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THE ALPS

A system under pressure

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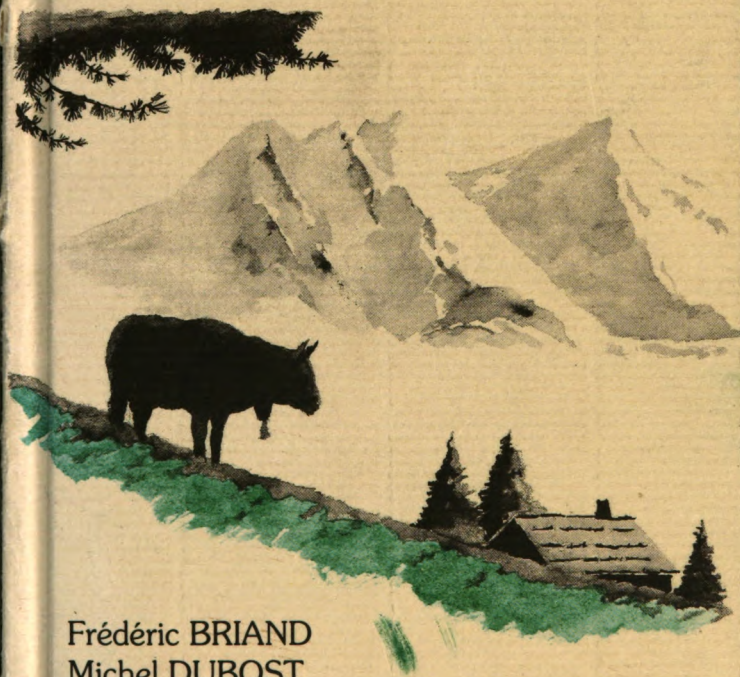
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Frédéric BRIAND
Michel DUBOST
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Dominique RAMBAUD



THE ALPS

A system under pressure

by

Frédéric BRIAND • Michel DUBOST
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This book and its French counterpart stem from a workshop on Alpine conservation organized by IUCN in December 1987 in Chambéry with the financial support of the Ministry of Environment, France, and of the Principality of Monaco. It is published for the European Action for the Environment sponsored by the Commission of the European Communities. The views expressed here do not necessarily reflect those of the sponsoring organizations. The presentation of material in this work and the geographical designations employed do not imply expression of any opinion whatsoever on the part of IUCN concerning the legal status of any country, territory or area or concerning the delimitation of frontiers or boundaries.

FOREWORD

The Alps are many things to many people. For those who live there, the mountain valleys and forests are land from which it is increasingly difficult to win a modern standard of living by traditional means. They see their communities dwindling as jobs decline and young people move to the plains.

For the visitor, in contrast, the Alps today are "the playground of Europe" on a scale Sir Leslie Stephen would never have dreamed of when he coined the phrase as title for a book of mountaineering reminiscence in 1894. The immense influx of walkers, climbers, skiers, and sightseers, most of them motorised, has festooned the high slopes with pylons and lifts, carved ski trails and roads through the forests, created a boom in holiday homes and brought an immense disruption of rural life. Pollution, that universal companion of motorised and industrial man, is blighting the forests and threatening the beauty that its makers come to see.

This small book summarizes these changing impacts on the Alps and demands action. It brings home to the reader that the landscape of the great mountains, vast though it is, is acutely vulnerable to human mis-use. It also demonstrates that despite the diversity of national jurisdictions, the Alps are an ecological and structural unit, with common problems and in need of common management. That is why an inter-

national Convention on the Alps is being proposed.

IUCN, the World Conservation Union, is proud to have worked for over 30 years on Alpine conservation and to have been a founder of CIPRA, the Commission Internationale pour la Protection des Régions Alpines, and more recently of ICALPE, the International Centre for Alpine Environments. We welcome the analysis in this book - not because we or its authors are under any illusions that it constitutes a final assessment, but because it provides the general reader with a stark statement of concern and a basis for debate about the actions that should be taken.

The Alps are a part of the European heritage. Their future depends on the conduct of everyone who interacts with them. For it is, in the end, human individuals that create environmental damage through their collective behaviour. If this book makes more people behave with care - and demand that their industries and Governments do the same - it will fulfil its purpose.

Martin W. Holdgate
Director General, IUCN
The World Conservation Union

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INTRODUCTION

This book has been produced for the European Action for the Environment with financial support from the Commission of the European Communities and from the French Government. A major object of the Year, and of this book, is to encourage environmental education and promote public awareness of significant ecological problems in Europe. The Alps present a good case in point. Recent expert meetings, such as the IUCN workshop held at Chambéry (France) in December 1987, have demonstrated a serious and worsening situation. Though the responsibility for the book lies ultimately with the authors, the text draws much from the collective wisdom of the experts gathered in Chambéry whose names appear in the Appendix 1.

This volume does not pretend to be a complete and comprehensive survey of the Alps. The evidence is too scattered and incomplete for that, and there is a wide range of opinions and interpretations about Alpine problems. Nor is the book a treatise on conservation. Instead, a selected number of critical problems are highlighted, especially those where urgent political action is called for.

The aim is to present an overall perspective based on the best available scientific evidence so as to stimulate debate and encourage more effective action. The style is therefore popular and intended for the general public. However, we hope that this book will also be read by the decision makers and administrators, whose actions

or inactions will contribute significantly to the future state of the Alps.

The authors are very grateful to the Commission of the European Communities, to the Ministry of the Environment, France, and to the Government of Monaco, whose financial support made the venue of the international workshop in Chambéry and the production of this book in both French and English versions possible.

Special thanks are due to Drs W. Burhenne, W. Danz, F. Framarin, B. Messerli, J. Sayer, P. Stone and J. Thorsell, who reviewed an earlier draft of this book.

The authors are especially indebted to Dr M.W. Holdgate, whose thorough and critical comments did much to improve successive versions of the manuscript. M. White made numerous invaluable editorial suggestions and A. Viscolo provided unflinching secretarial support.

CHAPTER ONE

The alpine environment



The Alps as referred to in this book are the highlands of South Central Europe extending in an arc approximately 1,500 km long, from near Nice to the suburbs of Vienna and the environs of Ljubliana. The waters rising in the Alps flow to the Atlantic, the Mediterranean and the Black Sea, and so much of Europe forms part of the Alpine lowland system. From these lowlands, and indeed from farther afield, come the people, the ideas and the resources which, together, make up the major human impact on these mountains. The Alps are primarily a cultural entity, a category imposed on a physical landscape. They belong to the common heritage of Europe.

The Alps cover a large territory, extending over nearly 200,000 km². There are seven Alpine countries. Italy is the largest (by area and population) ahead of Austria followed by France, Switzerland and Yugoslavia. The Federal Republic of Germany ranks next with its Bavarian territory whilst Liechtenstein, the smallest, is completely Alpine. The resident population numbers about 12 million, to which are added many times more tourists - 100 million already in the early 1980s (Barker 1982a) - breaking

down roughly into 40% vacationers and 60% day or weekend visitors.

The Alps are also a border, physical as well as cultural. The boundary is only relative, however, for the Alps are not particularly impenetrable, being broken up by long valleys connected by passes. Here the great peoples of Europe — Romance, Germanic, Slavic — have met and intermingled, so that it is possible to talk of an Alpine civilisation in its own right, especially before recent times when lowland neighbours have impinged on Alpine cultures.

Man first came to the Alps in Paleolithic times. The first large settlements were established later, around the iron ore and salt mines. From these areas radiated out the paths which the Romans used and extended to form a road network. Pastures were cleared at moderate altitude, but there was not a great deal of deforestation before the Middle Ages when the centres of settlement were often around the monasteries. The growing season was short and the crops hard to raise. There were bitter experiences of avalanche and flood following tree felling. Clearly all these features of the environment helped mould the Alpine character - modest, frugal, conservative and religious.

But if the Alps have been inhabited from the most ancient times, the peaks, permanent snowfields and glaciers were not of great interest to the local populations who regarded the mountains as places of supernatural, sacred beings and considerable danger. In fact, the word "alp" in ancient times referred to hill pastures mainly below

the snowline and "monts" to passes which the Romans knew and used. It was the foreign visitors, the "hill worshippers" as Lunn called them, seeking Rousseau's pristine paradise in nature, who gave alps their modern meaning. Many of these visitors came to climb the peaks and though there were ascents as early as the fourteenth century (the ascent of Rocciamelone in 1355 by the Knight Rotario d'Asti) the first real explorers came in the late eighteenth century. By the nineteenth century, the explorers had been joined by the tourists who included many of the most famous European writers - Byron, Dickens, Goethe, Dumas - and some not so famous.

1.1. PHYSICAL

GEOGRAPHY

The Alps are unique in many senses: an environment of high mountains, particularly in the western part, with great vertical distance between peaks and valley bottoms (3,800 m at Chamonix). Nowhere else in Europe is there a gaunt scenery of such grandeur and danger where natural hazards are a constant threat.

The physical geography, the climate, vegetation and resources are closely linked to the geology. The spine of high peaks, glaciers and rough mountain pastures is generally unsuitable for agriculture, but very attractive to tourists. Into

the spine run deep valleys like the Isère in France, the Rhône in Valais, Switzerland, the Inn and Salzach in Austria. The valleys run both longitudinally along the lines of geological weakness and transversally from the watersheds. At the bottom of these deep cut valleys lie alluvial plains, supporting farmlands and providing natural routes for communication. Though productive, these areas are, however, constantly at risk from the mountains around them, which bring torrents, avalanches, descending currents of cold air and frosts. The valleys are not only the product of very ancient tectonic processes but also of relatively recent events - the ice ages at the beginning of the Quaternary Period. It was then that successive ice sheets covered most of the Alps. The retreating ice deepened the valleys, created lake beds, and left a morainic plain sometimes fertile, sometimes too wet, which allowed a passage and place for man.

If geology creates a continuing and slowly changing milieu, climate is the changing daily influence. Not only altitude but site, exposure and relief interact in valleys and on peaks with the daily patterns of temperature, precipitation and wind flow to create a mosaic of microclimates.

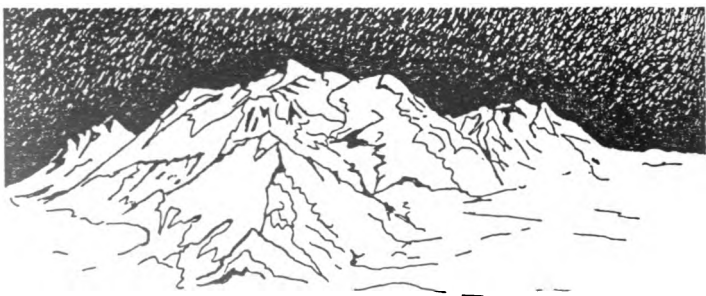
Except for the south-western Alps and internal axes, the dry areas are rather isolated in what is generally a zone of considerable precipitation, over 3,000 mm per year at some points. If one excludes such extremes, the average for 30 stations is still 1,228 mm (Cepede and Abensour 1961). As upward moving air gets colder, it must

release its excess moisture, and so one finds a general increase in precipitation with altitude, except for the "pluviometric optimum" (between 2,500 and 3,000m) where there is a decrease. Because most moisture comes in the easterly flow from the Atlantic Ocean, the western and central Alps experience the highest rainfall. Despite the moderating influence of the Adriatic Sea (1,252 mm of precipitation at Cortina d'Ampezzo), the eastern Alps are generally much drier. From an economic point of view there is probably too much moisture in most of the Alps, making summers rather wet and misty. Thus hay is difficult to dry, and the ripening of the grain is delayed.

In view of its particular touristic importance, snow deserves to be considered separately. Above a certain altitude - around 3,700 m in the western Alps - there are permanent snows, and the line descends in winter to the plains at 300 m or less. Snow cover varies greatly from year to year and recent years have seen a change of patterns, with snowfall coming later, even after the winter solstice. There are also great variations in the density of snow - some areas have 10 m cumulatively, while others are almost snow deserts. In general most snow falls on the outer and higher inner regions, but there are wide variations in snow cover on the ground depending on the frequency and type of snowfall, and on melt factors, accelerated by rain, fog and warm winds. This uncertainty means that in some areas winter tourism is a risky business, and

may become more so in the future if the warming process, already detectable, continues.

Precipitation provides the water which makes the Alps “the water tower of Europe”. The United Nations University has recently urged that all mountains be regarded as part of Highland-Lowland systems in which water is the key element. The waters of the great rivers of Europe - the Rhône, the Rhine, the Po and even the Danube (by its tributaries, such as the Inn) - rise



mainly in the Alps. The population of Europe depends on these flows for hydro-electric power, for drinking water and sanitation, for irrigation, transport and recreation. To compensate for the irregular flow of water and to complement the natural store in glaciers, the Alps are ringed with lines of dams which store the summer surplus for the winter when the demand for energy increases greatly.

1.2. FLORA AND FAUNA

The beautiful and varied Alpine vegetation reflects the complexities of climate, geology, soils and water. One may distinguish five broad zones (see Guggisberg 1986):

— The *foothill zone* extends to the upper limit of vineyards, that is about 550 m on northern slopes and up to 800 m on southern slopes. It is largely a zone of vineyards, orchards and farmlands.

— The *montane zone* above is the belt of green deciduous woodlands beloved of picnicking families. Here one finds woods of oaks, chestnuts and beeches, the red fruit of the barberry bushes and sometimes the perfume of the wild angelica.

— The *subalpine zone* (or coniferous zone), reaching up to 1,600 m in the north and 2,200 m in the south, is a kaleidoscope of colour and form - the domain of larch, fir, spruce, mountain pine and white pine mixed with deciduous trees like silver birch or green alder - with spring meadows of narcissus, and later of thistles, orchids, and carlines, with junipers, the red bearberry, the snowheather and the scots pine on the drier slopes, and marsh violets and mosses in the wet bogs. Immediately above the forest, in a transition area known as "*Kampfzone*" (combat zone), a few isolated trees stand, severely exposed to the elements. These are usually larches, stunted mountain pines and rhododendrons.

— The *alpine zone* begins above the timber line with dwarf bushes and the wild mountain fruits - raspberries and bilberries. This area is characterized by mountain pastures, with a thick grass vegetation rich in species and coloured by numerous Alpine flowers such as the famous gentians.

— The *nival zone* begins above the limit where snow is able to persist - at least in places - through the summer. There is little soil, and large expanses of exposed rock. This is the domain of lichens, glacier crowfoot or ranunculus.

Once rich and diverse, the Alpine fauna has had to retreat under the increasing pressures of man, and today many of its best-known representatives can be encountered only in remote or protected areas.



A great number of species - especially of birds and insects - are restricted by their specialized feeding habits to particular vegetation zones. Thus the black woodpecker, coal tit and the rare capercaillie belong to the subalpine zone, while the ptarmigan, the snowfinch and many species of butterflies - like the small apollo and alpine copper - are limited to the alpine zone. The somewhat barren nival zone hosts no less than 27 animal species (see Guggisberg 1986), mostly insects, which are "endemic" - that is, they occur nowhere else. Among them are represen-

tatives of springtails, flies, spiders, beetles and butterflies, as well as the "glacial flea" which lives only in areas of snow and ice and feeds on plant detritus carried upward by the winds.

But many animals enjoy a wider range and can be found from the lower hills to the high pastures, in open or wooded areas. Such is the case for the fox, stoat, mountain hare and the red mountain frog. Others still, like the dipper, the brown trout - now threatened by the introduction of the North American rainbow trout - and the rare otter, can follow rivers and torrents up to high altitudes.

Man has had a dramatic impact on the distribution and survival of many Alpine species. The wild mammals have taken a particularly heavy toll. The wolf disappeared at the end of the nineteenth century; the bear, once widespread, was last seen in the western Alps in 1937. The ibex, nearly extinct in the late eighteenth century, was only saved by the creation of the Val Samaranche Reserve by King Vittorio Emanuele II in 1856. Today this animal, which inspired the cave paintings of Magdalenian Man some 15,000 years ago, graces once more the high slopes of Switzerland, Austria, Yugoslavia and most recently France.

The hunting pressure on the chamois, the roe deer and the red deer varies considerably within the Alpine region, reflecting different cultures and customs. In Austria, Germany and Liechtenstein, the pressure is particularly low, resulting in a population explosion of these ungulates which cause much damage in the surrounding forests.

Recent changes in land use patterns in forestry and pastoralism have reduced the numbers of small game, such as the rock partridge, capercaillie, black grouse and hazel grouse, already affected by tourism. Birds of prey have suffered heavily as well. The impressive bearded vulture or Lammergeier - one of the largest birds in the world - was totally eliminated in the nineteenth century from the whole Alpine region, partly as a result of hunting and partly as a result of a



decline in the numbers of sheep, on whose carcasses the vulture relied. Future generations may, however, have a chance to see this superb animal glide again amidst the tallest peaks, as recent preliminary reintroductions in the Raurisertal (Austria) and in the Bornes (France) appear to have been successful. Among other raptors, the golden eagle has now recovered from a long history of human depredation, but the peregrine falcon is still endangered.

Human pressures on natural habitats have been no less damaging for the unique Alpine flora. For the region of Haute-Savoie (France) alone, Courtin (1987) notes the disappearance of nearly 60 species of plants since the beginning of this century.

1.3. HUMAN ACTIVITIES

Since the earliest times, man brought crops and animals into the mountains. Today vines are rarely found above 700 m. Much the same can be said for high-yielding orchards, though single fruit trees are found above 1,000 m, including chestnuts which used to be a staple in some areas. This is a limit too for wheat except in the Alpes-Maritimes, but rye, barley and oats may go to the limit of settlements, at 2,000 m. Since soil and climate are not suitable at these heights, cultivated plots are small, yet of importance for

mountain communities. Varieties of potatoes, which originate from the Andes, are well suited to altitude and there are other hardy vegetables as well. Higher up one may find hay meadows grown on rotation, either inside the forest to the limits of the Alpine pasture, or below the crop limit as in the Italian Alps.

If the alpine pastures ("*alpages*"), for so long an essential and characteristic part of the Alpine way of life, stretch to the zone of permanent



snow, they are seldom really suitable for grazing above 2,500 m. The best are those lower down that were carved out of the forests. Livestock have long been extremely important in the Alpine economy and society, although retreating today under extreme pressure. In general, cattle predominate, particularly in the northern Alps where the practice, upheld by old rights, of allowing cows into the forests is not really ideal for the growth of young deciduous trees. In part of the French and Italian Alps sheep may predominate in summer. Overall, milk is the characteristic product of the herds - and large milk trucks can be seen in Bavaria and Austria going all the way to 2,000 m - but meat production is not negligible. Agriculture is generally declining throughout the whole region.

Certain zones in the Alps are more likely than others to support human activities. There are relatively dry zones, for example, on the Mediterranean south-facing slopes which are subject to summer drought due to the influx of dry warm air and high insolation. This makes agriculture difficult without irrigation. Further north one finds relative drought due to shelter in the large inner valleys of Aosta in Italy, the Briançonnais in France, the Valais in Switzerland, or the Klagenfurt basin in Austria. There, summer rainfall is scarce but the climate may produce excellent wines. Elsewhere the inner valleys are cold in winter, acting as reservoirs of cold air. The Upper Engadine in Switzerland, for example, has over 200 days of frost per year.

The Alps experienced a demographic peak in the middle of the last century. Now many of the native population, especially of working age, have migrated to the plains, leaving the mountains to the elderly. Not only is agriculture generally in decline, but also the number of craftsmen and cottage industries. More important perhaps than the quantitative changes are the changes in the quality of life and the fabric of human communities, amounting in some areas to a total



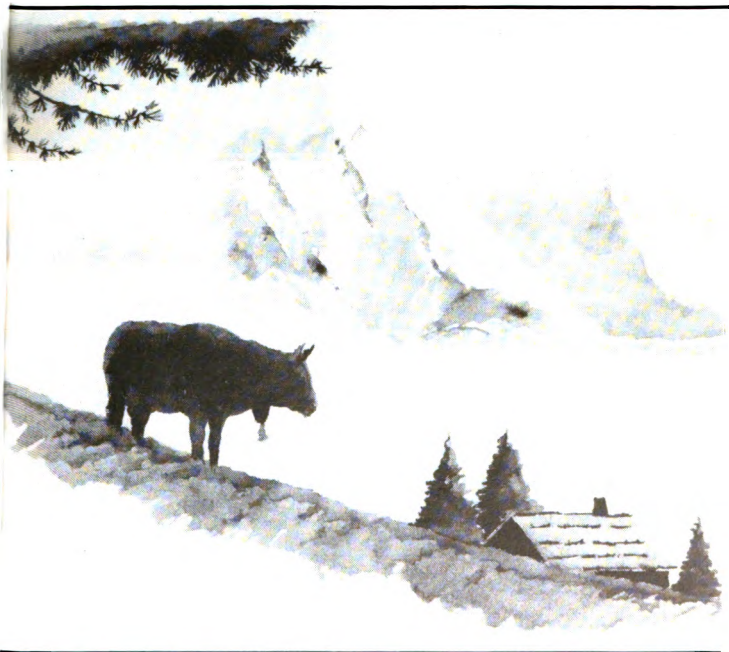
reconstruction of the local world and of its interactions with nature.

If agriculture and community are declining, tourism is a growth industry bringing people and capital which usually overwhelm the local society. As will be seen in the next chapter the intrusions into the mountains are not only social, demographic, economic and political, but also physical.

Such then are the Alps: a superb natural heritage confronted with a variety of social changes, particularly the decline of traditional culture and the arrival of intrusive forces from the plains. We now turn to survey the severe problems that outside pressures have created in this fragile system.

CHAPTER TWO

Main problems



It is not easy to disentangle all of the problems since they are interrelated, sometimes causally, sometimes consequentially, making priorities difficult to establish. Nonetheless it is possible to single out four main areas - the threat to the forests, tourist pressure, agricultural and community decline, and climate change.

2.1. THE THREAT TO THE FORESTS

The press, scientific as much as popular, has commented extensively on the decline and the death of the Alpine forests. Such statements must be carefully considered for the forest landscapes of today reflect not just contemporaneous but also past stresses. A brief historical overview of forest damage is therefore in order.

Historical aspects

Extensive cutting took place in former times, permitting human settlements and contributing to the unique landscapes which we now associate with the Alps, and which belong to our natural and cultural heritage - the altitudinal belts of meadows, forests, high pastures covered with rocky ridges and peaks. While we do not know precisely the extent of forest cover in earlier times, we have much evidence that the nineteenth century was a period of dramatic changes, as population densities reached a peak, leading to serious environmental disruptions. Increasing needs for food, fuelwood and housing were largely met by further depletion of the forest cover. Industrialization and urbanization also took a huge toll on Alpine forests. Despite drastic legislation in several countries to restrict uncontrolled cutting, and despite important soil conservation programmes, a sad legacy remained at the end of last century.

In the first part of this century the relationship between local communities and their forests underwent changes. Overexploitation gave way gradually to neglect as forests were left more and more to nature. It is possible to distinguish specific periods in this evolution, despite significant variations from valley to valley:

- first the depopulation associated with the economic depression, wars and the development of communications led to a rather sudden release of the pressure on the forest;

- then followed a period of relative restoration of the forest, both in ecological and economic terms; at the onset of World War II many Alpine forests were indeed reasonably productive, supporting whole villages in certain areas;

- recent times have been marked by economic depression, with timber prices raising more slowly than the cost of living. The overexploitation of former times has been replaced by a lack of exploitation. Abandoned or mismanaged, ageing forests can no longer protect the soil or regulate the water table adequately.

— Contemporaneous damage —

Especially since World War II the Alpine forests have been subject generally to great stress. The pressures have been of different types. First there is an endogenous or internal stress, including natural hazards, which may account for about a quarter of loss.

Today the greatest threat to the forests seems to be exogenous. While damage to trees through local concentrations of smoke and sulphur has been recognized since the late 19th century, it was only in the early 1970s that Europeans started to connect declining forest health with acid rain and other associated forms of air pollution. Accurate information, available only recently, does reveal considerable damage to forests. Thus, according to the latest UN/ECE survey

(1988) more than 50% of conifers in Switzerland exhibit slight to severe defoliation, a symptom exhibited by more than 50% of deciduous trees in Austria, Switzerland and the Federal Republic of Germany.

However, the greatest caution must be applied in interpreting the studies and the press statements. For example Nilsson and Duinker (1987) have pointed out that there is no broadly accepted standard definition of "forest decline". A



wide range of variables is used in quantifying the damage: stress symptoms in plant cells, foliar colour changes, and foliage loss. The most often used method, foliage loss, is also the most subjective and the least sophisticated. The more sophisticated methods have not been used because of the enormous expense in mounting surveys.

However, despite the apparent newness of the phenomena, the uncertainties of data and interpretation, and the obvious need for caution, it is generally agreed that preventive measures and precautions need to be established. Even though experts vary in their analyses, all point to a grave problem. Thus Nilsson and Duinker (1987), who conducted a major project on deforestation at the International Institute for Applied Systems Analysis (IIASA) in Austria, consider that a major forest decline on a continental scale is in progress in Europe. In most classifications of forest decline and trees at risk the Alpine countries head the list. For Switzerland alone the most recent report of the Federal Forest Institute indicates that, in 1988, 51% of all trees in mountain zones show evidence of damage. Forests between 900m and 1,300m in altitude are particularly stressed.

The process of forest damage is seen most dramatically in conifers. The first signs are disruption in the growth rate, then the conifers lose their leading shoot and the top of the tree appears concave. The needles become discoloured, and the older generation of needles fall. There is a

general balding from the top down. The root system degenerates. The symbiosis with specific fungi no longer holds. There is a decreased resistance to infections and disease.

For deciduous trees, originally thought to be less at risk, the situation has recently worsened. Thus the latest UN/ECE surveys point to an 11 to 12% increase between 1986 and 1987 in the incidence of damaged trees in Austria and Switzerland, whereas the decline of conifers appears to have stabilized.

What are the causes of forest decline and canopy dieback? There are clearly many factors involved. While a single agent like a strong point-source pollution, or a severe storm, flood or fire, or a killer disease - such as the white pine blister rust - can sometimes be incriminated, experts now agree that a complex of multiple causes usually must be invoked (see Mueller-Dombois 1988). Among these air pollution, climatic perturbations - such as unseasonable frost or drought - and past forest management practices figure prominently.

With regard to air pollutants, it was thought at first that sulphur dioxide (SO_2) - produced by industrial combustion installations, thermal power plants and domestic use, and deposited both directly and as weak sulphuric acid in rain - was the prime cause of forest damage, perhaps operating in the soil and affecting the roots by a complex process, including the release of aluminium with toxic effects. Later theories have incriminated nitrogen oxides

(NO_x) both because they are converted in the air to nitric acid and when deposited may damage or over-stress trees, and because of the ozone produced by their chemical reaction with hydrocarbons in sunlight. Vehicle emissions are likely to be the main source of nitrogen oxides and hydrocarbons in the Alps. Greenpeace claims that heavy weekends on the St. Gotthard pass see road traffic deposit 30 tonnes of NO_x, 25 tonnes of hydrocarbons and 75kg of lead into the atmosphere.

The levels of ozone recorded in a number of places in summer are close to, and at times exceed, the concentrations known to damage sensitive species in the laboratory. Recent research further indicates that exposure to ozone in summer can make coniferous trees more sensitive to early, severe frosts in autumn. Ozone is likely to exert its influence by diverse damage to the needles, allowing the leaching of calcium and magnesium from needles and harming the photosynthesis process.

While there is no final answer yet on the precise causes of damage, there is little doubt that air pollution is a major factor, an effect which may be increased in the Alpine environment by the retention of pollutants in the deep valleys below temperature inversions that often coincide with the tree line. The frequency of mists is another likely factor: such mists are often strongly acid and the canopies of trees catch the fine droplets and accentuate deposition.

Where does the pollution come from? Thanks

to the Cooperative Programme of the Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe (EMEP), and its network of 92 monitoring stations in 24 countries, we now have a good general picture of the movement of air masses and pollutants across Europe, at least so far as sulphur dioxide is concerned. There is much movement into Austria and Switzerland which certainly receive most of their sulphur dioxide from outside their boundaries (Weidner 1987). However, much pollution is also generated within the Alpine region both from automobiles and the neighbouring provinces of Italy, France and Germany.

Conclusion

The current situation of Alpine forests is definitely serious and worrisome. Superimposed on an unfavourable background, new stresses, mainly related to air pollution, are developing. Their interaction with historical and natural factors, such as mismanagement and climatic stress, creates a synergy which is complex and difficult to analyse.

However, if the causes of forest decline are only dimly perceived, the consequences are in contrast quite obvious. There is a considerably increased risk of avalanches, landslips, torrents and flooding, with much damage to life and property. Although the sums needed for extra pro-

tection appear enormous (e.g. 18 million Swiss francs a year for avalanche protection in Switzerland), they must be weighed against the destruction of natural habitats, or the value of human lives.

We can conclude at the very least that the situation is deeply disturbing. More effective measures are required to reduce air pollution and to foster the regeneration of the forests. To delay such actions until there is absolute certainty about the situation would be unwise.

2.2. TOURIST PRESSURE

The effects of tourism on the Alps have been enormous. Up to the 1920s, visitors came mainly in the summer season. The first Winter Olympics were held at Chamonix in 1924. By 1933, nearly half of the visitors in the Tyrol came in winter. But the tourist explosion came after the Second World War, especially from the 1950s onward. By 1980, 40 million vacationers and 60 million day trippers stayed in the Alps. Austria had 118 million overnight stays and Switzerland 75 million. In 1982 France registered 40 million overnight stays in winter, and 94 million in summer by French nationals alone. Foreign tourists added substantially to these numbers. Despite several fluctuations - linked to the oil price crisis

of the 1970s, the revaluation of Alpine countries' currencies, the warm winters of 1987-89 and other variables - there has been continuing expansion, particularly in winter.

From the 1960s, expansion of winter tourism was facilitated by the widespread construction of skilifts - there are now more than 40,000 skiruns in the Alps - and large resorts, often at high altitude. New technology allows the production of artificial snow compensating for the warmer, later seasons, and makes it possible to fly wealthy tourists by helicopter to otherwise inaccessible areas. More recently, the Alps have experienced a boom in ski touring and in new activities, such as golf or riding cross-country vehicles and mountain-bikes.

The building of second homes, chalets or apartments, is becoming increasingly fashionable: in resorts like Courchevel and l'Alpe d'Huez in France, such residences account for over 50% of all dwellings. In many areas, real estate development has been encouraged by local authorities so that farmers could sell off old houses or marginal land. Often tourism has become the major source of income, and sometimes the only one.

Tourism drastically changed the face of settlement in the Alps. In some villages traditional forms of architecture and culture (even cows walking through the village at milking time) have been retained especially for this purpose. But except in the remote valleys of Austria, most of the old peasant ways have been lost. Society and

economy are no longer based on a close integration with the mountain environment. Traditional knowledge of agriculture, of using herbs for medicine, of weaving and architecture have largely disappeared, together with the sturdy independence that always characterized the montagnard mentality and society. Instead, many mountain villages have been transformed into suburban zones of concrete and spidery lifts, connected by highways often jam-packed with auto-



mobiles. Today it is only in outdoor museums like Ballenberg in Switzerland that one catches a glimpse of the traditional ways of the past.

As a result of this transformation new kinds of social structures have emerged. For example, les Arcs and La Plagne in France, which were specially created as purpose-built resorts ("*stations intégrées*"), have a very small resident population and 10,000 or more guest beds per resident. Many of these guests are young cosmopolitan urbanites. But even in older, more staid resorts like Crans-Montana in Switzerland, outside predominance holds. These large "foreign" resorts, found more often in the western Alps, are usually built at higher altitudes in the very fragile zone between forest and grassland. In contrast, in the eastern Alps development is spread over smaller low-lying communities, with few exceptions like Obergurgl (Austria) or Madonna di Campiglio (Italy) in the central region. This east-west distinction reflects to some degree the cultural preferences of the visitors in the east, who seek to be a part of a modest local culture rather than to live in the glittering ghettos of the very inaptly named "*stations intégrées*". The decentralized nature of communal autonomy is also a factor. In Austria and Switzerland there are more controls and constraints and community-based initiatives whereas in France and Italy, planning controls are weaker and there is overdevelopment of vacation residences (see Guérin 1984).

These different approaches to tourism are reflected in different landscapes. In the western

model tourist developments usually occur high above the forest whilst local communities have retreated to the plains. In contrast, in the east the local economy is still present, and residences of tourists and locals (who may still predominate) remain at low altitude. The effects - ecologically and economically - are initially different. There are benefits in the eastern model to the local population whose standard of living is raised by the revenues from tourism. Ultimately, however, the level of pollution and sprawling buildings may create a situation hardly less damaging than in the west.

This impact is magnified by the scheduling of the "tourist invasion": everyone is going to the same place at the same time for the same reason. School and other vacations are concentrated into a limited time period and on weekends mountain resorts become particularly congested. It is more and more common for people on the plains to leave their homes to spend a single day in the mountains. Many rental periods begin and end on a Saturday. The automobile clubs call these "black Saturdays" when most of the Alpine roads are blocked with traffic. Heavy snowfalls, poorly-equipped cars and inexpert drivers can only complicate this pattern.

The effects of this situation can be summarized as follows.

— Land clearance —

The forest is cut for skiruns and lifts. The terrain is then reshaped by bulldozers to ensure better runs. The vegetation is further cleared for the construction of chalets, apartments and restaurants (which may be at high altitudes). The results are erosion as well as destruction of the natural habitat. The wounds of such clearing do not heal easily in the mountains.

Some 40,000 skiruns have now been constructed in the Alps. The vegetation clearance is not restricted there, as skiers now increasingly go "off piste", damaging young trees especially in that high altitude zone (*Kampfzone*) where they are struggling for their existence and are greatly disturbed if not killed by the skiers (see Leser et al. 1982).

Cross-country driving, now made possible with the advent of the 4-wheel drive vehicle, causes further damage. So too, do the automobiles of tourists which on some weekends create traffic jams along almost every road network of the Alps, contributing a major part of the pollutants which kill the forest.

— Construction —

The building sprawl often creates not only an ugly vista but also serious local ecological problems. Building may spread along traffic arteries, or be

concentrated in specially designated areas. The original top soil with its rare bulbs and flowers is removed and replaced with concrete, or sown with poor substitute grasses. Favoured sites are along lake shores or in belvederes commanding a beautiful view. The network of roads increases the spread of concrete (or asphalt) and the flow of cars. In winter heavy doses of salt and other chemicals are applied, eventually washing off in a toxic mix



on to the surrounding terrain. The roadsides may be left unvegetated, adding to unsightliness and increasing erosion. Finally there is a problem of water and sanitation in mountains where systems may become quickly overloaded and unable to cope with the population explosion during the vacations.

— **Socio-economic effects** —

Tourism also has grave socio-economic effects. Although there may be an initial cash benefit for residents, in general the profits flow to the plains. During the short and concentrated tourist season, there is an intense competition for business, the remainder of the year being mostly slack time. Therefore even the takings of the best years may not be adequate to support a resident family, particularly when costs such as housing are high.

Moreover the actual effects on local employment are not necessarily obvious, as statistical evidence may easily confuse seasonal (often exogenous) employment with a truly permanent one. Unfortunately tourism does not generally induce a real development of the local society as a whole, enhancing only a few selected sectors of the local economy.

The social and psychological effects are very serious as well. Residents may be regarded as somehow inferior, largely a source of "local

colour", and this degrades their culture even though tourism is a major reason why some traditions have been maintained or resurrected. Non-residents may come to dominate the political decision-making process, even when they are not often in the mountains. The remaining permanent residents often live in ghost villages or towns as quiet as cemeteries, inhabited only for a few frantic days or weeks. The traditional institutions of the community - the school, the dairy and the church - are often closed down so that the residents themselves have to leave the villages in order to have access to these facilities.

Future trends

Finally the long-term stability of the tourist trade itself is questionable. This industry is still experiencing a worldwide boom, but many mountain people fear that fashions or the climate may change. This has already happened in some low-altitude resorts which were popular enough in early periods when little snow or slope were required. Many resorts of this kind are now economically depressed.

It is of course difficult to anticipate the future behaviour of tourists, but two basic scenarios are worth examining: a stagnation of downhill skiing or a global increase of tourist pressure.

With respect to alpine skiing, a durable levelling off of European visitors, for demographic and

economic reasons, appears likely. In such a context, increasing competition among ski resorts, already endowed with an excessive real estate park for vacationers, is to be expected. Some resorts will be led to bankruptcy, others to opportunistic, very concentrated, development.

For global tourism as a whole, most predictions nonetheless signal increases in tourism. For instance the World Tourism Organization (WTO) forecasts a doubling of numbers by the year 2000 for vacation, excursion and weekend travel. Even if downhill skiing were to become less popular, because of changing fashions or congestion in ski areas, other new Alpine pleasures - some more ecologically appropriate like cross-country skiing, some less so like ski-bobbing or heliskiing - may soon develop. Krippendorf and others claim that the Alps will have a big share of this touristic expansion, because of the proximity of cities, the pollution of coastal areas and the continuing attraction of the Alpine landscape.

The increase in tourist numbers may become most marked in certain resorts that are already well equipped to receive the increasingly sophisticated international trade. Such sites are likely to become ever more saturated with the development of a heavy, aggressive, tourism infrastructure. What will happen to the less fashionable resorts is open to question: will they languish, or experience instead an increase in the favours of visitors seeking the tranquillity of quieter places off the beaten track?

2.3. AGRICULTURE AND SOCIAL DECLINE

A third problem area is agriculture. Some consider this to be a key problem since the decline of agriculture is intimately related to that of communities. In many parts of the Alps traditional agriculture has been displaced by tourism. The decline of agricultural areas, however, is neither



complete nor universal. In some places the agricultural sector has increased to supply the growing tourist industry. A small but important number of montagnard farmers remain, albeit on an income significantly lower than that of the plain farmers.

Until recently, many mountain villages were self-contained units. Basic needs were filled from local subsistence activities and there was an isolation from, even an opposition to, the market economy. There were low levels of mechanization and capital intensity in agriculture. A large family was called "the greatest blessing" since it provided a ready supply of labour. As Rieder says, "one lived and worked within the boundary of the village community. Most of what was needed was produced locally".

After the last war, the impetus moved outside the village. Communications, market forces, industrialization and urbanization came to the mountains and valleys. Mountain trades and craftsmen - mountain labour - migrated to the centres of expansion in the industrial regions. The population declined. The mechanization of mountain agriculture led to a new division of land utility: areas which could be mechanized and those that could not. Less labour was needed so that the depopulation spiral intensified.

Of greatest significance, the plains market came to dominate mountain agriculture which became more and more dependent on subsidies. Because the costs of production are higher in mountain regions, the montagnard can n

longer compete with the plainsman without some sort of protectionist policy. In this area the harmonization of agricultural policies among Alpine countries is far from complete. Thus the EEC Common Agricultural Policy subsidizes marginal land producers in the French, German and Italian Alps in a very different manner to that followed in Switzerland or Austria. In any case the subsidy system cannot ensure long-term viability.

In many mountain communities the farming population is not only in decline but in a minority. There do not appear to be any ways of revitalizing it without subsidies. And it may even be difficult to get decisions favouring agriculture through local community power structures. The present discussions in the EEC on set-aside land even raise the possibility of mountain farmers being paid not to farm. Hopefully the choice will be the use of subventions to encourage forestry, traditional farming methods, and generally wise environmental management.

The present declining, subsidised, way of agricultural life in the mountain settlements can be very demoralizing. The movement of skilled people to the valleys, and the dwindling numbers of permanent residents reduce the custom for services - school, doctor, veterinary surgeon and even church - to below the threshold of viability. Smaller families, the social norm in Europe today, accentuate these processes. There are not enough people to buy local products like cheese, so the remaining farmers tend to sell out their milk in bulk. And so the spiral continues.

With the decline of community institutions the home too atrophies. Women today, with their smaller families and higher expectations, are not satisfied with their traditional role in the home. Yet there are no jobs in the mountain village for them either. Agriculture cannot support or pay for extra labour, even if there are tasks to do. The scope for cottage industries is limited and there are few new enterprises. In tourism the demand for labour may be less than the demand for land.



Secondary residences, empty for many weeks in the year, do not require much labour input. And the waiting or cleaning jobs are quickly filled by students or immigrant labour who are forced to accept minimal wages and menial working conditions. The situation of women in the mountains is very difficult, often impossible.

If the home goes, so too do the children. Once the primary school has closed, they must make long journeys down the mountains to school. And the higher the education, the further the student must go. For example, a senior secondary school (Gymnasium) student from Diablerets in the Alpes Vaudoises must travel four hours a day to and from a school 100km away. Boarding children in town may be prohibitively expensive, costing as much as 25% of the average mountain family income in Switzerland. Nor are there jobs or recreational activities in the villages to occupy young people in leisure hours. So they marry, or cohabit with partners from the plains, and move away, preserving only tenuous or nostalgic links with their mountain homes.

What are the environmental effects of this decline in agriculture and community?

A. If Heidi, the Milka cow, and the flowing landscape of meadow and forest are no longer to be found, there is a loss of attraction for tourists. Meadows left ungrazed too long are likely to become rank, lose their flowers and revert to woodlands. Some experts see ecological value in the abandonment of traditional agriculture so as to let the woods return naturally. However,

whether unmanaged forests are ultimately the best defenders of the soil is a matter of current debate. Besides, abandoning these areas, with their historic cultural values, to the successional processes of nature may not create the optimum balance between humanity and the land.

B. In fact once the farmers have gone, fewer people remain to protect the landscape. Traditional farming was indeed a kind of landscape gardening and land management, producing scenes of great beauty and considerable harmony with nature.

C. Once agriculture declines the old customs disappear too. These customs included much traditional conservation lore, an ancient wisdom not necessarily contained in modern agronomy even on the rare occasions when mountain agriculture is given its appropriate place and attention in the scientific establishment.

Of course the clock cannot be turned back. It is necessary to have a mountain agriculture, standards of living, and working conditions that are modern, healthy and attractive. In this agriculture, there is still room for the best features of the traditional world, especially the close rapport between man and nature.

2.4. CLIMATE CHANGE

These various Alpine problems are compounded by the serious possibility of significant climate change over the coming decades. There is now an extensive literature about a global warming, the so-called greenhouse effect, due to increases in atmospheric carbon dioxide, methane, nitrous oxide, ozone and chlorofluocarbons. There are predictions of temperature rises in the middle latitudes of between 1° and 3°C over the next fifty years. This temperature rise may be most marked in winter and there may be more winter rainfall (or snowfall at high altitudes) as well.

There is a broad consensus among experts that the warming is largely due to an excessive emission of carbon dioxide from fossil fuel combustion; ozone from chemical reactions involving motor car exhausts; nitrous oxide and methane from agriculture; forest clearance and fuel combustion; and the group of industrial chemicals known as chlorofluorocarbons (CFCs) used in coolants in refrigerators, as propellants in aerosol sprays and for making plastic foams and solvents.

The impact of climate change could well exacerbate most of the problems already identified. Effects may range from glacial melt and downstream flooding of land to increased forest



damage via accumulation of snow and increased risks of avalanches.

In addition upward altitudinal shifts of the various mountain ecosystems are likely. On average, a movement upwards of 150 m is needed to counteract a 1°C rise in mean temperature. Until reliable estimates are produced on the temporal and spatial scales of such phenomena, it is difficult to be precise about the impact of these changes on agriculture, forestry or land use. But there are likely to be implications

for all of them and for the protection of threatened species and natural habitats. Incorporating the largest possible altitudinal range in national parks and other protected areas would be a minimal step for preserving biological diversity, should there be a clear upward movement altitudinally of the vegetation belts in response to climatic warming. No clear solution is in sight, however, to prevent the loss of species currently occupying the highest elevations.

In economic terms, should the warming trends be confirmed, the greatest effect will probably be on tourism. For example during the two consecutive winters of 1987-88 and 1988-89, the weather was unseasonably warm, and there was practically no snow before January even in high altitude resorts. The resulting absence of Christmas holiday-makers led to a large loss of revenue in most ski resorts. When the snow came, barely in time for the February holiday break in some resorts, it was in many areas already of the spring type, much prone to avalanche. The revenue deficit in this season placed many enterprises under great strain.

Such risks, which are particularly manifest through the example of the ski industry, represent only one aspect of a broader question: what will be the implications of climatic change for the whole Alpine region ? How will it affect among others the hydrological regime, the vegetation cover, the potentialities for agriculture ?

CHAPTER THREE

Solutions



Most ecological and conservation documents are naturally very concerned with problems, but the solutions need even more thought. It is true that there is “uncertainty on a Himalayan scale in most mountain regions of the world” (see Thompson et al. 1986); that is a grave lack of knowledge about precise dynamics and complexities. At least the Alps have been better studied than other ranges. Indeed there have been many solutions proposed and assorted strategies, plans and guidelines drawn up over the years. Moreover, most of these guidelines are in fundamental agreement about what should be done, though less certain on the ways of going about it.

Most significantly what is lacking is an integrated approach where the different piecemeal solutions, sensible in themselves, are given added strength by being placed in a concerted, comprehensive action plan. It is necessary to recognize the positive actions by governments and agencies concerned with conservation and development. The object here is not to list and evaluate such actions, but rather to highlight promising moves and ideas, and attempt to fit these together into a coherent blueprint.

There exists a large number of organizations and individuals, political, professional and administrative, who are attempting to rectify most if not all of the problems described. Examples are SAB (Switzerland), ANEM (France) or UNCEM (Italy), basically representatives of mountain populations and communities; ARGE-ALP (Central Alps), ARGE ALPEN ADRIA (Eastern Alps); as well as the CLRAE, the standing conference of local and regional authorities of the Council of Europe, and EEC committees for mountains and less favoured areas.

There are important specialist groups, such as EUROMONTANA, a part of the European Confederation of Agriculture which has, since the Second World War, pressed for agricultural reform. Since the recent meeting convened in Trento in 1988 by CLRAE these efforts and this cooperation are intensifying.

Nonetheless, as is frankly admitted, there is still much to be done. The state of the Alps remains worrisome and their future appears uncertain as threats intensify and new problems emerge.

What follows is an attempt to identify priority areas where an immediate integrated approach is possible ; it builds on, and expands, existing initiatives. The pillars are (1) a new initiative in mountain conservation, (2) accelerated pollution control, (3) environmentally appropriate tourism ("soft tourism"), (4) expanded protected areas, (5) revitalized agriculture, (6) community development. To achieve effective action in these areas, major organizational education, training and awareness reforms are called for. These are outlined as well.

3.1. A NEW MOUNTAIN CONSERVATION

A starting point has been the work of the International Union for Conservation of Nature and Natural Resources (IUCN - The World Conservation Union), which was founded in 1948 largely through the efforts of Unesco, the Government of France, and the Swiss League for the Protection of Nature. Shortly after its foundation, IUCN began work on the Alps, and in 1952 was largely responsible for the formation of CIPRA (Commission Internationale pour la Protection des Régions Alpines) - a regional commission responsible for the protection of the Alps. Over the years IUCN and CIPRA have spared no effort, documenting the survival of species, assisting in the process of establishing protected areas, gathering together information on the maze of legal systems and promoting education, training and public awareness.

The early 1970s marked a heightened consciousness - particularly amongst senior environmental policy-makers - that there was a deteriorating situation, especially in Europe and especially because of air pollution. Although the focus of concern over "acid rain" and its effects was initially on Scandinavia, there was a certain awareness of the Alpine problem. Unesco, through its Man and the Biosphere programme, sponsored expert meetings and studies which to

day constitute a most valuable archive for plotting the changes that have taken place and for preparing the future solutions. IUCN, together with other agencies, participated in these international activities and moved conservation strategies forward.

IUCN prepared, in conjunction with UNEP (United Nations Environmental Programme) and WWF (World Wide Fund for Nature), a special set of ecological guidelines for mountains for inclusion in the *World Conservation Strategy* (Dasmann & Poore 1979). These set out what should ideally be done, including: the most appropriate land use policies; the best allocation of resources; the avoidance of conflicts over soil and water conservation; the best forest, pastoral and agricultural uses; and the preservation of undisturbed ecosystems, wild genetic resources and places of natural beauty.

IUCN's ecological guidelines were important, adding to the debate in the 1980s on how conservation could align itself much more closely with development goals (see the report *Our Common Future* of the World Commission on Environment and Development, 1987) to promote a sustainable development based on international cooperation, changed human values, greater participation and equity. By the end of the 1980s, IUCN had officially established a mountain programme and given priority to the Alps as a most endangered ecosystem.

But although sound, the *World Conservation Strategy* itself was not sufficient. The

brush was too broad. Realistic solutions that would have to be hammered out in the cut and thrust of a complex political situation, and the fleetness of foot needed to keep up with a fast-changing dynamic situation, were lacking. In addition there was not enough specifically on the problems of particular areas such as the Alps.

In 1974 IUCN and the Italian Alpine Club jointly organized a major conference in Trento of over 500 experts and scientists, which produced an action plan for "The Future of the Alps". The plan was detailed, containing 84 items covering planning, management and use of resources, protection of nature and natural resources, and implementation. But despite the detail, or perhaps because of it, the Trento plan remained largely a pious hope and a dream rather than a reality.

The situation of the Alps has in fact noticeably worsened since 1974. Insufficient attention was paid to pollution. Tourism was rather too enthusiastically received whilst local society, culture and agriculture were not encouraged enough. Some recommendations of Trento now simply look unrealistic, like the last, which virtually places a moratorium on all future developments.

One can measure here the real difficulty of developing for the whole Alpine region a conservation strategy that is both scientifically sound and politically operational.

From the 1970s emerged a flood of charters, declarations and promises, some at the highest political level, like the Strasbourg Ecological



Charter for the Mountainous Regions of Europe in 1976, while others were the product of popular fervour, like those documents that emerged from the enthusiastic Alpine clubs. To some degree the rhetoric was translated into national legislation but unfortunately piecemeal rather than in a rational international code. CIPRA and the IUCN Environmental Law Centre are attempting to remedy that situation by proposing an Alpine Convention which will draw together the judicial threads into an effective web.

Of course such a convention will only be of value if it can be backed by firm measures that influence the conduct of people on the ground.

We have then a situation of good intentions and promises. Our proposal is, however, for concrete, urgent conservation action, oriented towards the problems we have identified - bringing forests, alpages, and associated ecosystems and the mountain communities amongst them back to life, and containing the intrusive forces of exploitation, be they pollution, tourism, or financial or political power. It would be naive to try to re-create a lost paradise which may never have existed. We seek instead a realistic plan which balances self-reliance and dependence. Such a course involves plans and strategies, laws and conventions, but most of all popular participation and the broad process of education, learning, training and awareness, which has been neglected in the pronouncements of the experts and the international ecological bureaucrats. Above all the blueprint sketched here tries to build on existing efforts rather than creating new structures. Very significantly many of the key factors it addresses are located outside the Alps, often hundreds of kilometres away.

But if conservation, at least in the expanded vision of the revised World Conservation Strategy, is the cutting edge of a new integrated Alpine initiative, it is only a part. Conservation needs to be placed more firmly in a conceptual and organizational frame encompassing not only

ecological, but also wider social, economic and political movements within which mountains are a focus.

3.2. ACCELERATED POLLUTION CONTROL

Pollution, especially air pollution, contributes heavily to forest damage. An important convention, the United Nations Economic Commission for Europe (UN/ECE) Convention on Long Range Transboundary Air Pollution (LRTBAP), covers the UN/ECE region from the Urals of the USSR to the Rocky Mountains of the USA and Canada, i.e. the region contributing most to the world's air pollution. The Convention has its origins as long ago as the 1950s when the first studies were carried out in Scandinavia and a European Air Chemistry Network was established. In 1972 Sweden submitted a case study on long-range transboundary air pollution - and a call for action - to the UN Conference on the Human Environment, held in Stockholm in that year. In Scandinavia, the principal concern had been the acidification of freshwaters and the destruction of fish. Later studies and a measurement

programme sponsored by the OECD indicated that, by the end of the 1970s, there was an expanding area of more intensely acid rainfall. The UN/ECE then established a cooperative programme (EMEP) to monitor and evaluate the long range transmission of air pollutants and began drafting the Long Range Transboundary Air Pollution (LRTBAP) Convention.

The text, drawn up in 1979, was at first quite weak, merely obliging the signatory states to endeavour "to limit and so far as possible gradually reduce and prevent air pollution" using only a technology that was "economically feasible". But as evidence of forest die-back accumulated, a "30% Club" was formed in 1982, whereby countries agreed to reduce the 1980 level of sulphur emissions or their transboundary fluxes of this gas by 30% by 1993. This was converted into a formal protocol to the LRTBAP Convention which 21 countries signed in 1985. By 1987 a sufficient number of countries had ratified this for it to come officially into force.

A further protocol to limit nitrogen oxides was signed on 1 November 1988 by 25 countries, which agreed in a first stage to freeze their national annual emissions, or transboundary fluxes, of NO_x by 1995. For most countries the base year will be the emissions of 1987. The preceding day, 12 countries, 6 of them Alpine - most significantly including France and Italy, both major emitters of NO_x in Europe - committed themselves by signing the Sofia Declaration to

try and achieve a 30% reduction in nitrogen oxide emissions by 1998.

There is still some way to go. Although most European countries have ratified the LRTBAP Convention, it remains more of a framework for information exchange than a tool for action. The protocol establishing the monitoring network, which provides a clear picture of the patterns of transboundary fluxes and depositions, has not been ratified by all States. The SO₂ protocol still lacks the signature of the United Kingdom which remains the largest single national emitter of sulphur dioxide in Western Europe. In 1988 the United Kingdom, together with the other members of the European Community, did agree on a directive on the control of sulphur dioxide from large commercial plants, and announced the fitting of controls to six existing power stations. However, the 30% protocol remained a sticking point. While UK emissions have declined considerably since their peak in the mid 1970s, and the Government there has committed itself to action to curb both SO₂ and NO_x releases from power stations, this refusal to sign the protocol is seen by most European nations as a demonstration of insufficient British concern for the environment.

The LRTBAP Convention has not, so far, been concerned with the regulation of vehicle emissions, which are a significant source of forest damage. Member states of the European Community are now discussing a series of measures that would bring new cars in compliance with

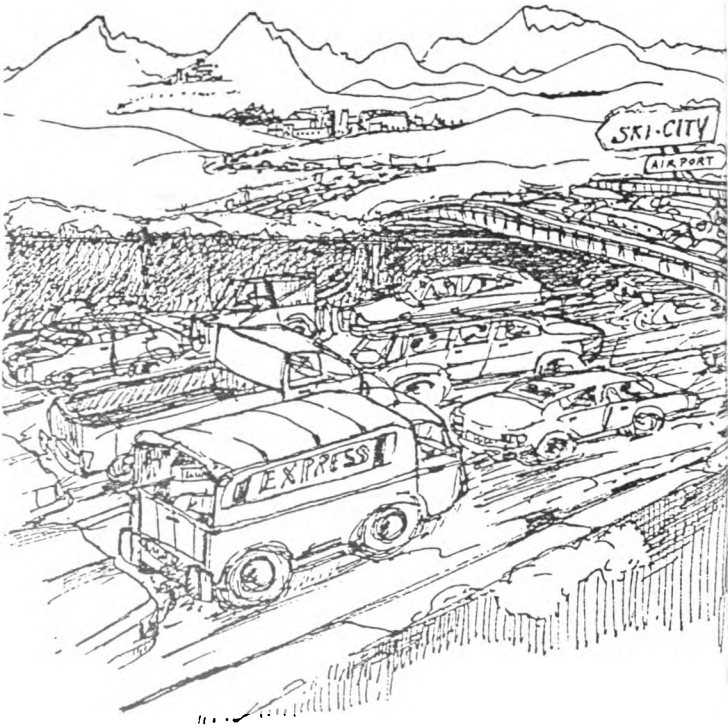
the strict standards for emission control pioneered in the USA. An agreement to this effect, concerning small-engined cars, and effective in 1992 has just been signed (June 1989).

For the Alpine forests, these measures are not sufficient, as the levels of deposition remain several times greater than the calculated tolerances of sensitive ecosystems. The new LRTBAP NO_x protocol, with its commitment to hold emission steady at 1987 levels, will probably still mean depositions above ecologically tolerable rates. Universal adoption of the best available technology (which at present means catalyst systems) could make a substantial inroad into the 40% or so of European NO_x that comes from cars: an associated benefit would be the elimination of lead from the fuel these cars must use.

If people used their cars less in the mountains, there would be an improvement, perhaps a dramatic improvement, in pollution levels. So far it seems as if the public are not very cooperative in this regard. When the EEC, as part of the European Year of the Environment, asked for car-free days, there was a minimal response. One section of the Touring Club Suisse, the motoring organization, even campaigned against the idea, seen as part of creeping infringement on motorists' rights.

The reasons are obvious. People prize their individual mobility: the right to go where they want

when they want. It would be immensely costly to provide public transport services which give a flexibility remotely comparable with private cars. The interests of the Alpine environment may nonetheless demand a switch from private to public transport. There is a strong case for appropriate zoning policies to reduce motorized traffic in the most vulnerable regions.



There are, therefore, a number of things that can realistically be done:

- the process of implementation of the existing LRTBAP Convention and its SO₂ protocol must be intensified. New and stringent protocols on NO_x and volatile organic hydrocarbons can be sought along the lines of the 1988 Sofia Declaration;

- incentives for using unleaded gasoline, including a favourable tax pricing system, should be increased;

- the key is not to work on the basis of arbitrary percentage reductions in emissions, but to calculate the levels of pollutant loading (the "critical loads") that are within the tolerance of ecosystems - especially forests and freshwaters - and to demand corresponding levels of emission control;

- the efforts initiated by certain NGOs, such as WWF and Greenpeace, to organize publicity and to provide information to the public, the decision-makers and the media, should be widened;

- an extensive educational campaign should be mounted. This should include training and encounter programmes for decision-makers so that the vital political impetus is enhanced. The learning procedure should be expanded into the schools, forming an essential part of the curriculum. There should be much more in the media and the informal learning networks ;

- delinquent factories that evade controls may need to be leaned on by the more responsible companies, be they local or multinational. There are hopeful signs in this direction, as can be seen from the work of organizations such as the International Environmental Bureau, which is a club of leading companies based in Geneva who are doing their best to improve both the image of industry and its performance in controlling environmental abuses;

- local authorities should encourage the use of public transport, and consider following the model of Avoriaz (France) and Zermatt (Switzerland) and restricting cars in particularly sensitive areas;

- the ordinary person may do much to help this process. A list of useful addresses for those wishing to become involved in the expanding network of action groups, or for those simply requiring more information, is appended.

3.3. "SOFT" TOURISM

There is much scope too for the reform of tourism activities in the mountains. Although

some conservationists have developed an almost pathological dislike of tourists, wanting to bar them completely from the Alpine region, any realistic solution must take into account the fact that many mountain communities now depend on tourist revenue for a great part of their livelihood. What is called for is essentially a process whereby there is both protection of the patrimony and local benefit.

The first steps in reform might consist of a planning process with a much greater popular participation than at present. Fuller independent environmental audits, and a monitoring mechanism should ensure that once a plan is approved, it is indeed carried out. Too often the key decisions to construct roads or grant concessions for ski installations come from outside the region, even in countries like Switzerland where there is considerable local community control. There is a case for localizing much more of the power to make decisions on access or infrastructure concessions in the local community.

On the other hand, when zoning for secondary residences has been in local hands, too much expansion took place as the local people, needing cash and inexperienced in dealing with construction firms, extended secondary residence zones - a decision many now regret since it resulted in increased land prices and in houses that are empty for most of the year. In the future, it may be possible to restrict the number of secondary residences, either through direct ceilings or punitive taxes. It is more difficult however to deal

with the present situation, as there are many hindrances at all levels - conflict of goals, lack of clear concepts, lack of coordination, institutional weakness, lack of political and popular will.

Above all, limiting the development of massive, concentrated, forms of tourism must become a priority. Drastic controls will not prove very effective there until one addresses the root of the problem, that is, the mentality of both "producers" and "consumers" of touristic development. Here a change of mentality is urgently called for, through the active promotion of touristic practices that will have a minimal adverse effect on the environment.

One of the most important ideas indeed is that of "soft" tourism (*tourisme doux*, *sanfter Tourismus*), which has been promoted particularly by CIPRA (see its 1985 Report). There are varying definitions of soft tourism. For some it is centred on harmonious relations between man and nature; for others it is a non-profit making activity involving a minimum of technology. There are already many soft tourists: those who come to the mountains to walk, perhaps with a dog, or to practise cross-country skiing and those who live very simply, perhaps in a tent, making sure that they leave no litter and light no fires.

The idea has been widely canvassed but the fact is that the use of skilifts is still increasing at a rate of about 5% a year and there are annually more cars and more beds. Obviously the average tourist consumer in the Alps is too weak, or too "soft", to practise soft tourism. The fashion

of walking and cross-country skiing is probably hampered by an image associated with older people and times of the past. Media coverage, for instance of Olympic and World Cup events, almost invariably feature the breakneck descents and slaloms rather than the gliding nordic skiers.



To make soft tourism a reality requires a change of popular mentality. The authorities can do much, putting taxes on skilifts, banning artificial snow, and controlling more effectively 4-wheel drive vehicles off roads, heliskiing, and skiing off-

piste. Incentives for cross-country skiing might come in the form of offering free equipment to school students, and discontinuing charges for cross-country trails where they exist. A further step would be to persuade tourist agencies to promote "soft" tourism.

Nevertheless the tourist pressure is one of quantity as much as quality. There would still be a major threat to the essence environments if the meadows were covered in tents - and indeed caravan parks in many places are not only unsightly but pose sanitation problems. Irresponsible walkers or cross-country skiers in any number can do immeasurable harm and may leave tons of litter over a wide area, as anyone who has worked with a clean-up team can testify. Ski de randonnée (ski off the cross-country pistes) may be very harmful when too many people are involved or when the skiing takes place at times of low snow cover and among fragile shrubs and trees.

New kinds of soft tourism might be developed or revived. Once mountain resorts were famous for their health-giving qualities: pure waters, fresh air and sun, good food and quiet. In some mountain resorts the hospitals are still there although the patients (mainly tuberculosis sufferers until the 1950s) have departed. Once again the mountains might be offered as a health haven. There are many stress-related diseases in a busy, frantic working world, which would be eased by the stillness of the mountains. In the search for longevity the Alps, like the Caucasus, could play

an even greater role for elderly people who seek health and retirement in congenial natural surroundings.

Education has also long been a feature of many mountain villages. The famous medieval teachers with feathers in their caps came from the mountains. Leysin (Switzerland) is a contemporary example of the integration of two functions, where colleges and schools are occupying former sanatoria. But more might be done to encourage the use of holiday buildings for longer seminars and training courses, or even for whole classes transferred out of the foggy plains, towns and cities.

These few suggestions, chosen among many others, serve to illustrate one central idea: that the future of tourism ultimately depends on an imaginative dialogue between the mountains and the plains, a debate which should be both possible and desirable in this age of telecommunication.

3.4. ENHANCED PROTECTED AREA SYSTEM

There is a need for protection even from soft tourism. How far can protected area concepts help the Alpine situation? In many parts of the world there is an increasing number of protect-

ed areas: nature reserves, national parks and protected landscapes amongst others. The current extent of such protected areas in the Alpine region according to the latest *United Nations List of National Parks and Protected Areas* (1985) is shown in Appendix 1.



The Alps have a long history of protection, initially to safeguard hunting, or protect against avalanches. By the mid-nineteenth century there were large tracts of land set aside in Austria, Bavaria and Italy as royal hunting reserves, some

of which became the core of national parks, like Gran Paradiso in Italy. In the twentieth century conservation motives became more important, beginning with the establishment of the Swiss National Park in 1914. In Austria fishing, hunting, tourism and conservation groups banded together in the Austrian Nature Protection Federation (1922) which now numbers several million members. The Alpine Clubs with a membership of nearly a million were another important group promoting protection. After the First World War, governments became involved, either at provincial level as in the Austrian Lander, or at central level where there has been increasing legislation since the 1970s addressing not only species protection but wider environmental issues as well.

Protected areas clearly play a fundamental role in safeguarding not only endangered species but habitats and ecosystems. However they are often limited by a lack of managerial resources and/or by a restricted range. One of the critical problems affecting not only the management but also the very concept of protected areas concerns their relation with human populations, both within and immediately outside their boundaries. In Europe, the problem is exemplified by National Parks, which enjoy by definition a high protection status.

When the countries of central Europe decided to create National Parks - Switzerland in 1914 (Engadine), Italy over 1922-1935 (Gran Paradi-

so, Abruzzo and Stelvio), France over 1963-1979 (Vanoise, Ecrins, Mercantour) and Germany in 1978 (Berchtesgaden) - they selected areas which were still in a nearly natural condition and had the fewest human settlements - which meant mountain areas. The solutions adopted to cope with the problem of human interference varied from country to country. Switzerland and Germany created relatively small National Parks (less than 20,000 ha) with no settlements and a well-regulated surrounding territory. Italy and France created larger National Parks (over 50,000 ha) which necessarily included human settlements.

Italian and French Parks differ at least in two important aspects. Italian National Parks, dating from an earlier period, are compact and have no zoning, which accounts largely for the present tensions between park management and inhabitants as in Stelvio. French Parks, on the other hand, are very irregular in shape and take on a more homogenous, compact configuration only with their "*pré-parc*" areas where little attention is paid to conservation and where development projects may jeopardise the future of the park itself. Thus a large part of the forthcoming 1992 winter Olympic Games will be held in the Vanoise pre-park.

How wide and how extensive should the protected area system be? The suggestion by some that the whole Alpine area should be under protected status so as to restrict the impact of man is not realistic. One must recognize that the

European Alps have long been zones where man and nature have interacted, in contrast to the often pristine protected areas of North America and Australasia. There remain, of course, environmentally sensitive areas and sites of exceptional interest, physically or culturally, which require special forms of protection as in the World Heritage scheme which has no Alpine sites yet. In the future, ways must be sought of defining areas where there are multiple uses, achieving a balance of protection and human activities.

One interesting model is that of the biosphere reserve (see Batisse 1986), of which several examples exist in the Alpine region (Appendix 2). The biosphere reserve can be conceptualized ideally as a series of concentric or adjacent and interlocking zones. Basically there are core areas subject to strict conservation, surrounded by buffer zones which allow research, environmental training and tourism. Next one finds a transition (or "multiple use") area which associates environment and development. There much emphasis is placed on traditional activities which include agriculture, and much importance is given to education. Rehabilitation schemes are taken into account and can be of great significance given the inclusion of degraded areas.

There certainly are problems. The concept of biosphere reserves is quite new; little more than 10 years have elapsed since the first reserves were established in the Alps. Biosphere reserves cover a very small area, in relation to areas under threat, or to other types of reserves. Yet the

concept is very worthwhile, not least because it is international in essence. Indeed many solutions to the Alpine problems must be international in outlook and context. For this reason, parks which straddle international boundaries like Gran Paradiso - Vanoise (Italy/France) are very useful models for the future.



In the meantime increased support for existing protected areas should be provided as a matter of priority. A comparative evaluation of the merits and effectiveness of the various formulas

for protecting areas across the Alpine arc would be useful in this context. Parks require and deserve a well-trained manpower base, efficient managerial tools and rapid law enforcement capabilities to defend their integrity. They must be better protected against human encroachment and development schemes, as the recent controversies surrounding the Vanoise Park (France) and Stelvio Park (Italy) well illustrate.

3.5. REVITALIZED AGROFORESTRY

In the ultimate analysis, to establish or re-establish the Alps as a viable complex of ecosystems and human uses requires a permanent population with a long-term interest in the environment. That society probably existed in traditional times but there is no way to put the clock back now, at least not completely. But how best can a mountain community be established or sustained? Some ideas can be suggested.

A. First there needs to be a viable economic base. Considering how mountain farming generates both beauty and benefit to those below, and that farmers on the plains already benefit from large subsidies, schemes providing fees and other incentives to those engaged in

traditional mountain farming should be developed. More generally “farming for conservation” should be seen as an essential service for the wider community, and paid as such.

However the viability of mountain agriculture must not be based solely on government subsidies. The development of diversified, original and economically viable farming schemes must be actively promoted. In this regard, the remarkable potential of the Alps for dairy production, in particular of high-quality cheeses, may well represent the best chance for the sustainable development of both agriculture and environment in the region.



In any event the case for a special value for mountain products needs to be put more forcefully. For example, mountain production methods are still "quasi-organic" as Darbellay calls them. Natural products make up the bulk of fertilizers, and there is little use of pesticides. The potential market for mountain products - milk, cheese, honey, fruit and herbs - is large, but the public should be educated to appreciate healthy food, and by extension the health-giving properties of mountain environments. Certain specialized products appear clearly promising in this regard: for example, the market for certain traditional cheeses, varieties of berries and lamb fed on aromatic herbs, may expand rapidly with appropriate promotion.

Much more should be made of the possibilities of combining agriculture with other earning opportunities. There is a need to encourage small-scale industry - cottage style or based on traditional occupations - and, in many marginal areas, commercial forestry. Already in several Swiss regions, such as Aletsch and Grindelwald, the majority of mountain farmers are engaged in another professional activity related to handicrafts, business, industry or most often tourism (Perrottet-Müller 1987). Overall there is a need to plan rationally and effectively for many interlocking activities. Careful preparation in research and especially in training will be needed so that a new generation of young people come forward well equipped and committed to mountain development.

B. The forest must be revitalized. The forest problem is intimately related to a range of economic difficulties which lead to abandonment, ineffective management and ageing of forested areas. A policy to improve this situation would involve long-term incentives, the recreation of a wood industry in the mountains and an infrastructure of training and research. Before this happens, there must be a change in thinking, not just amongst planners, but amongst the people themselves. The value of wood as an aesthetically pleasing and structurally efficient material for houses, public buildings and everyday use needs to be emphasised.

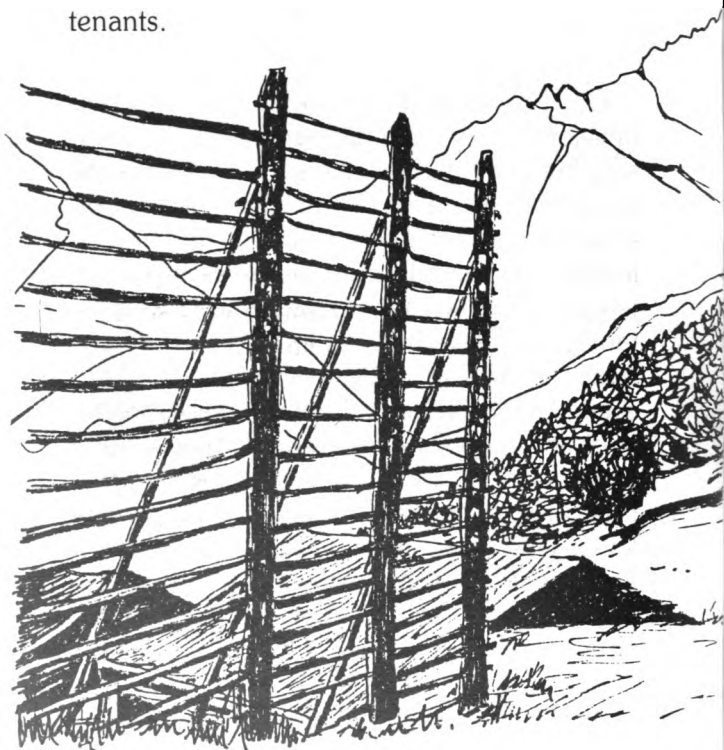


The Alpine timber-using industries need to be encouraged, and to market their products effectively. Changing attitudes will require a great deal of cooperation between all those who use the mountains, both the locals (and the temporary residents) and the industrial complexes that come from the plains.

C. Providing the economic bases for the development of mountain agroforestry is necessary but not sufficient: the social web must be consolidated as well. In particular, the position of women and children, as Coche and his colleagues have emphasized, deserves special attention. Mountain life was traditionally based on family life. The provision of increased special family allowances and services ought to be considered so that at least mountain families are not so disadvantaged in comparison with those of the plains. Schools should be retained even when numbers are very small, especially at the primary level. Open learning, correspondence school and nomadic teaching schemes should be expanded. And health and welfare care should adopt a similar policy.

While the public authorities have taken a leading role in this area in the past through a range of subsidies, more initiatives are called for. Whatever is done, the differential between incomes in mountain areas and on the plains should be reduced. There is also a need for more

flexibility and subtlety in existing policies. An interesting proposal in this context is that of Darbellay (1984) which would allow a differential system of assistance based on the particular situation of the farm - not just geographic situation, steepness or size, but aspect and even the socio-economic situation of the owners or tenants.



Once again the expectation that the public authorities should do everything is neither realistic nor desirable. In many Alpine villages farmers individually or cooperatively have taken

initiatives. In traditional times there were cooperatives dating from the Middle Ages when dairy or wine groups shared production, distribution and exchange. These were the first formal cooperatives in the world; they are re-emerging and have much potential.

To be effective development can no longer be restricted in the traditional way to a valley or a massif, but must be extended to wider regions connected by rapid transport and telecommunications. The renaissance of mountain communities, as with any other aspect of mountain development, depends on a happy and harmonious relationship with the adjacent regions, including the plains. But above all it depends on regaining a sense of their identity and a sense of "belonging" to the mountains.

D. Success will depend on changing attitudes in many sectors of the community. How is this to be achieved? Education? Training? Public awareness? All are necessary but there seems to be a critical entry point through education and learning. School syllabi still only deal with Alpine problems in a fragmented and peripheral fashion. With the advent of the telecommunications revolution in the Alps - as in the rest of the world - the audiovisual media present significant opportunities for communication in the wider sense, where the flow of knowledge is not only one way, but dialogue is possible too. Before this happens the parties concerned in the Alps should get their acts and more significantly their facts

together. The appropriate messages should be distilled without too much interference, at all levels, to all ages and all classes. To facilitate this process a series of training programmes must be developed both for professional educators and for the youth and community leaders who shape public opinion.

3.6. COMMUNITY DEVELOPMENT

In many ways community development may be the key. It is at community level, where there cannot really be a separation of activities and sectors in daily life, that all things become integrated. What is required for effective community development in the Alps? This is a complex question, much debated by social scientists, but some general points can be noted.

A. First there is a need for communities to have a larger scope to make their own decisions, whether *de jure* or *de facto*. Many social scientists have distinguished a negative community development imposed from above from a more positive, sustainable version where there is a genuine local input and an indigenous frame. Of course caution must be exercised to avoid giv-

ing back too much power to local communities when their vested interest conflicts with the harmonious development and conservation of the larger region. A study of successful community development schemes in the Alps (as in the Swiss Unesco/MAB studies in the Pays d'En-Haut) reveals some of the necessary steps in this intricate process.

There is a rich tradition to draw on in Alpine communities. The first cooperatives, the *fruitières*, were developed in the Alpine region in the Middle Ages. There were widespread forms of collective ownership and use in the alpage common lands and indeed communal and regional autonomy. There were traditional mechanisms too for linking with the plains - marriages and gift exchanges where wine came from below in return for cheeses and straw for the vineyards.

B. There is a need for a rapid and continuous flow of information. Not only should education, training and awareness programmes be adapted to provide essential technical information (on agricultural extension for example), but they should also include ideas for organizing local initiatives and setting up organizations of a cooperative kind.

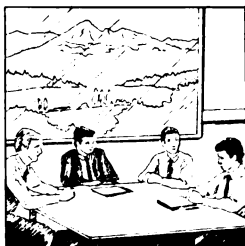
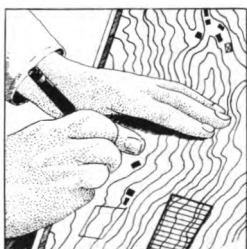
C. Part of this process of increasing the flow of information is the expansion of local participation. This should include not only the electoral mechanisms but also the bureaucracy which

should be opened up to local scrutiny as well as to judicial review in cases of abuse, perhaps through a mountain ombudsman system.

D. For any community development scheme to succeed, it is necessary to have a critical number of people. Encouragement might be given to the return migration of mountain people or to colonization from the plains, by means of tax concessions, insurance subsidies, etc. Schools, hospitals and other community facilities may need to be re-established even if they do not measure up to the cost-benefit criteria of lowland economists. The revival of mountain schools may be a key factor in retaining youth in the mountains as well as being, as in historical times, a source of pride and achievement. Vocations need to be built into these resurrected school systems with particular attention given to adapting traditional strengths. An interesting model is the Vallée de Joux in the Swiss Jura where current efforts utilize traditional watchmaking skills for new computer applications.

E. Finally no number of people, or range of institutions can succeed unless there is also a popular will to make a go of it in the mountains. Popular will is the necessary complement to political will, the generation of ideas, initiatives and investment that comes from outside. The creation of such change requires more than local motivation and general goodwill. The problems are long-term - for example the reversal of the

cumulative damage done to soils and forests will take many decades - and this demands consistent public policies. It requires a change in the mentality of society at all levels. It requires developments to be judged for their long-term impacts as well as their short-term profitability. Enhanced coordination is called for among both governmental and non-governmental organizations.



3.7. THE ROLE OF ORGANIZATIONS

It is self-evident that ultimate responsibility for achieving a better future for the Alps rests with government, at national, provincial and local level. It is the national Governments that have adopted and become responsible for implementing international Conventions like that on long-range transboundary air pollution, and within the European Community are increasingly addressing environmental questions at supra-national level. If there is an Alpine Convention, Governments will sign, ratify and operate it.

But the national level is inevitably concerned with broad policies. Detailed control of actions that affect the environment, from building to hunting and forest management, generally rests with provinces (*Länder, cantons, régions*) and with the communities of towns and villages. These activities need to be informed, coordinated, and made compatible with one another so that the Alpine region as a whole benefits from the wise management of its many parts. This in turn demands understanding - and pressure - from the electorate, and here the non-governmental (NGO) sector has a major part to play.

The conservation of the Alps is already a preoccupation of the NGO movement. A selected list of NGOs appears in Appendix 4. Many were assembled at Trento in 1974 and have pushed for integrated conservation and development ever since.

Since Trento, the realization has grown that Alpine problems involve a wide range of natural, cultural, social, economic and political questions of great complexity. So many interests, often conflicting, are at stake that the decision-making process must now carefully weigh the views of all interested parties. Thus the decision to create a protected area, for example, is usually long and arduous. Gone are the days when a decree could promptly establish a reserve in order to preserve the bouquetin for royal hunting pleasures! Today the NGOs influence decisions by acting both as a pressure group and as an educating force in the interface between the public and established power structures.

Since 1974 the NGOs have achieved much. Among other things, they have been responsible for the re-introduction of several species, the creation of protected areas and natural reserves, many actions to protect sites from industrial or tourist threats, and many educational activities (exhibitions, audiovisual displays, etc.).

Two organizations, IUCN and CIPRA, deserve special mention here. One major goal of IUCN is to promote integrated conservation and sustainable development within national frames and to secure the establishment of protected areas and the preservation of species, using a worldwide membership consisting of both governmental and non-governmental entities. In this regard all the Alpine countries have successes to show within their mountain territories. The list of protected areas (Appendix 1) is an

obvious sign of this activity, the Red Data Books of endangered species another. But the IUCN effort is now encouraged to turn more and more to the promotion of ecosystem or regional strategies, backed up by local efforts, as argued in the recent IUCN document *From Strategy to Action* (1989). It is intended that the Alps will figure prominently in this effort.

CIPRA has enjoyed strong links with IUCN since its creation. It brings together a range of NGOs and government representatives. A recent expert meeting in Vaduz (September 1988) invited CIPRA and IUCN's Law Commission (CEPLA) to jointly draft an Alpine Convention which would protect nature and culture in the Alpine region. A recent report by CIPRA reviews the successes and failures of ecological policies since Trento. CIPRA has made a series of resolutions, some general (e.g. for soft tourism or for a large coalition between mountain agriculture and conservation), some specific (e.g. against large winter sports events in ecologically sensitive areas, or against heliskiing).

IUCN and CIPRA have recently come together to convene a group of experts, the Chambéry Group, who have inspired this book and are working on an Alpine blueprint. Following their call for action, a special Centre supported largely by the Commission of the European Communities and the departmental government of Savoie (France) - the International Centre for Alpine Environments - was created in late 1988 to coordinate and catalyse the necessary scien-

tific research, and to pursue vigorously the most appropriate educational policies. This Centre will hopefully play a coordinating role in assessing and collecting what is known about Alpine problems and solutions. It will form a central node in a network of European institutions and be part of an international network allowing the different mountain regions to exchange vital comparative information.

The NGO movement with interest in the Alps extends well beyond those mountains. There are flourishing societies for the protection of the Alps in the least mountainous of the world's countries, the Netherlands. The International Mountain Society, the world's leading group of mountain scientists, based in the USA, has strong Alpine connections. Then there are the alpinists represented by the UIAA (International Union of Alpinism Associations).

The extensive NGO universe is considerably hampered, however, by its fragmented nature, and also by its weak support base. No single organization can act as an umbrella for all others. CIPRA, for example, varies in strength in different parts of the Alps. IUCN and WWF have interests and mandates which extend far beyond the Alps, or indeed mountain areas. The scientists, the alpinists and the activists rarely speak to each other.

Nor is the link to the governmental world strong enough. There is also fragmentation amongst the main international governmental organizations interested in the Alps (e.g. Unesco,

UNU, FAO, EEC, Council of Europe) and within those organizations, the administrative impulses are diffused over many departments. Everywhere education and the raising of consciousness is too much neglected. There is too little dialogue and too little attempt to work with industry, although many, perhaps most, want to preserve the Alpine environment as well.

Finally the outsiders, whether governments or NGOs, too seldom know what is happening at, or work with, the grass roots. Mistakes and misunderstandings proliferate and produce conflicts which become self-perpetuating cycles of mistrust.

Even if the mechanisms to achieve progress are complicated, networking is essential to ensure proper coordination at all levels, particularly for:

- a data bank (including careful synthesis and interpretations of data)
- a register of human expertise (incorporating grass root opinion)
- a central node to assist in action (as part of a decentralized network)
- a set of common-sense conventions (flexible enough to accommodate change)
- a continuing education curriculum (always learning from a most dynamic situation)
- above all, contact and discussion amongst the Alpine peoples, especially the young who will inherit the mountains.

The International Centre for Alpine Environments (ICALPE) has been established in Chambéry to meet the first three of these needs; the fourth and fifth are for governments; and the sixth is for us all.

CHAPTER FOUR

Conclusions - Next steps



It is one thing to suggest long-term solutions and reforms, but quite another to specify the vital steps which must be taken next. For there is urgency: in the Alps the situation could change for the worse, suddenly and soon. The next steps involve mobilizing political and popular will to move the Alpine cause up the agenda. What is needed is a clearly articulated set of actions that can and should be taken now. As a start here is a suggested checklist.

— Checklist of Actions to Save the Alps —

1. Coordination of land use and development plans among all Alpine countries, bringing in all levels of government and focussing especially on harmonized policies in the frontier zones.

2. An urgent “state of the art” review of what is known in the key problem areas - forest damage, tourist pressure, agricultural and community decline - and of the implications of likely

scenarios of climate change. This document should be widely diffused and discussed both inside and outside the Alpine region, by Governments, decision makers and local communities, as well as in schools and widely available public media.

3. The exploration of innovative protective arrangements for the Alps, taking account of plausible scenarios of climate change, including the extension of multiple use protected areas, biosphere reserves and international parks.

4. The preparation of integrated conservation, development strategies and action plans for the Alpine region as a whole, and for distinctive sub-regions.

5. The preparation of detailed prospective scenarios and forecasts for the region.

6. A public international Commission to review scientific conclusions and sectoral interests, to seek the opinions of the different communities with interests in the Alps, and to make recommendations to concerned governments and to the public.

7. The adoption of an Alpine Convention, both rationalizing and codifying existing instruments and proposing new "soft" codes of conduct and relevant legal mechanisms. Recognition of the Convention should be sought in both national and international fora.

8. The formal establishment of an Alpine network of scientific institutes, governmental agencies and NGOs, with the designation of a central coordinating institution and advisory committee.

This network should be computer-connected, sharing an on-line database and communication system. With the recent creation of ICALPE, this process is now under way.

9. The promotion of education, training and awareness objectives, through widely circulated publications, audiovisual material, specially designed curricula, manuals, courses and qualifications.

10. The provision of adequate financial and human resources for the task.

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APPENDIX

1. Protected areas in the alpine regions *

	Area (ha)	Year established
AUSTRIA		
Category IV		
Otscherland-Tormauer	9,000	1969
Schobergruppe-Nord in den Hohen Tauern NR	5,000	
Leiserberge NR	4,500	1969
Inneres Pollatal NR	3,200	
Rheindelta in den Bodensee NCA	1,400	1942
Patscherkofel NR	1,200	1947
Nasskohr NR	1,000	
Category V		
Karwendel NR	72,000	1933
Wildapenar Salzatal NR	51,460	1958
Hohe Tauern NP	25,000	1983
Gesause und anschliessendes Ennstal NR	23,800	1958
Arnspitze NR	12,500	1942
Kaisergebirge NR	10,200	1963
Grundlsee, Toplitzsee, Kammersee NR	9,700	1966
Weissensee	7,648	1970

* Central Europe Highland province according to Udvardy's biogeographic classification.

	Area (ha)	Year established
Valsertal NR	3,300	1941
Vornbacher Enge	3,000	
Keutschacher See-Tal	2,532	1971
Villacher Alpe NR	1,902	1942
Hohe Wand NR	1,800	1969
Blockheide Eibenstein	1,400	1964
Wollanig-Oswaldi Berg	1,120	1970
Grossfragant	1,115	
Althaussersee NR	1,050	1959

FRANCE

Category II

Ecrins NP	91,800	1973
Mercantour NP	68,500	1979
Vanoise NP	52,389	1963

Category IV

Sixt-Passy NR	9,260	1977
Contamines NR	5,500	
Aiguilles Rouges NR	3,279	1974
Val d'Isère-Bonneval NR	1,491	

Category V

Mercantour pré-parc	200,000	1979
Ecrins pré-parc	178,600	1973
Vanoise pré-parc	145,000	1963

FEDERAL REPUBLIC OF GERMANY

Category II

Berchtesgaden NP	20,800	1978
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	Area (ha)	Year established
Category IV		
Schilffkopf NR	1,320	
Category V		
Ammergauer Berge NR	27,600	1963
Karwendel und Karwendelvorgebirge NR	19,000	1959
Hochkienberg in Chiemgauer Alpen NR	9,500	
Feldberg NR	3,231	
Retterschwangertal mit Daumen NR	2,100	
Eggstadt-Hemhofer Seenplatte NR	1,008	

ITALY

Category II		
Gran Paradiso NP	70,000	1922
Category IV		
Piani Eterni Errera NR	5,463	1977
Schiara Occidentale NR	3,172	1977
Monti del Sole NR	3,032	1975
Foresta Vette Feltrine NR	2,764	1975
Monte Mottao NR	2,410	1970
Somadida NR	1,676	1972
Val Tovanella NR	1,040	1971
Category V		
Stelvio NP	137,000	1935
Alpe Veglia NaP	39,300	
Texelgruppe NaP	33,000	1976

	Area (ha)	Year established
Sarntaler Alpen NaP	29,800	
Cansiglio NaP	25,300	1972
Rieserferner NaP	15,000	
Puez Geissler NaP	9,400	1977
Schlern NaP	6,400	1974
Groane Reg.P3,000	1976	
Alta Valle Pesio NaP	2,690	1978
Prescudin NaP	1,647	1974

SWITZERLAND

Category II

Swiss NP	16,887	1914
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Category IV

Val de Bagnes NR	20,000	
Engstlen See-Junisbache- Achtelsass NR	10,500	
Grimsel NR	10,000	
Holloch Karst NR	9,240	
Binntal NR	4,650	
Gelten-Iffigen NR	4,300	
La Pierreuse NR	3,255	
Lauterbrunnen valley- Untersteiniberg NR	2,630	
Monte San Giorgio NR	2,500	
Valli di Languard, dal Fain & Minor NR	1,750	
Hohgant NR	1,504	
Vallon de Nant NR	1,371	
Combe Grede NR	1,202	

Category V

Piora	3,700	
Derborence	1,000	1959

	Area (ha)	Year established
YUGOSLAVIA (NP only)		
Triglav NP	2,000	1961
Martinjkova	2,146	
Mala Pisnice	868	
Milnarica Razor NHP	250	
Kukla	70	

KEY: Category II: National Park
 Category IV: Nature Conservation Reserve/
 Managed Nature Reserve/
 Wildlife Sanctuary
 Category V: Protected Landscape

ABBREVIATIONS:

NR Nature Reserve
 NP National Park
 NaP Nature Park
 P Park

SOURCES:

IUCN (1985) United Nations List of National Parks and
 Protected Areas, Club Alpino Italiano Carta Alpina

2. Biosphere reserves in the Alps

	Area (ha)	Year established
AUSTRIA		
Gurglerkamm	1,500	1977
Lobau Reserve	1,000	1977
Gossekollesee	100	1977
ITALY		
Collemellucio- Montedinezzo	478	1977
SWITZERLAND		
Swiss National Park	16,870	1979

Source as Appendix 1.

3. List of Participants

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THE WORLD CONSERVATION UNION



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INTERNATIONAL CENTRE FOR ALPINE ENVIRONMENTS

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