector that depends on cork, but also has important benefits both environmentally (by maintaining healthy cork oak ecosystems, and supporting the use of renewable materials) and socially (by improving living standards, access rights and livelihoods).
- The wine industry's demand for cork and for FSC-certified cork drives the cork processing industry to push for FSC certification on the ground, thus providing a long-lasting basis for best management practices that guarantee basic environmental, social and economic conditions.
- The cork processing industry's demand for certified cork puts pressure on landowners, which in the case of North Africa are the public authorities, to apply for FSC certification of their forest land; this implies a number of obligations (e.g. improving legislation and governance mechanisms, granting access rights to local communities and developing co-management frameworks) that have a positive effect on the mountain ecosystems and inhabitants.

The programme and the FSC partners have produced the following results so far: The first ever FSC-certified wine producers and traders using FSC cork stoppers (Bodegas Dagón in Spain; Willamette Valley winery in Oregon/US; African Dawn wines in South Africa). Cork producers in Portugal (Amorim Group, Piedade SA, Sá & Sobrinho SA, and Cork Supply Group Portugal) and Spain (Espadán Corks) have certified their chain of custody making FSC cork stoppers available in the market. Currently there are about 30,000 ha of FSC certified cork oak forests in Portugal, Spain and Italy, and more than 50,000 ha are under progress. National working groups for the development of FSC standards for responsible forest management are in place in Portugal and Morocco. Moreover, the programme is working with local community groups to support the diversification of their economies, based on a wide range of cork oak forest products and services, including ecotourism activities.

Guidelines

6.1. Regional conservation and development organizations together with research institutions should identify Mediterranean mountain goods and services and value them in economic and non-marketable terms as accurately as possible. This is a necessary step to capture such value, and redirect it from downstream users to mountain communities. This would also help distribute the costs of securing positive mountain externalities (such as high-quality water resources) and preventing negative ones (such as forest fires), so that these costs are covered by society as a whole and not just by mountain dwellers. The following recommendations should be considered:

- In addition to traditional economic tools, innovative environmental valuation techniques provide a means for attaching economic values to many resources which traditionally have not been measured[53].

- It is also important to evaluate in economic terms what is lost if we do nothing to cover the costs of securing markets for externalities, i.e. the cost of restoring what we destroy, whenever possible.

6.2. IUCN can play an important role in informing governments and decision makers about the values of Mediterranean mountain externalities, and in providing success stories on different policy and market mechanisms which have been effective in securing their costs. The final goal is that governments and decision makers legally recognise the obligation that societies have to cover the costs of maintaining environmental services, and adopt or promote different policy mechanisms[54] for securing them.

- Governments and the private sector (e.g. the tourism sector) should carefully analyse opportunities for payments for mountain environmental services (PES), keeping in mind the possible trade-offs between conservation efficiency and fairness that CIFOR warns about.

6.3. Since Mediterranean mountains are the centre of origin of numerous domestic animals and plants, special efforts should be made to value and secure the gene pool of endangered mountain breeds and wild ancestors of domestic flora and fauna.

- Innovative management systems and business opportunities (e.g. locally based wild plant production instead of harvesting from the wild; new energy production opportunities such as biomass; responsible tourism) should be developed with the support of research and conservation/development organizations, and should be transferred to local community groups. This should be done in the framework of integrated conservation and development programmes, which include capacity-building support (institutional development, training, education, etc.), governance mechanisms (participatory decision-making and collaborative management systems, etc.), legal protection (such as regulation policies favouring mountain inhabitants' access and rights to mountain resources), and incentive policies (subsidies, market opportunities, etc.).

6.4. The competitive advantage of less-favoured areas, such as mountains, increasingly depends on values that are less mobile (high-quality products and services sold *in situ*, including tourism) and less tangible (cultural values; aesthetic, relaxing, emotional and inspiring values of mountain landscapes). Therefore, it is necessary to develop specific and varied funding opportunities and measures to restore the environment–development balance in mountains and to make the mountain economic sector competitive. The measures for doing so should build on the lessons learned from the EU rural development policies for less-favoured areas, especially the Leader programmes. Economic assistance to Mediterranean mountain farmers to help them diversify their income may be innovative and/or adapted from funding schemes such as the EU rural development programmes. They may include:

- diversification of farming activities through the encouragement of tourist and craft activities, training schemes, and improvement of infrastructure; direct selling by a diversified economic system based on

---

[53] For further information, see http://www.medforex.net

[54] Direct regulation policies (i.e. environmental standards, licenses for nature resource use, regulations with technical specifications); Incentive policies (i.e. less taxes to mountain communities; taxes to protect mountain products against similar products from abroad with lower prices; subsidies; market opportunities); Decentralise policies.

non-timber forest products, agricultural products and tourism services, aiming to ensure overall sustainable development;

- compensation for constraints (compensatory allowances) to people who adopt good farming and forestry practices in less-favoured mountain areas;

- agri-environmental incentives and compensations, supporting land uses linked to mountain biodiversity (e.g. transhumance and high-mountain pasturing) and organic farming and quality products;

- investment aid to innovate, diversify and strengthen the mountain farming sector, with special focus on reducing environmental damage (e.g. new technologies in cork harvesting, fire-break design, and management through pastoral activities and truffle growing), the production of quality food products, as an environmentally friendly agricultural production sector on its own or coupled with tourism;

- development of new marketing opportunities, including certification and labelling, to promote the advantages of mountain regions, such as their ability to supply "authentic", high-quality products linked to cultural values and attractive to urban dwellers.

6.5. The socio-economic progress of Mediterranean mountain communities should be promoted in a sensitive way. Opportunities for raising living standards, increasing working opportunities and improving people's livelihoods should obviously not impact the mountain environment, lifestyles and cultures, as these values represent the very basis of the competitive advantage of mountains.

- Access is a priority for mountain communities, and the improvement of communication systems between mountains and lowland areas is a key issue in the effort to revitalize rural mountain sites. Nevertheless, the improvement of communications (e.g. roads) should be based on existing networks, preventing environmental impacts and in some cases controlling access to outsiders, so as to avoid uncontrolled actions with an adverse impact on the environment and culture[55].

- The overall improvement of mountain communities requires a synchronised investment plan in every mountain region. By doing so, the improvement of social services, local skills, governance systems, income generation opportunities, markets and policies will go hand in hand, and will be more effective in raising the competitive advantage of mountains and in preventing depopulation.

- It is important to avoid perverse situations, where mountain communities end up depending on subsidies for their subsistence, and no efforts are made to use these funds to enable people to develop new, competitive economic activities. It is thus recommended that long-term conservation and development programmes support local development through credits or revolving funds[56] instead of subsidies.

6.6. International NGOs and intergovernmental organizations should focus on strengthening grassroots NGOs active in mountain regions, especially by developing institutions and building skills to address the complex interrelation between mountain conservation and development. Moreover, international organizations should lobby national authorities to increase government recognition of the role of the civil society in mountain areas.

[55] New roads may indirectly cause new or more intense hunting pressure on endangered species living in remote mountain areas. TEMA Foundation provided examples from Turkey at the IUCN Mediterranean Mountains Workshop in December 2007.
[56] Revolving funds are producing good results in Morocco (personal communication from Myriem Noussairi, UNDP Morocco).

6.7. Governmental and international cooperation is a key factor for the success of economic policies that support the improvement of product quality and provide vital marketing tools to raise mountain people's income and pay for the environmental services provided by Mediterranean mountains[57].

- Trans-boundary cooperation on mountain tourism represents a good opportunity to strengthen socio-economic and environmental links between mountain communities in neighbouring countries[58].

6.8. In the case of North Africa and the Middle East, international NGOs and intergovernmental organizations should influence and support governments to undertake policy reforms that empower mountain communities in the management of their resources. Prerequisites for succeeding in this challenging but critical task are:

- skill development at different levels within the administration (e.g. ministerial decision makers, forest and agriculture managers, and local authorities), grassroots community groups and NGOs, on managerial, legislative and technical issues;

- development of specific participatory, consensus-oriented, accountable, transparent and effective processes to obtain the trust of local people and take their views, know-how and needs into account;

- field-testing of small-scale pilot schemes to find out what steps are needed in each mountain context to succeed in this process.

[57] The Euromontana Convention on 'Unlocking the Mountains' (2005) proposed a European Charter on Mountain Products in order to enhance their value for society, to promote their production and to create synergies between upland and lowland actors in the supply chain. Five basic principles are proposed: (1) raw materials must be derived from a mountain region; (2) processing must be carried out in a mountain region; (3) production must take into account local concerns relating to sustainable development; (4) production must attempt to maintain the biodiversity and heritage of mountain regions; (5) production must be able to guarantee at all times the transparency of information to consumers.

[58] i.e. TEMA Foundation mentioned during the IUCN Mediterranean Mountains Workshop. The case of trans-boundary tourism in the Caucasus region between Turkey and Georgia.

Theme 7

Specific legal frameworks and institutional settings for the Mediterranean mountains

A few years after the Rio Summit, a number of nations established institutions concerned with the sustainable development of their mountain areas, and others, particularly in Europe, developed laws and policies to this end (Price, 1999). In the Mediterranean region, so far only France, Greece and Italy have developed mountain-specific legal instruments, while Morocco is about to draw up a mountain law. In Italy, mountain legislation has been developed at a subnational level: most mountainous regions enacted mountain laws between 1996 and 2000.

An analysis of national provisions (Villeneuve, *et al.*, 2002) reveals a number of similarities which may be summed up as follows:

- National laws define the term 'mountain', setting parameters to demarcate their area of application. Altitude is the most significant criterion due to the fact that at certain altitudes living conditions become much more difficult and precarious than in the lowlands.

- Promoting the protection and development of mountain areas is the primary aim of most laws relating to mountains.

- Respecting the cultural identity of mountain communities is a further aim pursued by a number of laws.

- Sustainable development of mountain areas is another common legislative aim.

- The administrative organization of mountain areas usually leads to the establishment of specialized institutions. For example, in France, Act 85-30 established such structures at two levels: first, at the central level, the National Board for Mountain Development, Management and Protection coordinates government action in mountain areas; second, for each mountain range—seven altogether—a committee issues opinions and proposes management, protection and development measures. Local inhabitants are involved in decision-making processes (Decree 85-994). Similarly, the Greek law makes provision for the adoption of specific legal texts for each of the country's mountainous areas.

- Promoting the economic dimension of mountain development by encouraging mountain dwellers to develop their own resources is the main aim of most national laws. To this end, special funds are usually set up:

  a) The Italian national mountain fund established under the 1994 Act is funded by contributions from the State and the municipalities. Funds are distributed among the regions and the autonomous provinces. The latter establish their own regional mountain funds and decide how they are to be allocated.

  b) The French national land use planning and development fund is designed to pool credits earmarked, *inter alia*, for mountain development (Act 95-115).

- Agriculture occupies an important place in many mountain laws. In France, agriculture is acknowledged as being of public interest inasmuch as it is essential for the mountain peoples (Section 18 of Act 85-30, incorporated in Section L.113-1 of the rural code).

- Some laws deal with local products, usually crafts, from mountain areas. France awards a special label to such products as a guarantee of their quality and to promote local production (Act 85-30). Awarding of the 'mountain' label is subject to conditions laid down by Decree 2000-1231. In Italy, a similar label is awarded to products made in mountain areas (1994 Act).

- In an effort to prevent unsustainable mountain tourism development from undermining its natural and cultural environment, legislators have placed certain restrictions on mountain tourism. In France, Act 85-30 devotes an entire chapter to the running of tourism facilities and the management of ski lifts and ski runs, which must be operated under the supervision of the local authorities. For all new operations, contracts must be drawn up between the promoters and the local authorities, thereby allowing for some control over tourism development.

- National laws seek to improve the living standards of mountain communities by providing conditions comparable to those enjoyed by the lowland population. Recommended measures include the improvement and development of infrastructure and the enhancement of public services in mountain areas. In France, Act 85-30 provides for improving the efficiency of radio and television broadcasting.

In Italy, local public services in mountain communities must open information offices to remedy communication shortcomings and must give their inhabitants free access to non-confidential information available to them (1994 Act).

- Mountain people have an unrivalled knowledge of their environment. However, they must be in a position to capitalize on and transmit that knowledge using the appropriate tools. In France, school and university education and teaching programmes must take into consideration the specific environmental, economic and social values of mountains.

- Provisions to protect the fragile mountain environment are commonly included in laws pertaining to mountains, as well as in related texts (laws governing forests, water, soils, the environment, land use planning, etc.). In Italy, water management, reforestation and erosion control measures may be adopted for environmental protection purposes, including the expropriation of lands that require conservation (1971 and 1994 Acts).

In 1999 the Moroccan Ministry of Waters, Forests and the Fight against Desertification started to draft a policy framework for the conservation and integrated development of mountain areas, with a set of ongoing consultation and participatory workshops and meetings involving authorities, local leaders, technicians, researchers and NGOs. This specific policy framework has two main objectives: decreasing the socio-economic imbalance between mountains and lowlands, and combating poverty by stimulating self-governance. The achievement of these objectives will be based on the following strategy:

- promotion of a territorial approach to provide the necessary means for mountain inhabitants to organize themselves and mange their natural resources;

- integration of sectoral policies and activities ensuring local involvement in their implementation;

- adoption of a participatory approach for the conservation of natural resources;

- establishment of economic incentives (national solidarity) for the mountainous communities.

Considering the human and natural specificities of the various mountain chains, the Moroccan Directorate for Land Use Planning is leading the preparation of Development and Management Strategies for the main mountain chains of the country. This is part of a preliminary phase to define the principles on which the mountain law will be based. A pilot phase in the Middle Atlas Mountains is being implemented.

Guidelines

7.1. Specific legal frameworks and institutional settings are needed for mountain societies, and Mediterranean nations may follow the examples of countries like Italy and France, or develop *ad-hoc* frameworks for their own mountain legislation. To be effective and efficient, mountain-specific legal frameworks should:

- address in a coordinated, integrated, balanced and coherent manner the various aspects of sustainable development, such as forestry, agriculture, transportation, culture, education, health, economy, environment, biodiversity, tourism and mining;

- respect the cultures, protect the rights, promote the well-being and ensure the participation of the local communities in mountain areas, with a special focus on minorities;

- establish institutional frameworks that promote and facilitate dialogue and consensus among the various stakeholders and discuss interests in a multi-sectoral context;

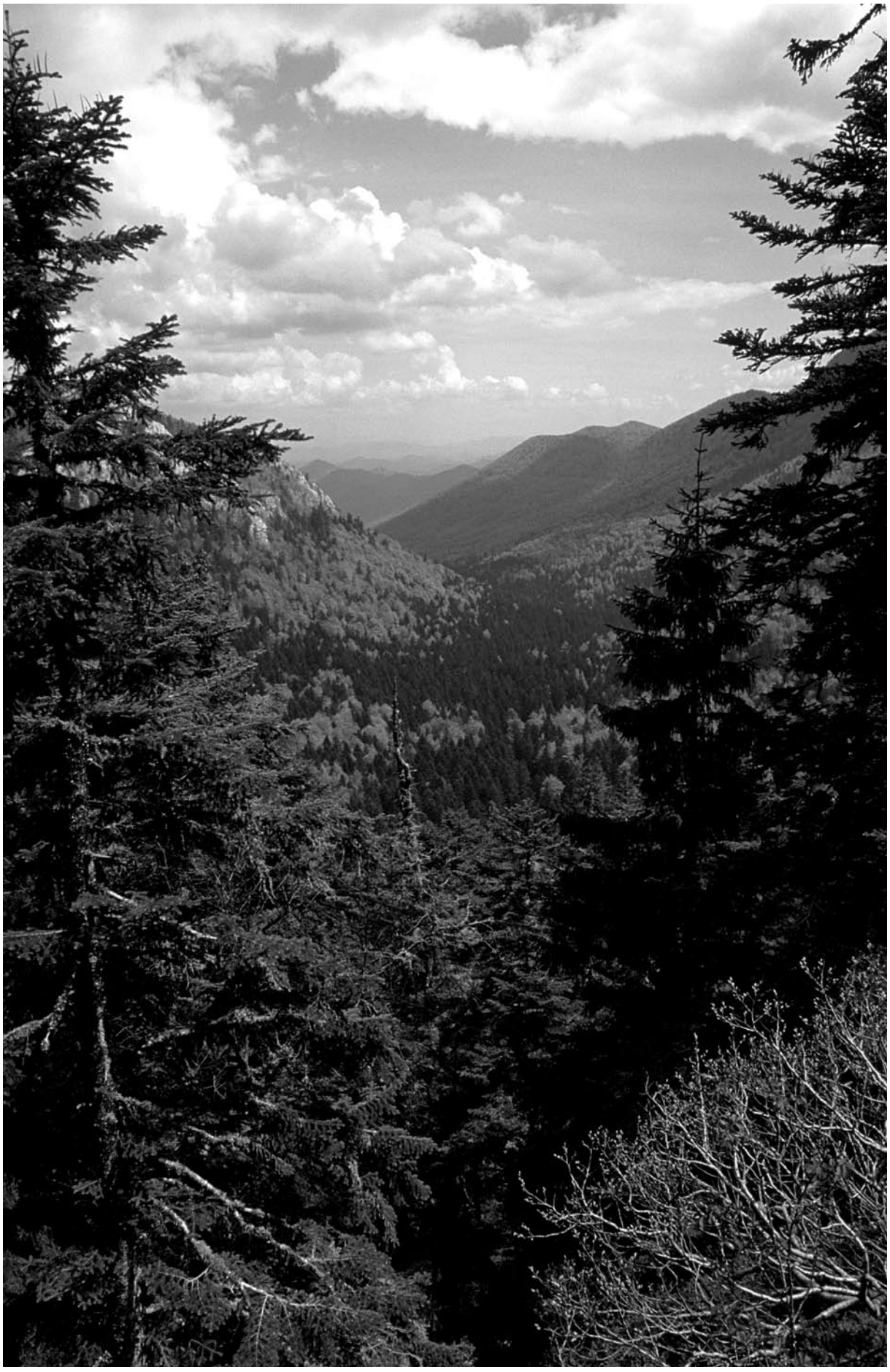
- provide suitable mechanisms for conflict resolution and dispute settlement in mountain regions;

- promote and facilitate bilateral and multilateral cooperation, particularly in trans-boundary mountain regions, making use of existing international instruments.

7.2. Such legal frameworks should be based on and supported by comprehensive national policies and strategies for the sustainable management of mountain ecosystems. They may also be supplemented, where appropriate, by regional agreements, such as the Alpine Convention, which provide frameworks for trans-frontier collaboration among countries sharing mountain ranges.

7.3. International organizations working on the CBD should support governments in developing concrete actions for the programme of work on mountain biological diversity, highlighting the links between mountain ecosystem services and good governance.

- Lobbying work to be undertaken at the CBD COPs.



Theme 8

International, regional and trans-boundary cooperation in Mediterranean mountains

The 1992 Earth Summit (UNCED) played a key role in raising awareness of the global importance of mountain systems for society and the high sensitivity of mountains to climate change. Chapter 13 of Agenda 21 (the United Nations programme on Sustainable Development launched at the 1992 Earth Summit) recognises the essential role of mountains—'a major ecosystem representing the complex and interrelated ecology of our planet'—for the survival of our planet's ecosystems. The international community, for the first time, clearly and formally signalled its common concern for the world's mountains as essential reservoirs of natural and human resources, which need to be preserved, restored and developed. This comprehensive blueprint of action includes two programme areas on sustainable mountain development:

- generating, strengthening and disseminating knowledge and appropriate mechanisms for the preservation of the fragile mountain ecosystems and sustainable management of their resources, with improved coordination of regional efforts;

- supporting integrated mountain development, considering watersheds as the spatial planning unit, and promoting income-generating opportunities adapted to the fragile and dynamic mountain context, while preventing the effects of natural disasters.

The formal implementation of Chapter 13 began in 1993, when FAO was appointed as its Task Manager. FAO has organized several meetings of an *ad-hoc* Inter-Agency Group on Mountains (IAGM), involving UN agencies, bilateral donors, NGOs and research institutions. The importance of having direct involvement of national governments in the implementation of Chapter 13 was recognised by IAGM, and a series of regional intergovernmental consultations has been organized since 1994 (Price, 1999a).

As a result of the 1996 conference on 'Mountain Research—Challenges for the 21st Century' (Bishkek, Kyrgyzstan), where participants proposed that sustainable mountain development should be the theme of an International Year, the UN General Assembly[59] declared 2002 as the International Year of Mountains and established 11 December as 'International Mountain Day'[60], to draw attention to the important role of mountain ecosystems and their

Box 16. A draft world charter for mountain populations

In the final declaration of the World Mountain Forum, held in Paris and Chambéry, France, in June 2000, more than 800 persons representing 70 mountain countries endorsed a draft world charter designed to represent the needs and aspirations of mountain peoples (World Mountain Forum, 2000a, 2000b). According to the draft, three conditions are crucial to meeting mountain populations' requirements:

- mountain peoples must find a place in society while retaining their identity;

- mountain peoples must face economic competition while changing the conditions of trade to their advantage;

- mountain peoples need to retain control of their environment and the development of their natural resources, while managing them for their own needs as well as on behalf of the national and world community.

The draft charter makes provision for the establishment of a worldwide organization to be called 'Mountains of the World', which would speak for mountain areas, and whose membership would be open to local authorities, associations and groups representing mountain dwellers. Alongside this organization, there should be a financial mechanism, possibly in the form of a foundation, which would mobilize the resources needed to strengthen cooperation and build partnerships among mountain regions and countries.

[59] UN General Assembly 53rd session (1998).
[60] UN General Assembly 57th session (2002).

inhabitants in sustaining life on earth (Pratt & Shilling, 2002). The international community and UN are increasingly aware of the need to improve living standards in mountain areas and to protect their ecosystems.

Since the 1992 Earth Summit, several international governmental and non-governmental fora dealing with mountain conservation and sustainable development have appeared, supporting the organization of workshops and symposiums where international declarations, resolutions, or plans of action are agreed with the aim of pushing countries to improve the situation of their mountain regions. A number of international organizations are promoting specific mountain conservation and development issues relevant to the Mediterranean region, as part of a broader international framework for mountain conservation and development. They include the Mountain Partnership/FAO, UNEP/Vienna Regional Office, the Mediterranean Agronomic Institute of Bari (IAMB), Blue Plan, the IUCN World Commission on Protected Areas, UNESCO–MAB; the European Observatory on Mountain Forests (EOMF), the Association européenne des élus de montagne (AEM), the Mountain Forum, and Euromontana. Other international organizations like the IUCN Centre for Mediterranean Cooperation and WWF Mediterranean

Box 17. CBD programme of work on mountain biodiversity: elements and goals

1. Direct actions for conservation, sustainable use and benefit-sharing:

   - To prevent and mitigate the negative impacts of key threats to mountain biological diversity;
   - To protect, recover and restore mountain biological diversity;
   - To promote the sustainable use of mountain biological resources;
   - To promote access to, and sharing of benefits arising from the utilization of genetic resources related to mountain biodiversity in accordance with national legislation, where it exists;
   - To maintain genetic diversity in mountain ecosystems in particular through the preservation and maintenance of traditional knowledge and practices.

2. Means of implementation for conservation, sustainable use and benefit-sharing:

   - To enhance the legal, policy, institutional and economic framework;
   - To respect, preserve, and maintain knowledge, practices and innovations of indigenous and local communities in mountain regions;
   - To establish regional and trans-boundary collaboration and the establishment of cooperative agreements.

3. Supporting actions for conservation, sustainable use and benefit-sharing:

   - To develop work on identification, monitoring and assessment of mountain biodiversity;
   - To improve knowledge on and methods for the assessment and monitoring of the status and trends of mountain biodiversity based on available information;
   - To improve the infrastructure for data and information management for accurate assessment and monitoring of mountain biodiversity and develop associated databases;
   - To improve research, technical and scientific cooperation, and other forms of capacity building related to mountain biodiversity;
   - To increase public education, participation and awareness in relation to mountain biodiversity;
   - To promote the development, validation and transfer of appropriate technologies for mountain ecosystems, including indigenous technologies in accordance with Article 8(j) of the CBD and related provisions.

Programme focus their forest conservation and development priorities on mountain biodiversity hotspots.

The Convention on Biological Diversity Conference of Parties has adopted a programme of work on mountain biodiversity with the overall goal of significantly reversing mountain biodiversity loss by 2010 at global, regional and national levels, thereby contributing to the three main objectives of the CBD, the Plan of Implementation of the World Summit on Sustainable Development, and the Millennium Development Goals. The programme of work is intended to assist Parties in establishing national programmes of work with targeted goals, objectives and actions, and with specific actors, timeframes, inputs, and expected measurable outputs.

Because mountain ranges often cross national borders, the issues involving them are in many cases inherently trans-national. In such contexts, global or regional dimensions of mountain protection and development that warrant international cooperation or action need to be legally addressed. However, with the exception of the Alpine Convention, this need has not prompted the shaping of legally binding, mountain-specific international instruments, either globally or regionally.

Cooperation opportunities for the Mediterranean mountains are conditioned by the complexity of the Mediterranean region and by the political difficulties between neighbouring countries sharing some of the Mediterranean mountain chains. Three continents, twenty-eight countries, numerous mountainous contexts from large mountain chains to scattered inland and coastal mountains located on several peninsulas and islands, as well as very different cultures, make it very difficult in most cases to think about a Mediterranean mountains convention in a similar way to the Alpine Convention. The easiest case may be the Dinaric Mountains, which spread across a number of countries (Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Kosovo, Albania, and FYR-Macedonia) in south-eastern Europe. UNEP[61], in cooperation with EURAC[62] and BFSD[63] and with the support of the Italian Ministry of Environment and Territory, is supporting the development and implementation of a legal cooperation framework for the protection and sustainable development of mountain regions in south-eastern Europe. Through a number of meetings with institutions from the countries concerned, the areas that this legal framework should deal with were identified: trans-boundary aspects of biodiversity conservation; sustainable local development and territorial planning; integrated water/river basin management; agriculture

Box 18. The Convention on the Protection of the Alps (Alpine Convention)

Adopted in 1991, the Alpine Convention entered into force in 1995. The signatory countries are: Austria, France, the European Community, Germany, Italy, Liechtenstein, Monaco, Slovenia and Switzerland. All nine parties had ratified the convention by 1999.

The Alpine Convention provides for the protection and sustainable development of the Alps in their entirety as a uniform regional ecosystem. Parties agree to establish a comprehensive policy to this effect, and endeavour to cooperate in several areas of common interest, including, among others, agriculture, forestry, land use planning, protection of landscapes, culture and population, leisure activities and air pollution control. The convention provisions are specified for effective implementation through additional protocols. Nine protocols have been completed (mountain agriculture; nature protection and landscape conservation; land use planning and sustainable development; mountain forests; tourism; soil conservation; energy; transport; dispute settlement), and four other protocols have not yet been prepared (population and culture; water; air quality; waste management). Although now signed by most parties, none of the protocols has been ratified to date. The Alpine Convention therefore has yet to be fully implemented.

Numerous information exchange and collaborative frameworks are currently in place. This convention is viewed as a model for developing trans-boundary mountain accords in other regions of the world. Similarly, a Carpathian Convention was recently signed by all countries concerned, and similar types of agreement are currently under preparation in the Altai and Caucasus ranges.

[61] United Nations Environmental Programme.
[62] European Academy.
[63] Balkan Foundation for Sustainable Development.

and rural development; forestry; transport and infrastructure; tourism; and energy. Active information exchange and cooperation with the Alpine and Carpathian Conventions will be developed, in the context of the Mountain Partnership[64].

The European Neighbourhood and Partnership Instrument (ENPI) is the principal financial instrument of the European Union for the implementation of the Euro-Mediterranean Partnership. The programme offers technical and financial support measures to accompany the reform of economic and social structures in the Mediterranean partner countries and it is implemented by DG EuropeAid. A new European Neighbourhood Policy (ENP) was developed in 2004, with the objective of avoiding the emergence of new dividing lines between the enlarged EU and its neighbours and instead enhancing the prosperity, stability and security of all concerned. The EU offers its neighbours a privileged relationship, building upon a mutual commitment to common values (democracy and human rights, rule of law, good governance, market economy principles and sustainable development). The ENP goes beyond existing relationships to offer a deeper political relationship and economic integration, its central element is the bilateral ENP Action Plans agreed between the EU and each partner. These set out an agenda of political and economic reforms with short and medium-term priorities.

The EU INTERACT (Sharing INTERREG experiences) Programme is part of the INTERREG Community Initiative. The programme seeks to build on the experience and lessons of INTERREG in order to increase the effectiveness of the current programming period. INTERACT has a wide geographic scope covering the 27 Member States, Norway, Switzerland and neighbouring countries. The PRO MONTE INTERACT project organized a seminar in Granada in 2006 on 'Territorial cooperation and Euro-Mediterranean partnership of the local and regional actors: which tools for the sustainable development of Mediterranean mountains?', devoted to a debate on the new possibilities and opportunities for cooperation in the Mediterranean mountain zones in the framework of new Structural Funds programmes for 2007–2013, and on the adaptability of current INTERREG III programmes in the Mediterranean mountain areas, with the European Neighbourhood Policy (i.e. ENPI) to support the specific needs of the Mediterranean mountain zones (including regional planning, accessibility, water management, sustainable tourism and development).

Box 19. The EU INTERREG programme

INTERREG aims to stimulate interregional cooperation between EU countries, opening up opportunities for third countries too. It is funded under the European Regional Development Fund (ERDF), and includes special measures for mountain areas. EU INTERREG assistance for the period 2000–2006 amounts to €5.5 billion. INTERREG programmes concerning Mediterranean mountains are:

- MEDITERRITAGE (INTERREG III C South): Promoting the economic value of the natural and cultural heritage of Mediterranean mountains;
- EUROMOUNTAINS (INTERREG III C South): Networking European mountains to promote sustainable development;
- PASTOMED (INTERREG III C South): Tradition and modernity in pastoral activity: its multiple roles in the sustainable development of Mediterranean territories;
- INCENDI (INTERREG III C South): Cooperation programme for managing fire risk in the territories of the Mediterranean basin;
- RURALMED I (INTERREG III B MEDOCC): Permanent forum and network of centres for Mediterranean rural development;
- The Transcontinental Biosphere Reserve between Spain and Morocco (INTERREG III A).

[64] For further details see: http://www.fao.org/regional/SEUR/events/Pelister/pelister_en.htm

The MEDA programme[65] has funded a number of projects in Morocco, on integrated rural development and forest resource management in the Rif (GEF–RIF project) and participatory rural development in the Central Middle Atlas. A new MEDA project started in 2006 in Northern Morocco on integrated rural development and natural resource management, with a watershed-oriented sub-project (in Snada, Ouergha, M'soun and Mammis oueds) which is highly relevant for mountain conservation and development work.

Guidelines

8.1. There is a need for partnership frameworks between Mediterranean mountain areas, including the transfer of technology and experience on innovative, economically viable management systems that help maintain and restore both environmental and cultural heritages.

- Specific mountain realities and problems at sub-regional and mountain range level are not always well reflected in global conventions. International organizations active in the region should develop specific multilateral environmental agreements for the Mediterranean mountain systems. This requires an agreed definition of what is meant by 'Mediterranean mountains' in terms of their geographical, environmental and human scope.

8.2. The Mediterranean mountain partnership should be understood as a set of formal collaboration frameworks and mountain action plans for each major mountain unit in the region (e.g. the Dinaric mountains; the Atlas ranges) instead of a single convention for all Mediterranean mountains. There is no such thing as a single type of collaboration framework that can work for all Mediterranean mountain contexts:

- Legally binding conventions (such as the Alpine Convention) may not be accepted by all governments and organizations involved in the process[66]. Nevertheless, a legal framework is needed to support stakeholder interventions in the field.

- Any collaboration framework must involve the participation of actors representing different organizations, from grassroots to the highest political level.

- Different trans-boundary cooperation options for large mountain chains (such as the North African Atlas ranges) and mountain watersheds shared by neighbouring countries and by neighbouring regions within a country should be developed whenever possible[67] and promoted in all Mediterranean large mountain units. This will facilitate the setting-up of a coordinated effort on adaptation options to enhance mountain environmental and social resilience to global changes[68].

- In spite of the difficulties encountered by partners in Mediterranean mountain regions where there are armed conflicts (e.g. the Lebanon mountain range), a lesson to be learnt from the Environment and Security Initiative[69] is that it is advisable to address environmental risk issues and identify cooperation possibilities that involve civil society, as it may be more receptive than government actors.

8.3. A Mediterranean-wide mountain partnership framework should mainly consist of networking initiatives for the sharing and transfer of experiences, know-how and technologies among large-scale mountain units. These

---

[65] The EU set up the MEDA programme to back its cooperation with the Mediterranean partner countries. In 2007, the European Neighbourhood and Partnership Instrument (ENPI) replaced MEDA.

[66] Douglas McGuire from the FAO/Mountain Partnership gave the case of the Caucasus, where governments reached an agreement to collaborate formally on mountain issues, but refused to have a legally binding convention.

[67] Trans-boundary cooperation is not possible in the Middle East mountain context under current political conflicts.

[68] The WCPA guidelines for trans-boundary cooperation in mountain protected areas implement cooperation initiatives in the Mediterranean. Successful ongoing initiatives in the region may provide lessons to be adapted elsewhere in the region, and opportunities for organizing exchanges and study visits for key actors from trans-boundary mountain contexts.

[69] An international Partnership for Managing Conflict and Risk, launched by UNEP, UNECE, UNDP, NATO, REC and OSCE in 2003.

would facilitate the implementation of mountain action plans, and translate successful results into concrete rural development policies for mountainous territories.

- There are useful funding mechanisms (such as the EU INTERREG and LIFE programmes) with strong trans-national focus that are also available to Mediterranean third countries. Such programmes are useful to strengthen networking efforts among stakeholders from large Mediterranean mountain units.

- The EU Neighbourhood policy includes priority actions encouraging cross-border collaboration with a North–South and cross-sectoral focus. This may be an opportunity worth investigating for Mediterranean mountain networking initiatives.

- Mountain networking can foster links between Mediterranean regions with cultural and environmental similarities, and help enhance communities' territorial identities and their links with the land. This is the first basic step to obtaining people's support and revitalizing local economies based on mountain resources and traditions[70].

- Mountain networking also helps in developing successful pilot schemes producing concrete results that can be used to lobby government institutions and give rise to specific rural development policies.

8.4. Representatives of the Mountain Partnership and other mountain cooperation frameworks (international organizations, convention representatives, governmental and non-governmental institutions) in and around the Mediterranean region (Alpine Convention, Carpathian Convention, and Dinaric Arc Initiative) or elsewhere (e.g. the Andean Mountains Initiative) should be invited by the leading partners of new mountain cooperation processes to provide inspiration and guidance, and to help activate and catalyse these new initiatives through the exchange of views and experiences.

- Developing personal relationships by means of face-to-face contact through exchanges and visits is essential for achieving solid cooperation frameworks.

- Exchanges, visits and other types of personal relationships should involve representatives from the various mountain stakeholder groups.

- In some cases, like the Caucasus initiative, informal settings make it much easier to arouse people's interest in cooperation.

- The Dinaric Arc Initiative (DAI) may represent a good example for organizations willing to start large-scale cooperation in Mediterranean mountain units and looking to develop joint policy actions to support Mediterranean mountains (for instance, they could take part with DAI in the side events at the 2008 CBD COP, presenting issues relevant to Mediterranean mountains).

8.5. Cooperation frameworks for large mountain units should take into consideration the existing regional and local policies and political processes and look for synergies to feed such processes with relevant mountain issues.

8.6. Cooperation frameworks for large mountain units should be multi-stakeholder processes, which may start in a top-down way due to their large-scale trans-boundary focus (for instance, through agreements between international organizations active in Mediterranean Sub-regions or Ecoregions). However, they should be run with a bottom-up approach from the outset. This is a critical issue in order to:

- ensure that local groups—especially local authorities and NGOs—are consulted and involved in decision-making processes, and that their views and needs are taken into account from the very beginning of these frameworks; this is the best way to secure willingness to participate and trust in the cooperation framework;

- make governments accountable;

---

[70] Personal communication (David Camacho) during the IUCN Mediterranean Mountains Workshop, regarding the INTERREG/MEDITERRITAGE experience of the CEDER Axarquía (Andalusia).

- build more transparent, more equitable and fairer processes for identifying candidate partners, contexts and issues for the allocation of cooperation projects;

- give civil society a leading role in activating and running cooperation frameworks: although in certain regions civil society needs to be strengthened and empowered in order to play such a role (as is the case of most North Africa NGOs), it has often demonstrated its leadership on cooperation and rural development through the EU LEADER programme[71].

8.7. Regional conservation organizations should increase their collaboration with the existing mountain-focused frameworks (such as FAO/Mountain Partnership, or Mountain Forum), participate in key mountain-oriented events, take advantage of the lessons and knowledge provided by these frameworks, exchange information, and feed these frameworks with success stories and relevant conservation and development issues.

8.8. As a follow-up to point 4.1, IUCN and WWF should jointly lead and support at least one multi-year initiative for cooperation in an outstanding large Mediterranean mountain unit, carrying out an in-depth stakeholder analysis, identifying opportunities (such as funding sources, or partnerships with existing large conservation and development initiatives in parts of these mountain units), and partnering up with major intergovernmental, governmental, research, and civil society actors.

[71] Southern European NGOs have directly received substantial funding from the EU LEADER programmes, have led participatory processes involving local authorities and community groups, and have independently decided on the best areas for investment in large, less-favoured territories.

References

Abell, R., M. Thieme, E. Dinerstein & D. Olson (2002). *A Sourcebook for Conducting Biological Assessments and Developing Biodiversity Visions for Ecoregion Conservation*. Conservation Science Program WWF-US. Washington DC.

Africano, J.L. (1550). *Descripción general del África y de las cosas peregrinas que allí hay*. Lunwerg Ed. S.A. 1995. Barcelona.

Baumann, H. (1993). *Greek wild flowers and plant lore in Ancient Greece*. The Herbert Press.

Blondel, J. & J. Aronson (1999). *Biology and Wildlife of the Mediterranean Region.* Oxford Univ. Press.

Blyth, S. *et al.* (2002). *Mountain Watch*. UNEP–WCMC.

Bryden, J. (2006). *From Leader I to Leader + and beyond the Leader axis*. Leader + Magazine 6:8–12.

Euromontana. (2005). *Unlocking mountains. A new approach to rural development for Europe's mountains*. Fourth European Mountain Convention, Rodez, France.

EOMF - European Observatory of Mountain Forests (2000): *White Book 2000 on Mountain Forest in Europe*. EOMF. Chambéry.

Fé d'Ostiani L. (2004). *Watershed Management: a key component of rural development in the Mediterranean region*. Watershed Management & Sustainable Development Working Paper Nº 4. FAO.

Gómez Sal, A. & A. González García (2007). *A comprehensive assessment of multifunctional agricultural land-use systems in Spain using a multi-dimensional evaluative model*. Agriculture, Ecosystems and Environment 120: 82–91.

Hamilton, L. & L. McMillan, synthesised and edited (2004). *Guidelines for Planning and Managing Mountain Protected Areas.* IUCN, Gland, Switzerland and Cambridge, UK.

Harris, D.R. (ed.) (1996). *The Origins and Spread of Agriculture and Pastoralism in Eurasia*. Routledge, Smithsonian Books.

Jongman, R.H.G & G. Pungetti (2004). *Ecological networks and greenways: concept, design implementation*. Cambridge University Press.

Körner, C. & M. Ohsawa Coord. Lead Authors (2005). *Chapter 24, Mountain Systems*. In: Millenium Ecosystem Assessment. Hassan, R., R. Scholes & N. Ash Ed. Island Press.

Lamb, D. & D. Gilmour (2003). *Rehabilitation and Restoration of Degraded Forests*. IUCN.

Lassen, B. & S. Savoia (2005). *Ecoregion Conservation Plan for the Alps*. WWF European Alpine Programme.

Lavorel S., J. Canadell, S. Rambal & J. Terradas (1998). *Mediterranean Terrestrial Ecosystems: Research Priorities on Global Change Effects*. Global Ecology and Biogeography Letters, Vol. 7, No. 3 (May, 1998), pp. 157-166.

Liniger H., R. Weingartner & M. Grosejean (1998). *Mountains of the world: Water towers for the 21st century*. Part I. Bern, Switzerland: Institute of Geography, University of Bern.

Loucks, C., J. Springer, S. Palminteri, J. Morrison & H. Strand (2004). *From Vision to the Ground: A guide to implementing ecoregion conservation in priority areas*. WWF. Washington DC.

Margat, J. & D. Vallée (2000). *Mediterranean Vision on water, population and the environment for the 21st Century***.** Blue Plan for the Global Water Partnership/Medtac.

Marušic, Z., S. Horak & S. Navrud (2005). *The economic value of coastal forests for tourism: A comparative study of three valuation methods*. Tourism 53, 2; pp 41-52.

McNeill, J.R. (1992). *The Mountains of the Mediterranean World: an environmental history.* Cambridge Univ. Press.

Médail F. & P.Quézel (1999). *Biodiversity Hotspots in the Mediterranean Basin: Setting Global Conservation Priorities*. Conservation Biology 13 (6), 1510-1513.

Mountain Agenda (2002). *Mountains of the World: Sustainable Development in Mountain Areas. The Need for Adequate Policies and Instruments*. (Prepared for the World Summit on Sustainable Development 2002). Bern: Buri Druck AG Ed.

Olson, D. M. & E. Dinerstein (2002). *The Global 200: Priority ecoregions for global conservation*. Annals of the Missouri Botanical Garden Volume 89: 199-224.

Papayannis, T. (2004). *Shared catchments and wetlands: increasing transboundary cooperation*. Paper presented at the 5th European Regional Meeting on the implementation and effectiveness of the Ramsar Convention. Yerevan.

Pettenella, D. & S. Kloehn (2007). *Mediterranean Mushrooms: how to market them*. In: Berrahmouni, N., X. Escute, P. Regato & C. Stein, Eds. Beyond Cork – A wealth of resources for people and nature. WWF.

Pratt, D. J. & L. Preston (1998). *The economics of mountain resource flows*. In: Moving Mountains, Unasylva Nº 195. FAO.

Pratt, J. & J.D. Shilling (2002). *High Time for Mountains: A program for sustaining mountain resources and livelihoods.* (Background paper for the 2003 World Development Report: Dynamic Development in a Sustainable World).

Price, M.F. (1999). *Chapter 13 in Action 1992-97 - a Task Manager's report.* Rome, FAO.

Price, M.F. & E.G. Kim (1999). *Priorities for sustainable mountain development in Europe*. International Journal of Sustainable Development and World Ecology Vol. 6.

Price, M.F. & B. Messerli (2002). *Fostering Sustainable Mountain Development: From Rio to the International Year of Mountains and beyond*. Unasylva Nº 208. FAO.

Quigley M.C., M. Sandiford & M. L. Cupper (2007). *Distinguishing tectonic from climatic controls on range-front sedimentation*. Basin Research 19 (4), 491-505.

Regato, P., N. Berrahmouni & A. Aghnaj Ed. (2003). *Forest Landscape Restoration in North Africa Workshop Proceedings (Alakhawayn University, Ifrane).* WWF-PNUD Maroc-Alakhawayn Univ-HCEFLCD.

Schweizer-Ries, P. (2001) *Decentralized energy use in mountain regions: the example of solar-electric stand-alone systems*. Mountain Research and Development 21:25-29. http://www.mrd-journal.org/abstracts.asp?Issue_ID=1

Shepherd, Gill. (2004). *The Ecosystem Approach: Five Steps to Implementation*. IUCN, Gland, Switzerland and Cambridge, UK. vi + 30 pp.

Smith, R.D. and E. Maltby. (2003). *Using the Ecosystem Approach to Implement the Convention on Biological Diversity: Key Issues and Case Studies*. IUCN, Gland, Switzerland and Cambridge, UK. x + 118 pp.

Society for Ecological Restoration Science & Policy Working Group (2002). *The SER primer on ecological restoration*. Retrieved September 1, 2002, from http://www.ser.org

Solomon, S., D. Qin, M. Manning, R.B. Alley, T. Berntsen, N.L. Bindoff, Z. Chen, A. Chidthaisong, J.M. Gregory, G.C. Hegerl, M. Heimann, B. Hewitson, B.J. Hoskins, F. Joos, J. Jouzel, V. Kattsov, U. Lohmann, T. Matsuno, M. Molina, N. Nicholls, J. Overpeck, G. Raga, V. Ramaswamy, J. Ren, M. Rusticucci, R. Somerville, T.F. Stocker, P. Whetton, R.A. Wood & D. Wratt (2007). Technical Summary. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Thirgood, J.V. (1981). *Man and the Mediterranean Forest. A history of resource depletion*. Academic Press.

Tilbury, D. & D. Wortman (2004). *Engaging People in Sustainability*. Commission on Education and Communication, IUCN, Gland, Switzerland and Cambridge, UK.

UNEP (2002*). Mountain watch – environmental change and sustainable development in mountains*. Cambridge: UNEP-World Conservation Monitoring Centre. Available from: http://www.globio.info

Villeneuve, A., P. Talla & M.A. Mekouar (2002). *The legal framework for sustainable mountain management: an overview of mountain-specific instruments*. Unasylva Nº 208. FAO.

Vuletic, D., T. Dubravac & M. Benko (2000). *The evaluation results of the benefits of tourism and recreational forestry functions*. XXI. IUFRO World Congress, Forest and Society: The Role of Research, 7.-12. August 2000, Kuala Lumpur, Poster Abstracts Vol. 3, pp.: 325, Malaysia.

World Commission on Environment and Development (WCED) (1987). *Our Common Future*. Oxford University Press.

World Mountain Forum (2000a). *Draft World Charter for mountain populations*. Adopted 9 June 2000, Chambéry, France. http://www.forum-mondial-montagne.org/ouvangl.html

World Mountain Forum (2000b). *Final Declaration*. Paris and Chambéry, France, 5 to 9 June. http://www.forum-mondial-montagne.org/ouvangl.html

Zakrevsky, A. (1995). *Status of mountain human settlements [Ukraine].* Letter to Mountain Forum. http://www.mtnforum.org/resources/library/zakra95a.htm

Wunder, S. (2007). *Should good guys finish last?*. CIFOR/POLEX 6 August 2007. http://www.cifor.cgiar.org/Publications/Polex/PolexDetail.htm?pid=780

Annex 1

Field Visit Case Study
Conservation and Management Adaptation Options for the *In-Situ* Preservation of Endemic Mountain Conifer Forests: The *Abies pinsapo* Case in Andalusia (Spain)

J.A. Carreira[1], J.B. López-Quintanilla[2] & J.C. Linares[1]

[1]Departmento de Ecología, Universidad de Jaén.
Campus Las Lagunillas B-3, 23071 Jaén (Spain)
Email: jafuente@ujaen.es

[2]Consejería de Medio Ambiente, Junta de Andalucía.
Delegación Provincial de Málaga, Avda. Mauricio Moro, 2. 29006 Málaga (Spain)

Conservation planning has traditionally focused on preserving patterns and has acted reactively, an approach that no longer fits in a changing world (Pressey, *et al.*, 2007). A paradigm shift is needed that focuses on processes rather than patterns and that gives priority to proactive planning. This requires the development of forecasting tools by scientists, to assist stakeholders in the development of decision tools based on predictions of the response of biodiversity to ongoing land-use and climate change.

As a result of intense historical and contemporary land-use, many of the forested areas in the Mediterranean basin are concentrated in mountainous areas. Mountain-top areas around the Mediterranean basin are refuges for relict conifer tree species (e.g., circum-Mediterranean fir species) as well as for genetically valuable, isolated populations of tree species whose core distribution is located at higher latitudes in temperate regions (e.g. *Pinus sylvestris*). Thus, to some extent, these areas represent temperate-like, conifer biome islands within the Mediterranean climate region, and are expected to be particularly vulnerable to the effects of ongoing climate change (Boisvenue & Running, 2006). There is evidence that the climate has warmed in the Mediterranean region (e.g. at a rate of 0.053 ºC yr^{-1} in Italy (Toreti & Desiato, 2007), and 0.054 ºC yr^{-1} in Spain (Brunet, *et al.*, 2005)). Regional models predict further temperature increase, the concentration of precipitation in extreme events, and a decrease in annual mean precipitation during the next century (IPCC, 2001; Räisänen, *et al.*, 2004).

In addition, the areas supporting endemic mountain conifer forests have experienced major land-use changes during recent decades, with the abandonment of traditional uses along with the adoption of protection measures. These have often been rather intensive, because of the high conservation value of these forests, their limited area of distribution and the low overall economic impact of their traditional uses (Ojeda, *et al.*, 1996). At first, protection measures were frequently directed towards encouraging natural regeneration and/or towards reforestation tasks focusing on the reconstruction of spatial patterns derived from potential vegetation models. Thereafter, no-management or minimum-management (just when problems arise) options have been commonly applied in the areas occupied by these forests (IPCC, 2007). Consequently, in the absence of a natural minor perturbation regime, it has led to the densification of these forests in recent decades, resulting in the reinforcement of density-dependent factors and low canopy structural diversity at the stand level. The carbon and energy balance of trees can be compromised under such conditions, weakening them. This can diminish the trees' ability to cope with climatic stress, especially drought (Valladares, 2008). Thus, paradoxically, the outcome of severe protection measures may be an increase in the vulnerability of endemic mountain conifer forests to climate change. In these cases, adaptation to climate change requires a shift to proactive management, directed towards the enhancement of canopy structural diversity at both stand and landscape levels (Millar, *et al.*, 2007).

Abies pinsapo is a relict species that belongs to the group of circum-Mediterranean fir species, and is endemic to the region on both sides of the Strait of Gibraltar. It forms isolated populations above 1000–1200 m in altitude, on north-facing slopes in coastal mountain ranges of southern Spain (West Betic Range) and northern Morocco (Rif Mountains). Following intense droughts during the 1990s, symptoms of acute decline and dieback episodes has been observed in the Spanish populations at mid- to low elevations, where root-pathogen fungi (*Heterobasidion abietinum*) are causing high mortality. No such symptoms have appeared in the North Africa populations. This contrasting behaviour, and the fact that land use in the areas occupied by *A. pinsapo* on both sides of the Mediterranean has diverged during recent decades, suggests the hypothesis that the higher vulnerability to recent climatic stress of *A. pinsapo* forests in the southern Iberian peninsula might be related to the predisposing effect of excessive stand densification in these forests associated with more severe protection measures (Figure 8). In contrast, the maintenance of low-intensity traditional uses (grazing and scattered logging) in Moroccan *A. pinsapo* forests must have acted as a minor perturbation regime promoting greater structural diversity, which might explain the higher resilience shown by the North Africa populations to recent climate change.

Dendrochronological data indicate that secondary growth in Spanish populations (except those located at the highest altitudes) began to decline consistently from the 1980s, and is currently at its minimum, whereas no such pattern has been detected in the Moroccan populations. The onset of growth decline in the Spanish populations coincided with the canopy closure that followed the adoption of protection measures from the early 1960s onward, as has been assessed by multi-temporal analysis of aerial orthophotographs. Both climatic and intra-population density-dependent factors contribute significantly to the explanation of observed variance in current mortality at lower-elevation sites in the Spanish populations. The reconstruction of changes in the water-use efficiency of trees during recent decades (wood ^{13}C signal) further supports the above conclusions. A field survey of canopy structure in a wide set of *A. pinsapo* stands demonstrated greater structural diversity and greater variability in the degree of resource competition among trees in the North Africa populations.

All these results suggest that adaptation needs for Spanish *A. pinsapo* populations include structural diversity enhancement at the stand level, and the implementation of a minor perturbation regime, through low-intensity thinning practices, to increase resilience to climate change at the landscape level. Current gap opening in previously homogeneous areas that have been affected by pathogens, and subsequent good spontaneous regeneration (including the establishment of tree species other than *A. pinsapo*, such as *Quercus faginea*, *Q. rotundifolia* and *Pinus halepensis*) can be viewed as natural, stabilizing processes that increase heterogeneity at the landscape level. However, proactive planning in areas where secondary-growth decline has been recorded but intensive mortality has still not appeared might help to reduce the severity and degree of incidence of possible mortality patterns to come.

A pilot experiment to test the adaptation option mentioned was developed in close cooperation with the forestry administration. We conducted a thinning experiment focusing on the enhancement of structural diversity in *Abies pinsapo* stands at low elevation sites (1200 m), in order to develop a management protocol for the structural adaptation of these forests to climate change. The prior accumulation of scientific evidence on the mechanisms underlying previously observed dieback episodes, and a programme of periodic meetings between scientists and forest managers, which was launched as an action plan within the Second Programme for the Recovery of *A. pinsapo* (Andalusia Regional Government), were essential enabling conditions for implementing the proposed adaptation options. Monitoring of the pilot experiment, now in its fourth year, has shown that the trees' performance has improved and that their response to drought stress in the last two hydrological years was comparable to that of trees in non-managed, dense stands located in the middle of their altitudinal range. If the case of *A. pinsapo* forests can be regarded as representative of other endemic mountain conifer forests, the presence of a minor perturbation regime, either natural or implemented by management, seems to be important in improving the resilience of these forests to climate change, through its effect of fostering structural diversity.

References

Boisvenue, C., and Running, S. W. (2006). 'Impacts of climate change on natural forest productivity—evidence since the middle of the 20th century'. *Global Change Biology* 12:1–12.

Brunet, M., Sigro, J., Saladie, O., Aguilar, E., Jones, P. D., Moberg, A., Walther, A. and López, D. (2005). 'Long-term change in the mean and extreme state of surface air temperature over Spain (1850–2003)'. *Geophysical Research Abstracts* 7.

IPCC. (2001). 'Climate change 2001: impacts, adaptation and vulnerability'. In J. J. McCarthy, O. F. Canziani and N. A. Leary (eds). *Contribution of working Groups II to the Third Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.

IPCC. 'Afforestation, Reforestation, and Deforestation (ARD) Activities'. *IPCC Special Report on Land Use, Land-Use Change And Forestry*. http://www.grida.no/Climate/ipcc/land_use/112.htm. March 2007. [Electronic Citation].

Millar, C. I., Stephenson, N. L. and Stephens, S. L. (2007). 'Climate change and forests of the future: managing in the face of uncertainity'. *Ecological Applications* 17:2145–2151.

Ojeda, T., Marañón, T. and Arroyo, J. (1996). 'Patterns of ecological, chorological and taxonomic diversity at both sides of the Strait of Gibraltar'. *Journal of Vegetation Science* 7:63–72.

Pressey, R. L., Cabeza, M., Watts, M. E., Cowling, R. M. and Wilson, A. (2007). 'Conservation planning in a changing world'. *Trends in Ecology & Evolution* 22:583–592.

Räisänen, J., Hansson, U., Ullerstig, A., Döscher, R., Graham, L. P., Jones, C., Meier, H. E. M., Samuelsson, P. and Willén, U. (2004). 'European climate in the late twenty-first century: regional simulations with two driving global models and two forcing scenarios'. *Climate Dynamics* 22:13-31.

Toreti, A. and Desiato, F. (2007). 'Temperature trend over Italy from 1961 to 2004'. *Theoretical and Applied Climatology* [published online] (28 February 2007) http://www.springerlink.com/content/22153r5p2970u3qx [DOI 10.1007/s00704-006-0289-6].

Valladares, F. (2008). 'A mechanistic view of the capacity of forest to cope with climate change'. In F. Bravo, V. Le May, R. Jandl and K. von Gadow (eds). *Managing Forest Ecosystems: the challenge of climate change*, pp. 11–35. Berlin: Springer Verlag.

Annex 2

List of Participants - December 2007 Workshop
"Mediterranean mountains in a changing world" (Málaga, Spain)

Name	Organization	Email	Address
Agueda Villa	Consejería de Medio Ambiente, Junta de Andalucía	agueda.villa.ext@juntadeandalucia.es	Consejería de Medio Ambiente Avda. Manuel Siurot, 50 41071 Sevilla (Spain) Mobile: +34 647602145
Alexia Baldascini	Mountain Products Programme, FAO	alexia.baldascini@fao.org	Viale delle Terme di Caracalla; 00100 Rome (Italy)
Antonio Gómez Sal	Dept. de Ecología, Universidad de Alcalá de Henares, Madrid	antonio.gomez@uah.es	Campus Universitario, Ctra. Madrid-Barcelona Km 33600. 28871 Alcalá de Henares, Madrid (Spain)
Carlos Sánchez	Fundación Naturaleza y Hombre – FNYH (NGO)	fundacion@fnyh.org	C/ 18 de Julio, 25 Entlo. 39610 El Astillero (Spain) T: +34 942558709 - F: +34 942559119 http://www.fnyh.org
Corrado Teofili	WWF Italy (NGO)	c.teofili@wwf.it	Via Po 25/C, 00198 Rome (Italy) T: +39 06 84497 445
David Camacho	CEDER Axarquía, Málaga	cederaxarquia@cederaxarquia.org	Mobile: +34-606956595 - http://www.cederaxarquia.org
Douglas McGuire	Mountain Partnership Secretariat, FAO	douglas.mcguire@fao.org	Viale delle Terme di Caracalla; 00100 Rome (Italy) T: +39 06 5705 3275 F: +39 06 5705 5137
Federico Cinquepalmi	Direzione Generale per la Protezione della Natura, Ministero dell'Ambiente e della Tutela del Territorio e del Mar	cinquepalmi.federico@minambiente.it	Via Capitan Bavastro, 174 00154 Roma (Italy) T: +39 06 5722 5383 F: +39 06 5722 3486
George Mitri	Association for Forest Development and Conservation - AFDC (NGO)	gmitri@afdc.org.lb	Marinian Center, 8th floor, Hamra, Beirut (Lebanon) T/F: + 961 1 752670 - Mobile: + 961 3 695229
Gloria Pungetti	Cambridge Centre for Landscape and People (CCLP)	cclp@hermes.cam.ac.uk	T: +44 792 052 00 22 http://www.cclp.group.cam.ac.uk

Name	Organization	Email	Address
Ignacio Trillo	Delegado Provincial de Medio Ambiente de Málaga, Junta de Andalucía	delegado.ma.cma@juntadeandalucia.es	Delegación Provincial de Medio Ambiente de Málaga C/ Mauricio Moro Pareto 2 29006 Málaga (Spain) T: +34 951040106-07 F: +34 951040108
Israel Marcos Álvarez	Fundación Naturaleza y Hombre – FNYH (NGO)	marcos@fnyh.org	C/ 18 de Julio, 25 Entlo. 39610 El Astillero (Spain) T: +34 942558709 - F: +34 942559119 http://www.fnyh.org
Jelenia Beronja	SEE/ENVSEC Regional Desk UNEP Regional Office for Europe	jelena.beronja@unvienna.org	UNEP Vienna, Room D0434 Vienna International Centre P.O. Box 500, A 1400 Vienna (Austria) T: +43 1 26060 5796 F: +43 1 26060 7 5796
Joerg Wyder	EUROMONTANA - European Association for Mountain Areas (NGO)	joerg.wyder@bluewin.ch	Place du Champs de Mars 2, B-1050 Bruxelles (Belgium) T: +32 2 280 42 83 - F: +32 2 280 42 85 http://www.euromontana.org
Jorge Castro	Departamento de Ecología, Facultad de Ciencias, Universidad de Granada	jorge@ugr.es	E-18071 Granada (Spain) T: +34 958 243242; +34 958 248915 F: +34 958 243238
José Antonio Carreira	Departamento de Ecología, Universidad de Jaén	jafuente@ujaen.es	Edificio B-3. Paraje las Lagunillas S/N. 23071 Jaén (Spain) T: +34 953 21 25 51 F: +34 953 21 18 73
Laetitia Hugot	Conservatoire Botanique National Méditerranéen de Porquerolles / Office de l'Environnement de la Corse	hugot@fr.oleane.com	Avenue Jean Nicoli 20250 Corte (France) T: +33 04 95 45 04 00 F: +33 04 95 45 04 01
Mohamed El Andalosi	Association AZIR pour la protection De l'environnement Al-Hoceima (NGO)	mohazir@hotmail.com ass.azir@caramail.com	Quartier Cala Bonita – Al-Hoceima (Morocco) T: +212 39 84 1718 Mobile: +212 060050702; +212 062024503

Name	Organization	Email	Address
Myriem Noussairi	Environmental Programme. Environment and Energy Unit. UNDP Morocco	myriem.noussairi@undp.org	Angle Avenue Moulay Hassan et Rue Moulay Ahmed Loukili Casier ONU, Rabat Chellah (Morocco) T: +212 (0) 37 70 35 55 - F: +212 (0) 37 70 15 66 http://www.pnud.org.ma/
Natasa Durakovic	Green Home (NGO)	natasa.green@cg.yu	Radosava Burica 31, 81 000 Podgorica (Montenegro) T/F: + 382 81 609 375; + 382 81 609 376 Mobile: +382 67 60 50 60 http://www.greenhome.cg.yu http://www.ecotourism.cg.yu
Nora Berrahmouni	WWF Mediterranean Programme Office - WWF-MedPO (Int. NGO)	nberrahmouni@wwfmedpo.org	Via Po 25/C, 00198 Roma (Italy) T: +39 0684497230 F: +39 06 8413866
Patrícia Turra	Defesa do Património de Mértola – ADPM (NGO)	desenvolv-coop@adpm.pt	Largo Vasco da Gama, s/n 7750-328 Mértola (Portugal) T: +351 286 610 000 F: +351 286 610 001 http://www.adpm.pt
Rafael Haro	Dirección del Parque Natural Sierra de Las Nieves	rangel.haro@juntadeandalucia.es	Delegación Provincial de Medio Ambiente de Málaga C/ Mauricio Moro Pareto 2 29006 Málaga (Spain) T: +34 951040091
Regino Zamora	Departamento de Ecología, Facultad de Ciencias, Universidad de Granada	rzamora@ugr.es	E-18071 Granada (Spain) T: +34 958 243242; +34 958 248915 F: +34 958 243238
Robert Mavsar	Mediterranean Regional Office, European Forest Institute (EFIMED)	robert.mavsar@efi.int	Passeig Lluis Companys 23 08010 Barcelona (Spain) T: +34 93 268 77 00 F: +34 93 268 37 68 Mobile : +34 630 236912

Name	Organization	Email	Address
Sandra Cascalheira	Defesa do Património de Mértola – ADPM (NGO)	desenvolv-coop@adpm.pt	Largo Vasco da Gama, s/n 7750-328 Mértola (Portugal) T: +351 286 610 000 F: +351 286 610 001 http://www.adpm.pt
Stefano Spinetti	Associazione Italiana Guide Ambientali Escursionistiche (AIGAE)	presidente@aigae.org	T: +39 06 27800984 F: +39 06 2751759 http://www.aigae.org
Süreyya Ýsfendiyaroðlu	Tema Foundation (NGO)	sureyya.isfendiyaroglu@tema.org.tr	Çayır Çimen Sokak Emlak Kredi Blokları A-2 Blok Kat:2 Daire:8 34330 Levent-Istanbul (Turkey) T: +90 0212 283 78 16 F: +90 0212 281 11 32 http://english.tema.org.tr/
IUCN Representatives			
Aymeric Eeckman	IUCN-Med	aymeric.eeckman@iucn.org	Parque Tecnológico de Andalucía Calle Marie Curie, 35 (Sede Social) 29590 Campanillas, Málaga (Spain) T: +34 952028430
Margarita Astrálaga	IUCN-Med	margarita.astralaga@iucn.org	Parque Tecnológico de Andalucía Calle Marie Curie, 35 (Sede Social) 29590 Campanillas, Málaga (Spain) T: +34 952028430
Pedro Regato	IUCN-Med	pedro.regato@iucn.org	Parque Tecnológico de Andalucía Calle Marie Curie, 35 (Sede Social) 29590 Campanillas, Málaga (Spain) Mobile: +34 645 810 097
Rami Salman	IUCN-Med	rami.salman@iucn.org	Parque Tecnológico de Andalucía Calle Marie Curie, 35 (Sede Social) 29590 Campanillas, Málaga (Spain) T: +34 952028452

Figures in Colour

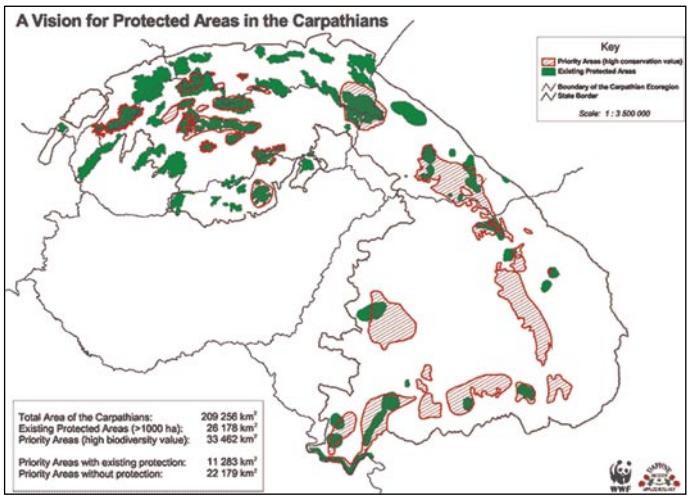


Figure 2. A vision for protected areas in the Carpathians. (Source: http://www.carpates.org)

Figure 3. Priority areas for conservation in the Central Mediterranean Ecoregion (Italy). (Source: http://www.wwf.it/mediterraneo)

Figure 4. APE – The "Appennino Parco d'Europa" initiative. (Source: www.legambiente.eu/documenti/2004/0503_areeProtette/APE.php)

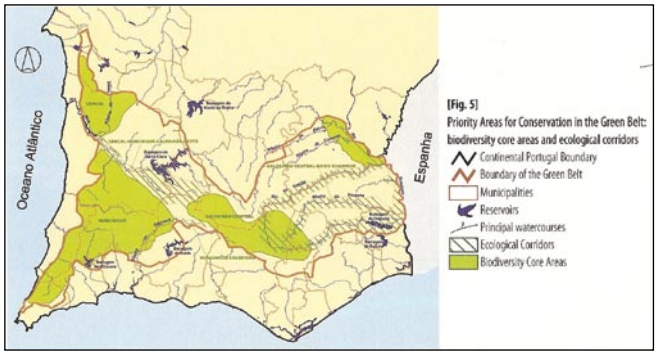


Figure 5. Priority areas for conservation and corridor zones in the Southern Portugal Mountainous Green Belt (Source: Oliveira, R. & L. Palma. 2003. Um Cordão Verde para o Sul de Portugal. Restauração de paisagens florestais. Ed: Associação de Defesa do Património de Mértola).

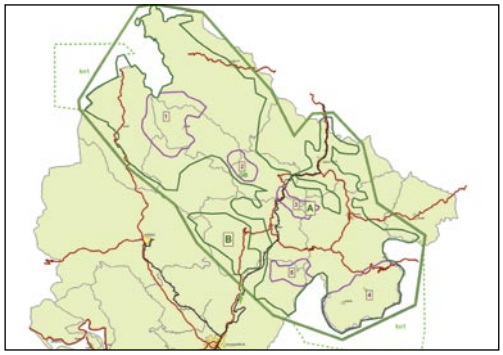


Figure 6. Priority areas for conservation and corridors in the Northern Montenegro Mountains: the Durmitor-Tara-Prokeletije Green Belt (Source: http://www.greenhome.cg.yu/_english/kancelarija.htm)

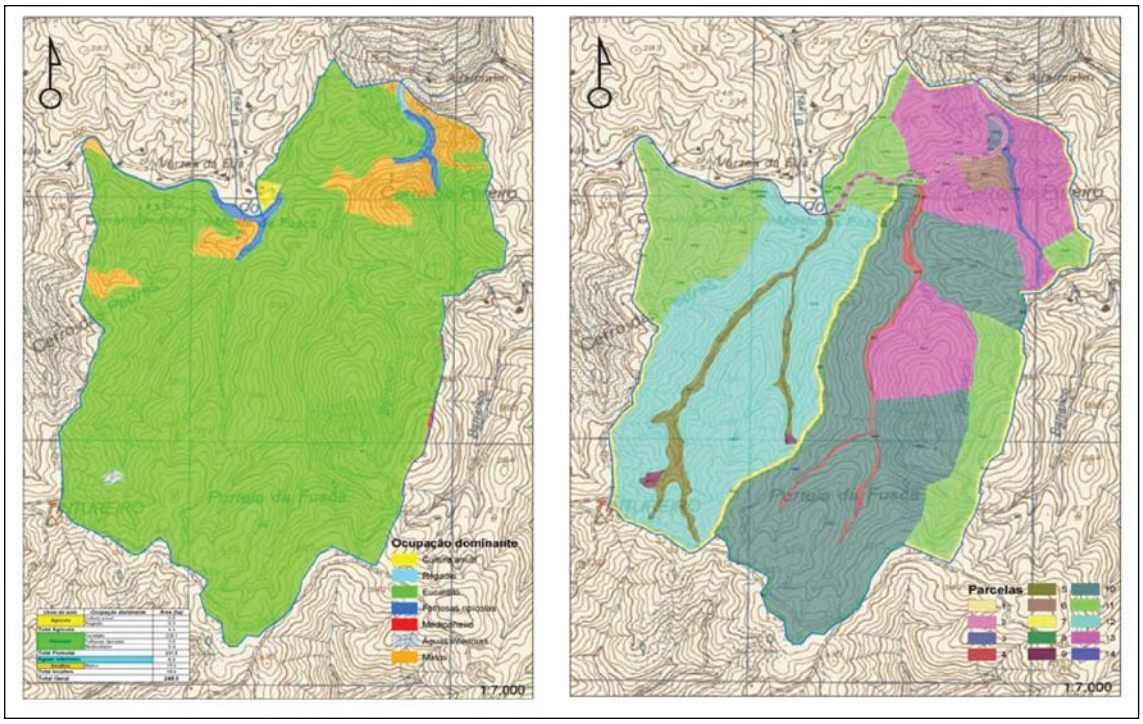


Figure 7. The Cansino project: Fire risk reduction and biodiversity improvement of burned eucalyptus plantations in the Nature 2000 site of Monchique Mountain (Southern Portugal). This is a joint initiative of WWF, the Forest services of Algarve (DGRF), Aliança Florestal (Portucel) and individual land owners, developed into 2 phases, between 2005 and 2007, in a Natura 2000 mountain site which totally burned as a result of the wild fires of 2003 and 2004. The pre-fire monotonous landscape dominated by eucalyptus plantations in a pilot catchment area (left figure), was redesigned into a mosaic-like landscape (right figure), breaking the plantations continuity hile maintaining their economic viability, while reducing the fire risk and increasing the biodiversity value of the landscape.

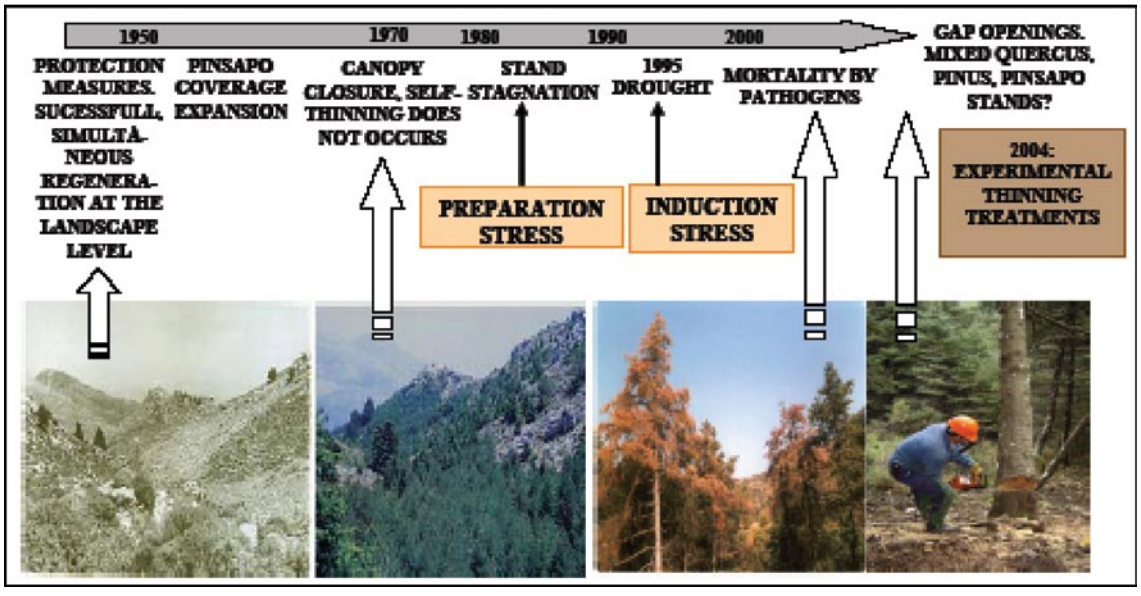


Figure 8. Chronology of key processes leading to Abies pinsapo decline symptoms and dieback in southern Spain. The working hypothesis is that endogenous intra-population factors (canopy structure) act as a stress, increasing the susceptibility of forests to climatic anomalies (induction stress), and resulting in their sudden decline and mortality by pathogens. The hypothesis has been tested in A. pinsapo forests, and might be applicable to other endemic mountain conifer forests. This highlights the adaptation management needs for mountain relic forests to reduce vulnerability against climate change. The conservation objectives of relic mountain forests should include adaptive management practices (i.e. enhancement of their structural diversity) to be identified, tested and implemented urgently in order to minimize risks of catastrophic dieback. (Source: Carreira, J.A., J.B. López-Quintanilla & J.C. Linares. See Annex 1)

Photo Gallery

Picture 1. The Strait of Gibraltar from the mountains of Tarifa (Cádiz, Spain), with the impressive Jebel Musa (Morocco) in the African side. (Pedro Regato)

"Mountains constitute the Backbone of the Mediterranean Sea".

Picture 2. The Etna (north of Sicily), one of the three active volcanoes in Italy. (Pedro Regato)

"The high geo-morphological richness and complexity of the Mediterranean mountains strongly affect soil types, physical processes (i.e. erosion, landslides, mud flows, avalanches and rock-fall) and climate. It also contributes to very high diversity at the landscape, community, species and genus levels."

Picture 3. The *Monte Perdido* Glacier in the central Pyreenes (Spain). (Ignacio Pardinilla)

"Glacial and periglacial landforms are widespread in the mountains of the Mediterranean region. Mountain glaciers at this latitudinal zone are particularly sensitive to changes in the global climate system".

Picture 4. The Etna birch (*Betula aetniensis*) in Sicily (Italy). (Pedro Regato)

"The Etna birch is a narrow endemism located in the volcanic rocks of the eastern side of the Etna volcano in the island of Sicily. There are nearly 10,000 islands in the Mediterranean Basin, of all sizes and origin, many of them with a mountainous character. The role of the Mediterranean islands, as a reservoir for plant genetic resources is of extraordinary importance as a result of the evolution of a highly diversified flora. The rate of plant endemism is usually around 10% in the larger mountainous islands".

Picture 5. *Aquilegia bernardii*, (Corsica island, France). (Pedro Regato)

"Corsica is a "mountainous island" with a plant endemism rate of approximately 12% (296 species of a total 2,524 floral species). The endemic flora is distributed all along the altitudinal gradient representing half of the total number of species of the alpine zone."

Picture 6. The endemic golden oak (Quercus alnifolia), confined to the igneous geological complex of the Troodos Mountains in the island of Cyprus . (Pedro Regato)

"The habitat type "Scrub and low forest vegetation of Quercus alnifolia" is a priority habitat in the EU Habitat Directive, and the golden oak is protected by the forest law of Cyprus and selected as the country's national tree by the parliament in 2006."

Picture 7. *Cyclamen persicum* in the mountains of Lebanon. (Marco Pagliani)

"Twenty one species of the popular ornamental flower Cyclamen grow spontaneously in the Mediterranean mountains. Climate change may make unsuitable for an important number of Cyclamen species the driest mountains of the southern Mediterranean shores."

Picture 8. The Barbary macaque (*Macaca sylvanus*) in the cedar forests in Ifrane National Park (Middle Atlas, Morocco). (Pedro Regato)

"The Barbary macaque is the only Mediterranean primate species, endemic to the mountains of Morocco and Algeria. Habitat (forests of cedar, pine and oak) reduction and degradation, together with other pressures have led the Barbary Macaque to be listed as vulnerable by the IUCN Red List."

Picture 9. Cypress (*Cupressus sempervirens*) forests in Samaria Gorge in the White Mountains (Lefka Ori) of Crete Island. (Pedro Regato)

"There are three *cupressus* species endemic to the Mediterranean region (*C. sempervirens*, in the south-eastern part of the region; the very rare *C. atlantica* endemic to the valley of the Oued-n-Fis river in the High Atlas Mountains of Morocco; and the very rare *C. dupreziana*, native to the Tassili n'Ajjer mountains in south-east Algeria). The Venetian Senate forbade the export of cypress timber from the mountains of Crete in the 15th century CE, due to centuries of overexploitation."

Picture 10. Ice cream shop in Damascus old city. (Marco Pagliani)

"All year around snow cover in high mountain summits has contributed to the ancient culture of ice cream production. In the XV-XVI century, ice was brought from the mountains to the lowland cities all over the region (i.e. Malta, Damascus, Tripoli, Istanbul, Rome, Venetia, Oran, Madrid) and served as a delicatessen in many dishes, as well as used for making sorbets. Due to the strategic importance of ice trading, it became a state monopoly in Rome in the XV century", (Fernand Braudel. 1996. *The Mediterranean and the Mediterranean World in the Age of Philip II*, Volume I. Univ. of California Press)

Picture11. Archaeological ruins in the summit of Nemrut Dag mountain (Eastern Taurus range, Turkey). (Pedro Regato)

"The magnificent ruins on the summit of the Nemrut Dag Mountain (2,150 m) are the famous burial mound and precinct of King Antiochos I of the Kommagene dynasty (80 B.C. to 72 A.D), built for the ages and generations that were to follow him "as a debt of thanks to the gods ...for their manifest assistance." (en.wikipedia.org/wiki/Mount_Nemrut)

Picture 12. The Taurus Mountains, Southern Turkey. (Pedro Regato)

"The cedars of the Cilician Taurus supplied the markets of Rome in the days of Cleopatra. The combination of local needs and distant markets (Syria and Egypt) has significantly bared the Taurus range. The forests of these mountains provided considerable volume of timber needed for the construction of the Suez Canal in 1869." (McNeill, 1992)

Picture 13. Cedar forest in the Chouf Mountains (Lebanon). (Pedro Regato)

"The Epic of Gilgamesh is an epic poem from Ancient Mesopotamia, about the mythological hero-king Gilgamesh, who might have been a real ruler in the late Early Dynastic II period (ca. 27th century BC). The Cedar Forests are the glorious realm of the gods of Mesopotamian mythology. They are guarded by the demigod Humbaba and were once entered by the hero Gilgamesh who dared cut down trees from its virgin stands during his quest for immortality" (*en.wikipedia.org/wiki/Gilgamesh*).

Picture 14. The Bosnian pine (*Pinus heldreichii*) in Mount Olympus (Greece). (Pedro Regato)

Mount Olympus is the highest mountain in Greece (2,919 m), known as the residence of the divine family, the twelve most important ruling gods and goddesses of ancient Greece, who therefore were called the Olympians. It is written that Zeus talks to the gods from "the topmost peak of many-ridged Olympus."

Picture 15. Metéora mountains in central Greece. (Pedro Regato)

"Metéora is one of the largest and most important complexes of Eastern Orthodox monasteries, built on natural sandstone rock pillars in Kalambaka (central Greece). Metéora is included on the UNESCO World Heritage List."

Picture 16. The Tara River Canyon (Montenegro). (Marco Pagliani)

"The Tara River Canyon is the longest canyon in Montenegro and Europe and the second-longest in the world, with 82 km long and 1,300 m height at its deepest point. The canyon is protected as a UNESCO World Heritage Site, and is a part of Durmitor national park."

Picture 17. Prokletije mountains (Montenegro). (Pedro Regato)

"The 255 endemic plant species of Prokletije makes this mountain region outstanding at the European level. The presence of more than 200 bird species makes Prokletije one of the most significant ornithological areas in the Balkans and Europe, and it has been declared an Important Bird Area (IBA) of international importance."

Picture 18. Komovi mountains (Montenegro). (Pedro Regato)

"The Komovi mountain range is very rich in plant endemics, and is situated in the eastern part of Montenegro, stretching between the Tara river and Prokletije mountains. It is part of the Northern Montenegro Green Belt initiative, launched by Green Home and WWF MedPO."

Picture 19. The Villuercas mountains in Extremadura (Spain). (Pedro Regato)

“Mountains are considered water castles; they influence climate and precipitation regimes, store rainfall water, and modulate the gradual flow of water and sediments downstream”

Picture 20. The Ouzud waterfall in the Middle Atlas (Morocco). (Pedro Regato)

“Water stress is an intrinsic feature to which Mediterranean ecosystems and people are adapted. This specific climate feature enhances the role of mountains in storing and regulating water flow to lowland areas, and the need to maintain and restore stable and functional mountain ecosystems.”

Picture 21. River canyon in the Küre Mountains, northern Turkey. (Pedro Regato)

“Karst mountain regions, with spectacular scenic areas like deep canyons, extensive cave systems and doline grounds, waterfalls, and springs, are abundant in the region. Karst aquifers provide large supplies of water, on which depend more than one quarter of the world’s population.”

Picture 22. Aigües Tortes national park, eastern Pyrenees (Spain). (Pedro Regato)

"Mountain watershed protection and management is considered a priority by most Mediterranean countries, and has been one of the main reasons for protecting upland forests."

Picture 23. Child gathering water in the Oued Beth, Middle Atlas mountains (Morocco). (Pedro Regato)

"Water is essential to all aspects of life, and mountains play a critical role in global freshwater supply".

Picture 24. The Ruddy Shelduck (*Tadorna ferruginea*). (Pedro Regato)

"A dramatic decline in the Ruddy Shelduck western populations between the 1980s and mid-1990s may be caused by poaching and the degradation of wetlands in the Atlas mountain lakes. This species is of European Conservation Concern, being considered Vulnerable. The species is listed in the EU Wild Birds Directive (Annex I), Bern Convention (Appendix II), and Bonn Convention (Appendix II).

Picture 25. Somiedo natural park in the Cantabric mountains (Spain). (Marco Pagliani)

"Mountain landscapes with traditional grazing systems encompass a wide diversity in terms of plant species, plant communities and landscape heterogeneity".

Picture 26. The endemic Chamois (*Rupicapra ornata*) in Abbruzzo National Park (Italy). (Pedro Regato)

"The maintenance of high mountain pastures and grazing systems is a key factor for securing winter feeding requirements for large herbivores like the chamois".

Picture 27. Beehives inside a stone wall, a defensive structure against bear disturbances in the Ancares mountains, north-western Spain. (Pedro Regato)

"Traditional management systems in mountain areas have traditionally provide a wide range of products for mountain dwellers, in a compatible way with nature conservation."

Picture 28. Tent of transhumant shepherds during summer in the Bou Iblane Mountain, Middle Atlas (Morocco). (Pedro Regato)

“Transhumance is a very effective mechanism to overcome the seasonal environmental constraints of highlands (winter cold) and lowlands (summer drought).”

Picture 29. Cabañas del Castillo, a shepherd village in the Villuercas mountains, Extremadura (Spain). (Marco Pagliani)

“Seasonal upland-lowland livestock movements have helped to develop extensive, highly diverse, multipurpose agroforestry systems, like the Spanish dehesas or Portuguese montados”.

Picture 30. High pasture land in the Sibillini Mountains national park, Italy. (Pedro Regato)

“Organic Soil not only contributes to carbon sink but also improves, water retention, site productivity and nutrient availability. Effective mountain grazing management practices help prevent large reductions in ground cover and soil erosion rates.”

Picture 31. Scattered specimens of African juniper tree (*Juniperus thurifera* subsp. *africana*) in the Bou Ibane mountain summit (Middle Atlas, Morocco). (Pedro Regato)

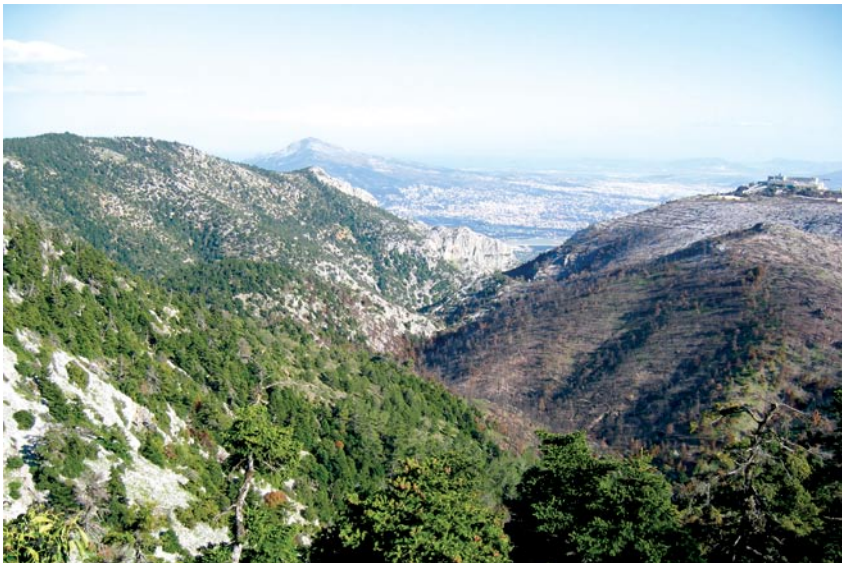
"Overgrazing and uncontrolled harvesting of tree branches for winter animal fodder, cooking and heating are still contributing to mountain deforestation and soil erosion in many massifs from the south and eastern part of the Mediterranean region".

Picture 32. Irrational subsistence agriculture in the Middle Atlas (Morocco). (Pedro Regato)

"Mountain desertification is taking place much faster than historically and usually arises from the demands of increased populations that settle in upland areas in order to grow crops and graze animals."

Picture 33. Burned forest land in the mountains near Athens. (Rami Salman)

"The climate change exacerbation of extreme weather events like heat weaves and their consequences (i.e. large scale forest fires) not only is causing dramatic environmental (i.e. forest and species loss, soil erosion, floods) and socio-economic problems, but also resulting in mountain ecosystem changes."



Picture 34. Illegally logged cedar tree in the Middle Atlas (Morocco). (Pedro Regato)

"Illegal logging is an important cause of forest land degradation in the southern and eastern mountain areas of the region. The occurrence of illegal logging is explained by poverty, but also by land ownership and right of use conflicts, and by weak law enforcement. Illegal logging is most intense in the less accessible forest areas."

Picture 35. Gathering African juniper (*Juniperus thurifera* subsp. *africana*) fruits in its Bou Iblane population (Middle Atlas, Morocco). (Pedro Regato)

"Relic mountain tree species, like the African juniper, often have regeneration problems due to a combination of factors –human disturbances and climate change. Assisting their natural regeneration through tree nursery production and ecological restoration techniques may represent the unique way to prevent species loss".

Picture 36. Native species tree nursery in the Middle Atlas (Moroco). (WWF-Mediterranean/Abdoul Dia)

"Forest landscape restoration is a planned process aiming to strengthen resilience and regain ecological integrity in forest landscapes, while securing human wellbeing."

Picture 37. Forest restoration in the Lower Guadiana Valley natural park (southern Portugal). (WWF-Mediterranean/Rui Cunha)

"Networks of pilot restoration sites are established in a number of priority Mediterranean mountain landscapes, aiming at developing good ecological restoration practices under different conditions (i.e. after fire, in abandoned agriculture land, in degraded forest land) and at the same time creating conditions to improve land management and biodiversity."

Picture 38. Women harvesting shrub cuttings for aromatic plant production and packaging. The Monte do Vento property of the Portuguese NGO ADPM. Lower Guadiana Valley natural park (Portugal). (ADPM)

"Tree nurseries for native species production can have a multipurpose objective: the production of seedlings for ecological restoration projects; the production of plants for xeric gardening and road banks; and the production of aromatic/medicinal plants for marketing. Women cooperatives are currently running a number of multipurpose tree nurseries in mountainous areas from the region (i.e. Algeria and Portugal)."

Picture 39. School in a mountain village (Morocco). (Pedro Regato)

"Environmental education in rural schools can have an important awareness raising and ice-breaking role, bringing together actors who are often in conflict (i.e. foresters and farmers), who become active and join forces to support the children's activities. Therefore, environmental education programmes including school tree nurseries may be considered as a first step to start conservation work in conflictive mountain areas."

Picture 40. Children from a mountain village in the Middle Atlas (Morocco). (Pedro Regato)

"Keeping mountain people on their land is a priority in sustainable development policies. Acceptable numbers of mountain dwellers not exceeding the carrying capacity of the system and traditional agro-forestry are crucial to prevent biodiversity loss and environmental degradation."

Picture 41. Woman farmer in Kure mountains, northern Turkey. (Pedro Regato)

"One of the main challenges in mountain areas is to turn isolation from a handicap into an asset. The final aim is to enhance the self-esteem of mountain dwellers and correct the perception that society in general has of mountain cultures".

Picture 42. Children in a village party, Aspromonte national park (Italy). (Marco Pagliani)

"Young people have the task to maintain traditions and values in the long term; training in new technologies, creating jobs and providing basic services help fix young population in mountain areas."

Picture 43. Certified honey from Feija national park in the Kroumerie Mountains (Tunisia) and from the Monte Arcosu nature reserve in Sardinia (Italy). (Pedro Regato)

"North-south cooperation (e.g. twining mountain protected areas) for exchanging know-how and technology, and funding support for diversifying mountain farmers incomes and for developing high quality products are key steps to secure economically viable livelihoods".

Picture 44. Traditional carpet handcraft in a village in the Taurus mountains (Turkey). (Marco Pagliani)

"The EU LEADER programme has contributed to reinforce local identity, to diversify and link local development sectors, such as farming and tourism, and to revive unique local skills such as wool weaving and traditional cooking through the training of young people and women and job creation. Transferring and adapting successful stories from this programme may positively influence less favourable mountain areas in third regional countries".

Picture 45. Traditional cheese production in the Aspromonte national park (Italy). (Marco Pagliani)

"In the current global market mountains could have a clear advantage due to their unique environmental and cultural values, which could result in very high-quality products".

Picture 46. Organic herbs production in the Prespa National Park (Greece). (Marco Pagliani)

"The Society for the Protection of Prespa works to preserve the natural and cultural heritage of the area. The Society supported local farmer to switch his bean farm to organic production. Since the 90's a large number of farmers have followed suit, due to the higher prices and better sales of the organic beans and because of their understanding that intensive agriculture impoverishes their land. The trilateral protected area in the Prespa lakes shared by Albania, Greece and the FYR of Macedonia is a good example of trans-boundary cooperation in Mediterranean mountains".

Picture 47. Cork harvesting in the mountains of eastern Algeria. (WWF-Mediterranean/Nora Berrahmouni)

"FSC certification can help solve chronic problems associated with interrelated environmental, social and economic issues, which prevent the achievement of sustainable development goals in the North African mountains".

Picture 48. Organic wine with FSC certified stoppers, Dagón Wineries (Spain). (Pedro Regato)

"The wine industry's demand for FSC certified cork drives the cork processing industry to push FSC certification on the ground, thus providing long-lasting basis for best management practices that guarantee basic environmental, social and economic conditions."

Picture 49. Women cooperative for the production of cork stoppers in Sierra de Espadán (eastern Spain). (WWF-Mediterranean/Nora Berrahmouni)

“Mountain women suffer the highest illiteracy levels, and bear the burden of the hardest work. Education at all levels and the introduction of new technologies can aid in empowering women and reduce poverty”.

Picture 50. Khaloa in a cork oak forest in the Rif (Morocco). (Pedro Regato)

“The North African khaloas are natural places with the remains of honoured local figures, that people have traditionally protected because of the spiritual values they symbolise. In many cases, these sacred forests are the last remnants of the primeval forests”.

Picture 51. Khaloa with degraded cork oak forest due to kif cultivation (Rif mountains, Morocco). (Pedro Regato)

“Social conflicts, illegal land uses such as kif cultivation, and poverty are currently threatening these very valuable sites. Strengthening and promoting local traditions and spiritual approaches to nature can help protect this unique natural and cultural heritage”.

Picture 52. *Abies pinsapo* relic forest in Sierra de Las Nieves natural park (Spain). (Pedro Regato)

"Mountain summits around the Mediterranean basin are refugial areas for relic conifer tree species, such as the *Abies* group, with 8 species endemic to the Mediterranean mountains."

Picture 53. December 2007 Workshop "Mediterranean mountains in a changing world" (Malaga, Spain). Field visit to Sierra de Las Nieves natural park (Spain). (Pedro Regato)

"The workshop participants observing *Abies pinsapo* regeneration in the understorey of an Aleppo pine (*Pinus halepensis*) forest stand."

Picture 54. Andalusian fir (Abies pinsapo) forest gaps due to dieback facilitate Aleppo pine (*Pinus halepensis*) colonization in Sierra de Las Nieves natural park (Spain). (Pedro Regato)

"The susceptibility of forests to climatic change anomalies (induction stress), and the sudden decline and mortality by pathogens of mountain relic conifer populations, open forest gaps and provide competitive advantages to more xeric trees".

INTERNATIONAL UNION
FOR CONSERVATION OF NATURE

IUCN CENTRE FOR MEDITERRANEAN COOPERATION
Parque Tecnológico de Andalucía
C. / Marie Curie, 35 (Sede Social)
29590 - Malaga (Spain)
Tel 34 - 952 02 84 30
Fax 34 - 952 02 81 45
uicnmed@iucn.org
www.uicnmed.org
www.iucn.org/mediterranean

Core support to the IUCN Centre for
Mediterranean Cooperation is provided by:

GOBIERNO DE ESPAÑA
MINISTERIO DE MEDIO AMBIENTE Y MEDIO RURAL Y MARINO

JUNTA DE ANDALUCIA
CONSEJERÍA DE MEDIO AMBIENTE