

EFFECTS OF THE SKIING INDUSTRY ON THE ENVIRONMENT

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FOREWORD

The following project was written in 1993 as part of my studies towards a B.A. Honours degree in Modern Languages from Coventry University. As part of the four year course, students were required to spend their third year of study at a foreign university, studying alongside native students.

At the time of researching and writing the project, I was studying at Stendhal University in Grenoble, France.

Grenoble is considered by the French to be the capital of the Alps, and as a keen skier at the time, and someone who had (and still has) a love of the Alps, I had jumped at the opportunity to study in that part of the world.

In the early 1990s, the environmental movement was starting to make serious in-roads into mainstream politics. I had a genuine interest in the ecological welfare of the planet, both on a global and a local scale, and a love of skiing. Grenoble is home to organisations which have a direct involvement in management and protection of the Alpine ecology, so it seemed like the ideal opportunity to write a project based around two of my interests, with very good research resources in the vicinity, and to see if I could reconcile my love of skiing with my emerging concern for ecological issues.

Time has moved on since 1993 and some of the horrific consequences of global warming (a pressing concern at the time of writing following a period of low snowfall over the preceding years) may not have turned out to have been as bad as predicted by some, but on reading the project through again, I am sure that much of the content is equally applicable today, nearly twenty years later; in particular where this relates to sustainable development of skiing facilities in the mountains.

I graduated in 1994 with a First Class degree, so all the effort was worth it in the end!

John Chivers - December, 2010

INTRODUCTION: THE DEVELOPMENT AND IMPORTANCE OF THE SKIING INDUSTRY

The choice of title for this project comes from a personal interest in both environmental issues and skiing. Nowadays, there are many who enjoy skiing, but who are unfortunately unaware of the sport's impact on the mountain ecosystem. The aim of this project is to bring to light and discuss some major aspects of skiing's impact on the environment, both indirectly, through resort development and management, and directly, through the practice of the various forms of the sport itself. The project has not been written to force opinions on the reader, nor to give all skiers a feeling of culpability for the problems dealt with by the study. The aim is simply to clarify the main processes and issues around the development of resorts and the problems caused by skiing, although the conclusion will contain what may be considered as likely future developments in the subject area and an assessment of these.

In writing the project, I have tried to deal with the major points of concern and those which are more likely to be of interest to the reader. Firstly, a condensed history of the development of the sport and an overview of the economic role of the skiing industry will be given. Chapter one will deal with public attitudes towards environmental issues in skiing and the process of resort development. In the second chapter, the secondary effects of skiing, i.e. problems caused by the urbanisation of mountains will be discussed, whilst the third chapter will examine the sport's impact itself. Possible solutions to problems, should they exist, will be given wherever possible. Finally, in the conclusion, attention will be turned to future developments in ecological issues in skiing and a balanced assessment of the environmental sustainability of the sport will be put forward.

In researching and writing the project, organisations involved in the subject, both on the development side and on the ecological side have proven very helpful, as have the *Conseil Régional*¹ in Lyon and the *Conseil Général de l'Isère*² in Grenoble, who have provided information usually given to resort developers to aid them when attempting to

¹ *Conseil Régional* - Regional Council. The capital city of the Rhône-Alpes region, in which Grenoble is situated, is Lyons, and this is where the *Conseil Régional*, the regional government is based.

² *Conseil Général de l'Isère* - General Council of Isère. This is local government on a smaller scale than that of the *Conseil Régional*, and is based in Grenoble.

create a resort in harmony with its surroundings. The press section of Grenoble's public library has proved to be a very useful source for gaining a more critical insight into the subject. Certain organisations and political groups were not forthcoming with opinions, whilst interviews with those holding an interest in the subject proved to be of great assistance.

Many of the issues dealt with have not only a local relevance, but several apply to all skiing areas in both France and indeed the rest of Europe. Whenever possible, examples have been found within the *département*³ Isère or the Rhône-Alpes region: the home of French skiing. However, sometimes other places may be used to better illustrate points. Grenoble is, in any case, home to several organisations involved in the study and would therefore seem an ideal place to undertake such a project.

The sport of skiing, originating from Scandinavia, where it had been used as a form of transport for centuries, appeared in France at the turn of the twentieth century. However, ski resorts themselves and the development which took place as a result of these only really came about during the 1920s, especially after the first Winter Olympic Games in Chamonix in 1924. First generation resorts began to appear around hamlets, and hotels were built to cater for the influx of tourists. The main areas of development of these resorts were in Chamonix, Megève, Peisey-Nancroix, Boreas, Cauterets, and Val d'Isère. After 1947, resorts at a higher altitude were built. Equipped with services by the authorities of a *département*, an area of land was sold to property developers and second generation resorts were born. In the 1960s, as the ski boom started to grip the nation, third generation resorts, which in no way sought to fit into the mountain environment, appeared. These resorts, such as La Plagne, Les Arcs, Les Menuires and Val Thorens, often meant the compulsory purchase of locals' homes and left communities divided in opinion. The fact that these resorts actually repelled holidaymakers led to the conception and construction of fourth generation resorts towards 1972. Constructed lower down the valley, these were built by a single property developer and involved local operators and authorities wherever possible, trying to capture the traditional charm of mountain villages. The architecture became less imposing and the results of these attempts can be seen at Plagne-Villages, Risoul, Valmorel and

³ *Département* - Department. Isère is one of the ninety-five main administrative divisions of France.

Montchavin amongst others. With the implementation of the *Plan Neige*⁴ in 1971, 'white gold' fever gripped France and during the seventies 360,000 beds were created, thanks often to state subsidies and loans. In 1991, the number of French skiers reached six million. According to the developers, these new skiers need to be catered for and rapid construction is required.

Skiing plays a very important role in the economic development of the Rhône-Alpes region and the *département of Isère*. The survival of *communes*⁵ in the area depends upon the continuing activity of skiing as a tourist attraction, which can bring a great deal of money and double employment figures. Quite simply, there is now more money to be made for developers in skiing than there is in agriculture. This has meant that former areas of strong agricultural activity have been turned over to ski pistes and hotels. This decline in agriculture may be an inevitable consequence of the impracticality of farming on a large scale in the mountains, but it means that there is an increased likelihood of skiing becoming the only activity in the mountains, which could also have a negative effect on the rural economy.

At the same time as arguing for the preservation of nature, 'human ecology' should be considered. A skiing development may indeed have negative effects, but these should be balanced against the rights of people in otherwise formerly poor areas of Europe to earn a living. Skiing does have a great impact on mountain village life, bringing in money for local communities, but brings other problems also. As Monsieur Alain Perroud, *Chef de Service d'Environnement et de Cadre de Vie*⁶ at the *Conseil Général de l'Isère* commented,

*Une station de ski doit être calibrée pour recevoir un nombre de touristes qui multiplie peut-être par cent le nombre d'habitants habituels... Le problème est qu'il faut construire la station comme si elle devait accueillir cinquante mille personnes toute l'année, alors que les gens qui payent ne sont que cinq cents."*⁷

⁴ *Plan Neige* - Snow Plan. A government drive during the 1970s to promote skiing.

⁵ *Commune* - District, town or more commonly a village.

⁶ *Chef de Service d'Environnement et de Cadre de Vie* -Head of the Department for Environment and Living Environment. One of the departments with responsibility for matters concerning Isère.

⁷ "A ski resort must be capable of catering for a number of tourists which represents perhaps a one-hundredfold increase in the number of usual residents... The problem is that the resort must be built as if it were to provide for fifty thousand people all year round, whereas those paying for this number only five hundred."

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This naturally poses problems for inhabitants in small communities, who must find capital to pay for these facilities. It seems ironically that the only viable way for communities to fund these necessary facilities for the influx of tourists during the winter season is through their most profitable source of income: skiing.

PUBLIC OPINION AND THE PROCESS OF SKI RESORT DEVELOPMENT

Le ski alpin n'est plus un sport dans la nature, mais pratiqué sur le dos de la nature, à laquelle il ne demande que de fournir la matière première: neige, pente et soleil... La pratique de ce ski, les infrastructures et tous équipements liés ont des répercussions sur les grands éléments des systèmes biologiques du milieu montagneux: le sol, l'eau, la couverture végétale, la vie sauvage, l'esthétique.⁸

The above quote more or less sums up the impact of skiing on the mountain environment. The ceaseless and speedy development of ski resorts has, according to environmentalists, had numerous effects on mountain water levels of lakes and streams, damaged mountain wildlife through destruction of habitat, noise and pollution, and given rise to an increased likelihood of landslides and avalanches owing to the clearance of large forested areas. It is true that the development of ski resorts on an ever increasing scale has necessitated the construction of concrete buildings in mountain pastures, of an increasing number of bigger and faster ski-lifts, and of course of access roads, motorways and railways. All these factors have contributed to the urbanisation of mountainous zones and 'people pollution'. The mountain environment is a very fragile part of nature, easily affected by mankind's intervention, and any damage inflicted is very difficult to repair.

Not only are the development of resorts and the appropriate facilities of great concern to environmentalists, but also skiing itself and the necessary maintenance of pistes before, during and following the ski season. For those concerned with the issues, skiing may well represent the best chance of economic survival for mountain inhabitants, but at the same time it poses a great threat for the whole mountain ecosystem. The question of the environmental sustainability of the whole skiing industry must be considered.

An issue which could easily be left out of discussion and one which has unfortunately too often not been thoroughly considered by resort

⁸ "Alpine skiing is no longer a sport in harmony with nature, but undertaken at the expense of nature, from which it merely requires the provision of the raw material snow, slope and sun... The practice of this type of skiing, its infrastructures and all its associated facilities have repercussions on the primary elements of the mountain environment's biological systems: ground, water, surface vegetation, wildlife, aesthetic quality."

developers is the public attitude towards environmental issues in skiing. For many of those who head for the slopes during the winter months, the quality of skiing is not their only motivation when selecting a particular resort, but also the quality of the environment. Indeed, environmental mismanagement of a resort can drive the skier to another area. Before choosing a particular resort, the customer nowadays tends to seek precise information on the quality of the surrounding countryside and the style of architecture. According to a survey carried out by the *Conseil Général de l'Isère* of one thousand inhabitants, ninety-three percent of those questioned consider the mountain a natural space and forty-eight percent of these seek a quality environment when on holiday. Moreover, it would be foolish to think that winter holiday-makers head to resorts merely to ski. Another survey carried out by the Ministry of Tourism showed that twenty-five percent of holiday-makers went mainly to ski, whereas fifty-five percent actually went principally in order to rest, twelve percent 'accompanied somebody' and a significant eight percent did not ski at all.

A further indication of the importance of the environment and the whole ambiance of a resort in the customer's eyes is shown in the alarming trend of more and more foreigners heading to Austria and Switzerland rather than France for their winter holiday (nearly 5 million in Austria, compared to 1.2 million in France). Despite this, general opinion seems to indicate that French resorts such as Les Deux-Alpes, Méribel, and La Plagne are unrivalled abroad, so why do holiday-makers elect to head elsewhere other than France? The *sénateur-maire*⁹ of Autrans, Jean Faure's answer to this is simple: "La génération d'hébergements construits dans les années 70 ne peuvent pas les satisfaire."¹⁰ Holiday-makers are clearly demanding more than just a good skiing area and for many of these, French resorts are devoid of charm and badly integrated into their surroundings. According to the professionals of the French skiing industry, the reasons for the lack of skiers are a lack of snow, the price of ski-lift passes and the fact that exotic holidays are becoming cheaper, but less apparent reasons, such as a cold welcome, bad après-ski atmosphere and a lack of walking tracks do not seem to figure in their estimation. The truth is that ten million European holiday-makers who seek a traditional Alpine

⁹ *Sénateur-maire* - Senator-mayor.

¹⁰ "The generation of lodgings built during the seventies cannot meet their requirements."

atmosphere and a feeling of closeness to nature have too often been ignored by French developers.

The mountainous zones in metropolitan France are divided into seven ranges or *massifs*. These are, according to article three of the *Loi Montagne*¹¹, the northern Alps, the southern Alps, Corsica, the Massif Central, Jura, the Pyrenees and the Vosges¹². Each *massif* has a *comité de massif*¹³, presided over by the *Commissaire de la République de Région*¹⁴.

The Rhône-Alpes region, in which Grenoble is situated, has the largest equipped skiing area in the world, comprising 220 ski resorts, 70 of which are of international standing. There are a total of 2300 ski-lifts. The region has hosted the Winter Olympic Games three times: in Chamonix (the first Winter Games) in 1924, Grenoble in 1968 and more recently in Albertville in 1992. The region is visited by eight million skiers every year and is also home to two national parks, la Vanoise and les Ecrins, in addition to two regional parks, Vercours and Pilat¹⁵.

Most laws relating to any mountain development schemes and the new layout of structures concerning any decisions taken on mountains are laid down in the *Loi Montagne* of 1985. This law was ratified two years after the law of decentralisation, of 7th January 1983, which gave much more power to the regions of France, rather than decisions being made by an inter-ministerial committee and being relayed by the *Commissaire de la République du département*¹⁶ directly to the appropriate *commune*, as was the case before 1985. It could be said that a fault of the current governmental structures concerning development in the mountains is that there exists no equivalent for the mountain of the *Ministère de la ville*¹⁷. The *Loi Montagne* has also come under criticism, with many of those involved, such as Didier Magaud, *député*¹⁸ for Isère, calling for modification of the law.

¹¹ *Loi Montagne* - Mountain Law. Ratified in 1985, this law changed radically the procedure of development in the mountains, decentralising the decision process.

¹² See appendix A.

¹³ *Comité de massif* - Range committee. Made up of elected locals and tourism professionals and responsible for planning, development, and protection of its own *massif*.

¹⁴ *Commissaire de la République de Région* – Regional Representative of the Republic.

¹⁵ See appendix B.

¹⁶ *Commissaire de la République du département* - Departmental Representative of the Republic.

¹⁷ *Ministère de la ville* - Ministry of towns.

¹⁸ *Député* - Deputy. Member of the French parliament.

Creating or expanding a ski resort is a long process, involving several preliminary stages of planning before permission to build is given and any work can commence. It is better in the long term for a developer to take the environment into consideration at the planning stage, rather than to have to rehabilitate an area at a subsequent date. There exists a set procedure for this, which is as follows.

Firstly, a request must be made by the local authorities. The creation of any U.T.N.¹⁹, or the installation of ski-lifts or piste development costing more than six million francs must be accompanied by a study of the development's environmental impact. Such a study, together with graphical simulations of the possible impacts of the development, help in choosing the best way to go about the expansion with the least amount of damage to landscape or fauna²⁰. A descriptive text, thematic maps and analysis documents are prepared, indicating areas where development is possible without significant risk. These studies are also an aid to reference during any future work carried out in the same area²¹.

After a study of the area in question has been made, a preliminary development is carried out to define the future outlook of the project. Only when a full study has been carried out, satisfying the *conseil municipal*²² and the *Commissaire de la République du département*, can it be sent to the *Commissaire de la République de Région* and the *comité de massif* for final approval or rejection. Should the study be approved and authorisation given, work can commence on the development. The decision process is not, however, without criticism. Didier Magaud, *député* in Isère, complains that in the U.T.N. process, the decisions of the *comité de massif* are taken without his opinion. A final requirement of the U.T.N. process is that the development be monitored over a period of at least five years, in which time any necessary modifications to the original plan may be made.

The first stage in the realisation of a development is the choice of developer and the drawing up of specification details. These specifications contain instructions relative to the environment and lay down certain terms and clauses which must be adhered to by the

¹⁹ U.T.N. (*Unité touristique nouvelle*) - New touristic unit. Any significant mountain development.

²⁰ See appendix C.

²¹ See appendix D.

²² *Conseil municipal* - Town council.

developers. Should these terms not be properly met, penalties exist within the contract. It is often the case that resorts use their own personnel at this stage, since these tend to have a good knowledge of the area on which the work is being carried out.

During any kind of construction or earth-moving work it is again important to try to keep to a minimum any damage which may be inflicted on the landscape. Light tracked vehicles are of great importance here, since they distribute the weight of the machine carrying out work over a greater area, rather than on one point. Other specialist machines include the spider digger, which permits digging in areas of difficult access; the marsh digger, which has less impact on the soil than the weight of a person, and the Becker blade, used for the removal of tree stumps. The use of helicopters can also be of great assistance, although these may have other, less desirable consequences, as shall be seen later.

The creation of access paths for construction or piste maintenance machines, or for access to ski-lifts has a great impact on an area, particularly during the execution of major work. The ideal solution to these problems is the use of already existent paths. However, some tracks may need to be made, and again foresight through the careful layout of these will inevitably spare the environment and save money in the long term. On conclusion of work, the re-turfing of temporary access paths will limit further any possible environmental damage.

THE SECONDARY (INDIRECT) IMPACT OF SKIING ON THE ENVIRONMENT

When dealing with the impact of skiing on the environment, it is necessary not only to consider the direct impact of the sport itself, but also of the wider aspect of resort development, which has a far greater effect on mountain ecology. As the mountain is conquered for human pleasure and new developments spring up in quiet corners of the wilderness, the past respect for the mountain is vanishing. Areas that were formerly deemed inaccessible are being exploited for the skiing industry. An improvement in means of communication, such as the construction of T.G.V.²³ train lines and autoroutes²⁴, together with longer holidays, mean a greater number of people heading to the mountains.

The construction of hotels, flats and secondary residences has increased the amount of space occupied by roads and buildings. Monsieur Gérard Cardin, vice-president of the *Commission du Budget, de l'Economie et de l'Administration Départementale*²⁵ and mayor of Corps believes that the building of holiday apartments should be halted.

*Je crois qu'il y a suffisamment d'immobilier actuellement en montagne, qu'il faut rentabiliser les immobiliers qui existent pendant au moins une dizaine d'années et puis après on pourra redévelopper.*²⁶

The large amount of people living in a concentrated area (with a population that may increase tenfold during the skiing season) requires special water, sewage and electricity systems, all of which usually require a great deal of construction work.

An increase in the number of access roads to resorts in recent years has given the average French person easier access to the mountains. There are those who feel that one access road for one resort would suffice, such as Monsieur Cardin, unless a new road would be beneficial for a whole *massif*.

²³ T.G.V. (*Train a grande vitesse*) - High-speed Train (H.S.T.).

²⁴ *Autoroute* - Motorway.

²⁵ *Commission du Budget, de l'Economie et de l'Administration Départementale* - Committee of Budget, Economy and Departmental Public Services.

²⁶ "I believe that there currently exist sufficient lodgings in the mountains and that the existing lodgings need to be made profitable during a period of at least around ten years, after which redevelopment will be possible."

Access roads are responsible for high amounts of erosion. Salt put on the roads in winter collects in snow, together with lead and hydrocarbons from vehicles and this then flows into mountain streams, literally burning the surrounding countryside. Roads themselves could be made much more attractive through a few simple measures. Using wood rather than metal for crash barriers costs forty percent more initially, but wood lasts longer and costs less to maintain. Panoramic rest spots may be developed, putting abandoned areas to good use. In addition, the 'Naturroc'²⁷ process of re-turfing and ageing rock faces allows any recent work carried out to be easily hidden.

The importance of water for a resort is often underestimated. Resorts have been closed in mid-season before owing to a lack of water. Sometimes natural lakes must be tapped or reservoirs built to cater for resort demand. There seems, however, to be a general satisfaction with the issues of sewage and waste disposal, especially in the larger resorts. Purification centres exist and the laws are held to be quite sufficient. It is now in theory the case that developers are only permitted to build in areas where the amount of water available for the future influx of tourists is sufficient. Waste products in general cause little problem nowadays and a European Community directive has determined that resorts are responsible for the purification of all water used by them.

An inevitable consequence of the urbanisation of mountainous areas is a build-up of concrete in the form of buildings, or tarmacadam in the form of roads or car parks. Together with tightly packed-down pistes, these represent an impermeable surface, which prevents the otherwise natural flow of water into the ground in certain areas. Consequently, the water table is disturbed and soil erosion occurs in undesired places, with sometimes disastrous results. The full consequences of this were experienced in Isère's neighbouring *département* Savoie, in the *commune* Bourg-Saint-Maurice. Here, in 1981, a disruption of the natural flow of water, due to the expansion of the resort of Les Arcs, led to an artificially excessive amount of water flowing into an otherwise quiet mountain stream, the Ravoire. Heavy rain in April 1981 caused a great swelling of the stream, which dislodged and carried with it large rocks, burying all in its path: a water purification plant, railway lines, a bridge and roads. The cost of the repairs came to fifty million

²⁷ In the 'Naturroc' process, a substance harmless to wildlife is combined with a mixture of seeds and is sprayed onto rocks. This mixture forms very quickly on the rocks, providing a natural cover for areas left exposed after excavation work.

francs²⁸ and repair work took four years to carry out. However, three years later on the other side of the same valley, where there is no ski resort, the same phenomenon occurred, sparking off a controversy between environmentalists and developers. It is possible that impermeable surfaces contribute to a stronger flow of water, but such events as were seen during April 1981 do not occur in all resorts and moreover, there are areas without resorts where such phenomena have been known.

In 1986, forty people were killed by avalanches in France, two thirds of whom were skiers. Whether accidentally triggered by human error or merely a natural consequence of weather conditions, avalanches can result in a great deal of damage to property and life. It is argued that avalanches are becoming more frequent owing to the decline in traditional agricultural activity and careless urbanisation in the mountains. At the same time, agricultural activity on a large scale is no longer a viable activity in the Alps. Measures have been developed by organisations such as ANENA²⁹ and CEMAGREF³⁰ to trigger controlled avalanches, thus rendering an area safe. Active defence methods employed to prevent the occurrence of avalanches include the physical reshaping of a landscape or the construction of barriers. These measures often call for the breaching of rocks, the levelling out of surfaces, the felling of trees, and the laying down of cables for the detonation of explosives when triggering a controlled avalanche, all of which damage flora and the surface and have an impact on the aesthetic value of a mountain.

If skiers returned to the pistes at the end of the skiing season, they would be surprised at what they saw. It has become clear over the last few years that the rehabilitation of surfaces used during the ski season provides advantages for both the environment and resort owners. Firstly, rehabilitation limits erosion problems and creates a surface on which the snow can hold better and for a longer time. It also means that pistes can be restored to their otherwise normal natural beauty,

²⁸ Fifty million French francs - approximately 6,250,000 pounds sterling (at current exchange rate : £1 - 8 FF).

²⁹ ANENA (*Association nationale pour l'étude de la neige et des avalanches*) = National Association for the Study of Snow and Avalanches.

³⁰ CEMAGREF (*Centre national du machinisme agricole, du génie rural des eaux et des forêts*) - National Centre of Agricultural Mechanisation and Rural Engineering of Water and Forests.

attracting more summer visitors. As André Marzolf, *directeur des pistes*³¹ at La Plagne commented.

*Nous avons maintenant compris que, plus la montagne sera verte l'été, plus elle restera blanche l'hiver.*³²

The rehabilitation of skiing areas is greatly encouraged by local government. the *Conseil Général de l'Isère* and the *Conseil Régional de Rhône-Alpes*, which provide subventions to aid resorts with re-turfing. It would be tempting to try to re-vegetate surfaces of a high altitude, providing a larger area for skiing. However, no vegetation of slopes, even artificial, will be successful above 2800 metres. To create good ski pistes, slopes are de-stumped, rocks are removed and pistes are reprofiled and compacted. Trees need to be felled to provide link-up paths between pistes. In 1990 in Isère, 200 hectares of piste were reshaped, using 300 tonnes of biological fertilizers and 40 tonnes of seed. This work means that pistes may be used with a snow cover of between only ten and fifteen centimetres. The rehabilitation of pistes in itself calls for the creation or a number of access paths, which should, where possible, be kept to a minimum. Having returfed a surface, constant surveillance and maintenance of the surface is required for any work carried out to prove a success. Destructive factors are dryness, storms, the inadequacy of soil or the uncontrolled use of vehicles on sensitive areas, since any rehabilitated surface is fragile for years afterwards.

*Les remontées mécaniques permettent, tout en respectant la faune et la flore d'accéder à des sites extraordinaires.*³³

The above quote, from an information leaflet by the *Syndicat National des Téléphériques et Téléskis de France*³⁴ may seem like a likely statement from an organisation involved in promoting the ski-lift industry, but it does find agreement from Monsieur Gérard Cardin at the *Conseil Général de l'Isère*. Ski-lifts are however a very difficult area of ski development, requiring a great deal of preliminary planning. Trying to conceal ski-lifts, in order that they might blend well into their surroundings is of course a good idea, but can ironically pose a threat to wildlife. Birds, and especially nocturnal birds often decapitate

³¹ *Directeur des pistes* - Piste Manager.

³² "We now understand that the greener the mountain is during the summer, the longer it will remain white during the winter."

³³ "Ski-lifts allow access to extraordinary beauty spots, whilst respecting fauna and flora."

³⁴ *Syndicat National des Téléphériques et Téléskis de France* - National Association of French Cablecars and Ski-lifts.

themselves at night or during times of mist or frost on ski-lift cables raised above the ground.

When building a ski-lift, its line of operation must be shaped and drained, especially when a ski-tow is being constructed. Large concrete blocks must be set down for pylons. These can, if not carefully placed, cause damage to surface vegetation. The use of helicopters during the installation of ski-lift pylons may seem costly (usually between 7,000 and 8,500 francs per hour³⁵), but this prevents surface damage and makes up for the seemingly high cost by the number of pylons that can be installed in an hour (approximately twenty). A further, seemingly less important problem arising from pylons is their obvious presence on a mountain. Many resorts paint pylons deliberately in garish colours during summer months for visible security. Although there is a tendency to use more and more chair-lifts rather than ski-tows (which require a greater deal of constant attention and have a greater impact, since they must effectively be treated as normal pistes), chair-lifts still sometimes require the mining or destruction of rocks, leaving large cuttings exposed for centuries.

³⁵ 7,000 to 8,500 French francs - approximately 875 to 1,062 pounds sterling (at current exchange rate : £1 -8 FF) .

THE PRIMARY (DIRECT) IMPACT OF SKIING ON THE ENVIRONMENT

Perhaps the biggest impact skiing has on the environment is the damage it causes to wildlife and fauna. In some resorts, such as Les Arcs, the only way to protect animals seems to be to fence off areas of hibernation and to put up signs. Often, an education scheme is developed to promote better public awareness, rather than the physical fencing-off of an area. The *tétras-lyre* or black grouse is one of the most threatened species in resorts. Many ecologists argue that some animals, such as hares and chamois can weaken themselves in deep snow when fleeing from skiers. An animal's instinct is to keep on running, even if it kills itself through exhaustion in the process. The other side of the argument claims that most animals avoid areas with skiers if they are bothered by them.

The forest, as well as being a commercial asset for a resort, is also an essential regulator of the mountain climate, affecting air and water. Young trees have a difficult life, requiring thirty to fifty years to grow a mere four metres. They have to suffer intense cold, heat, frosts and thaws, with a vegetation period of only two or three months. In addition, acid rain, air pollution, viruses and of course skiers make life for trees very difficult. Many skiers now seek the delights of off-piste skiing in virgin snow through forest areas, without realising the damage this can cause. The edges of a ski are sharp enough to break or bark a young tree: buds are pollarded, preventing the growth of any new shoots. Outside forest areas, off-piste skiing can be responsible for starting avalanches, threatening forests, homes, railways and roads lower down the mountain. Such avalanches are responsible for thirty-five percent of accidents and thirty-one percent of deaths in the mountains.

One way of keeping skiers away from sensitive areas is to 'channel' them, using ropes, nets or a higher densification of trees. However, all of these require constant maintenance and are costly. Again, the education of the public in ski schools has an important role to play here, in addition to the erection of signs on off-piste routes. In some resorts, tree plantation zones are simply left undefended against off-piste skiers.

There are those who maintain that off-piste skiing is a sustainable activity. They argue that the ecologists exaggerate the issues. According

to these advocates of skiing in forest zones, the arguments put forward by those against off-piste skiing are that it does not do trees any good and that it surely does cause damage, so it must be stopped. It should in any case be said that a total ban on off-piste skiing is unrealistic. Resort developers and forest managers must strive to seek a compromise, by banning sensitive areas and carefully utilising less sensitive areas for tourists.

*...Si systématiquement les jeunes (arbres) disparaissent ou sont mutilés, la relève ne sera pas assurée et dans un siècle ou deux, nos magnifiques forêts ne seront plus constituées que de vieillards...*³⁶

A fall in the volume of snow in recent years has led to a rise in the use of artificial snow, which is made by machines (snow canon) spraying water at great pressure into sufficiently cold air, which then falls as snow. Sometimes, to obtain good quality snow, dust or bacteria is mixed with the water to form better snowflakes. The long-term environmental effects of this are still uncertain. The manufacture of artificial snow is costly and uses large amounts of water: water which often shelters rare species of animal and which in itself is a commodity. According to FRAPNA³⁷, one day's use of snow canon at Tarentaise consumes as much water as the whole city of Grenoble in two days. Despite this, SEATM³⁸ maintain that resorts have sufficient amounts of water for snow canon.

Sometimes, the creation of an artificial lake proves necessary for the manufacture of artificial snow. If this is well planned, it may also serve as a reservoir for drinkable or fire-fighting water. It can even become a beauty spot for summer holiday-makers. Should the creation of an artificial lake prove impossible, owing to its effects on the local water table or flora, natural lakes may have to be used, providing the hydrobiological sensitivities of the surrounding area are respected.

Snow canon do have a great impact on the mountain ecology. Their usage redistributes a large amount of water unnaturally over the land. Artificial snow freezes ground vegetation late into spring, preventing growth and leaving pistes bare. This, combined with the excess amount of water, increases the likelihood of landslides and avalanches. Also, the

³⁶ "...If young trees systematically disappear or are injured, their succession cannot be guaranteed and in one or two centuries our magnificent forests will consist only of old trees..."

³⁷ FRAPNA (*Fédération Rhône-Alpes de protection de la nature*) - Rhône-Alpes Federation for the Protection of Nature.

³⁸ SEATM (*Service d'Etude et d'Aménagement Touristique de la Montagne*) - Department of Study for Mountain Touristic Development.

construction of access paths and pipes for the manufacture of artificial snow poses an environmental menace. Some resorts have found a cheaper and more obvious way of creating a piste with a quality covering of snow: simply by gathering the snow from unwanted places, such as roads and car parks, and moving it using lorries to the pistes.

Cross-country skiing, descending from the first form of skiing, became popular as a sport in France after the 1968 Winter Olympic Games in Grenoble. Until then, it had been used chiefly by the army for winter combat situations. Nowadays, there are an estimated 2 million cross-country skiers in France, compared to approximately 500 in 1960. It is a growing sport and most resorts now have at least one *loipe*³⁹, with a third of skiers in resorts also taking part in cross-country skiing. There are a total of 8,500 kilometres of marked cross-country pistes in France.

Cross-country skiing is a very good way of keeping both physically and mentally fit, allowing close contact with nature whilst undertaking a very demanding form of exercise. The discipline requires very little preliminary development: a few trees need to be pruned and certain streams may need to be bridged. *Loipes* are prepared by a snow scooter or a small tracked vehicle, only the noise of which is likely to cause any nuisance. When preparing tracks, it is beneficial to use already-existent paths, rather than to create new paths. Peat bogs are to be avoided, since these are often a refuge for flora.

Once again, educating the public about the importance of environmental issues, through exhibition rooms, signposts and leaflets has a large part to play in the protection of the forest. Although cross-country skiing has a much more minor effect on the environment than Alpine skiing (even long distance treks such as Chamonix to Zermatt inflict little damage), if the practice of the discipline should explode in popularity over the next few years, there is a danger of it becoming as harmful for fauna and trees as off-piste skiing. For animals, it can cause the psychological division of their territories.

One aspect of skiing which has caused and still gives rise to heated discussion is the activity heli-skiing, whereby skiers are transported by helicopter to high mountain tops and set down, in order to ski freely down the mountain. It is a costly area of skiing and is strictly speaking only available to a very rich minority of skiers. The practice of heli-skiing

³⁹ A *loipe* is the name of a piste or track used in cross-country skiing.

was outlawed in France in 1985, by article seventy-six of the *Loi Montagne*, but there has been a great deal of criticism of this ban, especially from SEATM, who argue that helicopters leave only very small traces in the snow which simply vanish at first snowfall. They also claim that in Switzerland (where heli-skiing is still permitted), the total yearly consumption of kerosene used in the sport is equivalent only to the amount used by Concorde in one flight from Paris to New York (approximately 200 tonnes).

From the ecologist's point of view, the problem with heli-skiing is that...

*C'est un problème considérable, bruyant, irrégulier, qui se déroule pendant une période où les animaux arrivent en état de faiblesse physiologique. C'est une nuisance dangereuse qui peut provoquer des avalanches, affoler la faune et qui n'est pas liée à une activité indispensable.*⁴⁰

Monsieur G. Cupillard, the president of Ski France⁴¹ and mayor of Huez-en-Oisans has argued for the reauthorisation of heli-skiing in selected areas, claiming that foreign competition from Austria, Italy and Switzerland means that France loses out on a valuable source of revenue. It would indeed seem that the total ban of heli-skiing deprives resorts of further income. In any case, helicopters are used for maintenance and rescue purposes, so why not for heli-skiing in strict set-down points on certain days of the year?

SEATM argue further that the sound of a helicopter taking off creates only the same level of noise as the maximum noise limit imposed on light vehicles (eighty decibels), and that any nuisance caused by this could in any case be resolved by placing helipads in areas out of built-up areas. Noise pollution can in itself provoke undesired consequences, such as avalanches, as well as being a nuisance for anyone living nearby. A great deal of noise is produced by snow canon. This problem can however be resolved through the use of a low pressure system, although this proves to be more costly.

When discussing aesthetic damage inflicted on mountains by skiing, it should be remembered that skiing zones only occupy one percent of the French mountains. However, pylons, avalanche barriers, pistes and gaps cut through the forest are particularly visible during the summer season

⁴⁰ "It is a significant, noisy, irregular problem, occurring at a time when animals are at a state of physiological weakness. It is a dangerous form of noise pollution, which can cause avalanches, terrify fauna and which cannot be considered as being an essential activity."

⁴¹ Ski France is an organisation whose aim it is to represent the interests of the skiing industry.

and resort complexes do not represent everyone's idea of human progress in harmony with nature.

FUTURE DEVELOPMENTS: IS SKIING A SUSTAINABLE ACTIVITY IN THE MOUNTAINS?

Although it is nowadays generally appreciated that considering the quality of its environment can help a ski resort, both in attracting holiday-makers and in securing its own future survival, there are unfortunately still cases of developers ignoring this fact. When La Tagna, a modern resort of the 1990s, was built, the opportunity of creating a resort which kept the traditional Alpine charm was not exploited. Instead, the developer favoured eight and nine-storey buildings, which were finally approved. It can only be hoped that the Alps will not take the same road as the Côte d'Azur, as natural beauty gives way to ugly new developments. In the resort Méribel in Savoie, the plans of an architect from forty years ago to maintain the Alpine spirit throughout the construction of only chalet-style buildings have been respected. Originally, Méribel was laughed at for living in the past. However, the resort now has a growing and loyal clientèle and other resorts are starting to follow Méribel's example.

Although Isère saw several new developments during the 1980s, these have been greatly reduced for three main reasons: firstly, a lack of snow in recent years has simply meant resorts being unable to operate normally; secondly, the general economic situation has far from encouraged developers; and finally, the *Loi Montagne* has limited any developments or extensions. Any work undertaken now tends to be renovation work, such as at the resort Chamrousse, near Grenoble in 1992, where two chair-lifts dating from 1960 were replaced by new ones. At the present time, the likelihood is that there will be no more major developments in the next ten years at least. The only option for the survival of ski resorts would seem to be a diversification of activities offered by them to holiday-makers. In this way, the present facilities should be made profitable all year round, by offering alternative leisure activities and sports to the public. Full exploitation of the current resorts must take place before new construction on a global scale can be considered. FRAPNA sees the necessity of rejecting *monoactivité*⁴² and encourages *pluriactivité*⁴³, this also being an objective of the *Loi Montagne*.

⁴² *Monoactivité* - Single activity (tourism).

⁴³ *Pluriactivité* - The maintaining of agricultural and administrative services).

Since 1987, Isère and the Alps in general have had a series of 'bad' winter seasons, which, to all intents and purposes, means that there has not been sufficient snow. This has of course caused a number of problems, only inadequately resolved through the use of snow canon, which clearly does not tackle the root of the problem, but merely 'patches it up'. To many, the cause of the problem is the now well-known phenomenon of global warming, caused by the release of an increasing amount of carbon dioxide into the atmosphere. It may well be tempting to accept wholeheartedly this explanation. However, in this century the people of south Isère have known two other long periods without a significant fall of snow: the first time around 1925 and then again around 1942. Is this whole process merely a part of the natural cycle of the mountain climate? The United Nations has already tackled the subject and the results of a controversial study by the organisation found that winter sports are likely to disappear from the Alps and even from Europe in the next twenty to thirty years⁴⁴, owing to global warming. For many, the future of skiing in France and the Alps seems bleak.

In 1988, the *Club alpin français*⁴⁵ initiated a dialogue with the French president, François Mitterrand, concerning development in the mountains, and raised two main points of concern. The club claimed that despite the fall in demand, French resorts are still over-equipped and that most resorts are in great financial difficulty and only survive thanks to the taxpayer. The government's response to this was the promotion of *tourisme doux*⁴⁶ and a five-year freeze on the construction of new resorts. However, resorts have continued to be built or enlarged, and there seems to be little sign of the development of *tourisme doux* according to the club.

*Que restera-t-il dans quelques années comme espace sauvage d'altitude, accessible, non aménagé et visuellement intact d'intervention humaine*⁴⁷

A great number of people express this concern about the over-exploitation of mountains. There are however those, such as Monsieur Gérard Cardin, who believe that the skiing industry is now no longer a

⁴⁴ 'Un scénario catastrophe pour les Alpes', Le Figaro, 14th November 1991.

⁴⁵ *Club alpin français* - French Alpine Club.

⁴⁶ *Tourisme doux* - Mild tourism. The concept of a tourism which considers and respects environmental sensitivities.

⁴⁷ "In a few years, what will remain of wild mountain areas which are accessible, undeveloped and visually intact from human intervention?"

great environmental threat, as a result of the new mentality in development, whereby a balance between development and ecology is sought. Asked whether he considered skiing a sustainable activity in the mountains. Monsieur Cardin's answer was brief: "Tout à fait!"⁴⁸ Monsieur Jean-Jacques Ritschard's⁴⁹ response was similar, but more revealing:

*Oui, c'est une activité supportable, mais aussi une activité nécessaire. Il ne faut cependant pas asservir la montagne au ski. Je crois qu'il faut insérer l'activité de ski dans la montagne.*⁵⁰

Although climatic change and economic pressures will surely have a very significant effect on the skiing industry in future years, the environment must undoubtedly be considered a foremost priority. Resorts will have to respect mountain ecology if they wish to stand any chance of survival, both in terms of customer demand and the actual sustainability of the resort's activities by the mountain itself. Any concrete carbuncles or obvious malpractice on the part of resorts will meet with refutation from the public, which has become more aware in recent years of the importance of a healthy ecosystem and an aesthetically pleasing holiday area. However, since the continuation of skiing on its former scale now seems unlikely, resorts must seek alternatives to offer holiday-makers, such as ice skating, nature walks, or hikes, all of which do not necessitate snow. It would indeed seem that a compromise on the part of developers and environmentalists is required, so that resorts can continue to attract tourists, with the minimum ecological damage being inflicted. A total ban of tourist activity in the mountains is out of the question. The importance of the skiing industry for the economy of the *département*, the region and the country is unmistakable, and a ban on skiing would result in the death of hundreds of tiny mountain communities and a great deal of unemployment.

*La montagne française a l'air de vouloir se reprendre en main et personne ne s'en plaindra.*⁵¹

There is at least the desire on the part of those who are seriously involved with and committed to the continuation of skiing in Isère and

⁴⁸ "Absolutely!"

⁴⁹ Official representative of DATAR (*Commissariat à l'aménagement et au développement économique des Alpes*) - Commission for the planning and economic development of the Alps.

⁵⁰ "Yes, it is a sustainable activity, but also a necessary activity. The mountain need not be subjugated by skiing. I think it is necessary to incorporate skiing into the mountain."

⁵¹ "The French mountain seems like it wants to take itself in hand, and nobody can object to that."

the whole of the Alps to look at the long-term future of skiing and to work together with ecologists to ensure the survival of a sport enjoyed by a great number of people. It is to be hoped that the environmental concern shown in many areas of life will one day be shared by all those involved with the development of skiing.

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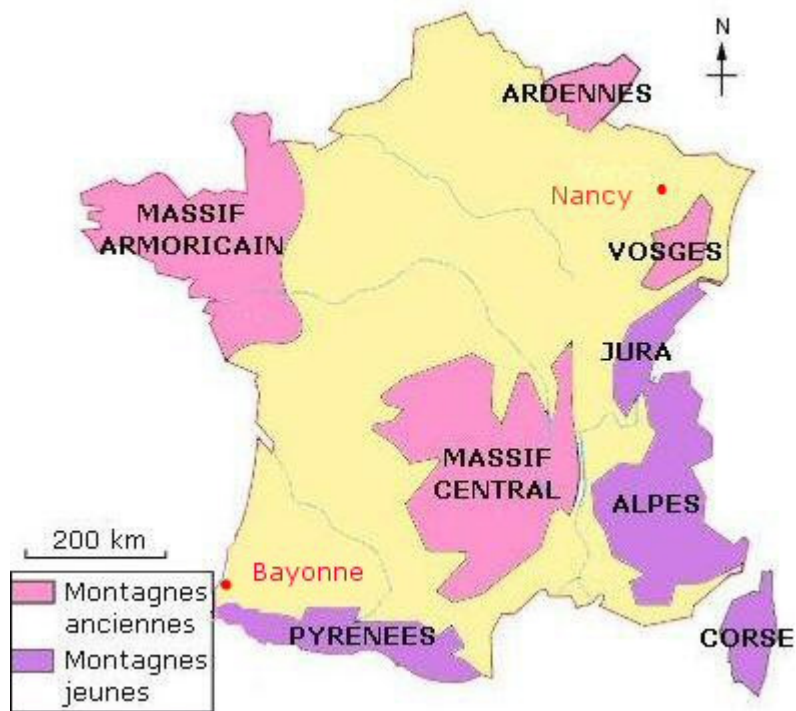
Gilbert Biessy, Député de l'Isère and mayor of Echirolles, 7th June 1993

Daniel Plumet, representative of the Syndicat national des téléphériques et téléskis de France. 27th May 1993

APPENDICES

APPENDIX A

Map of French mountain ranges or 'massifs'



Source: <http://www.maxicours.com/soutien-scolaire/geographie/ce2/119931.html>

APPENDIX B

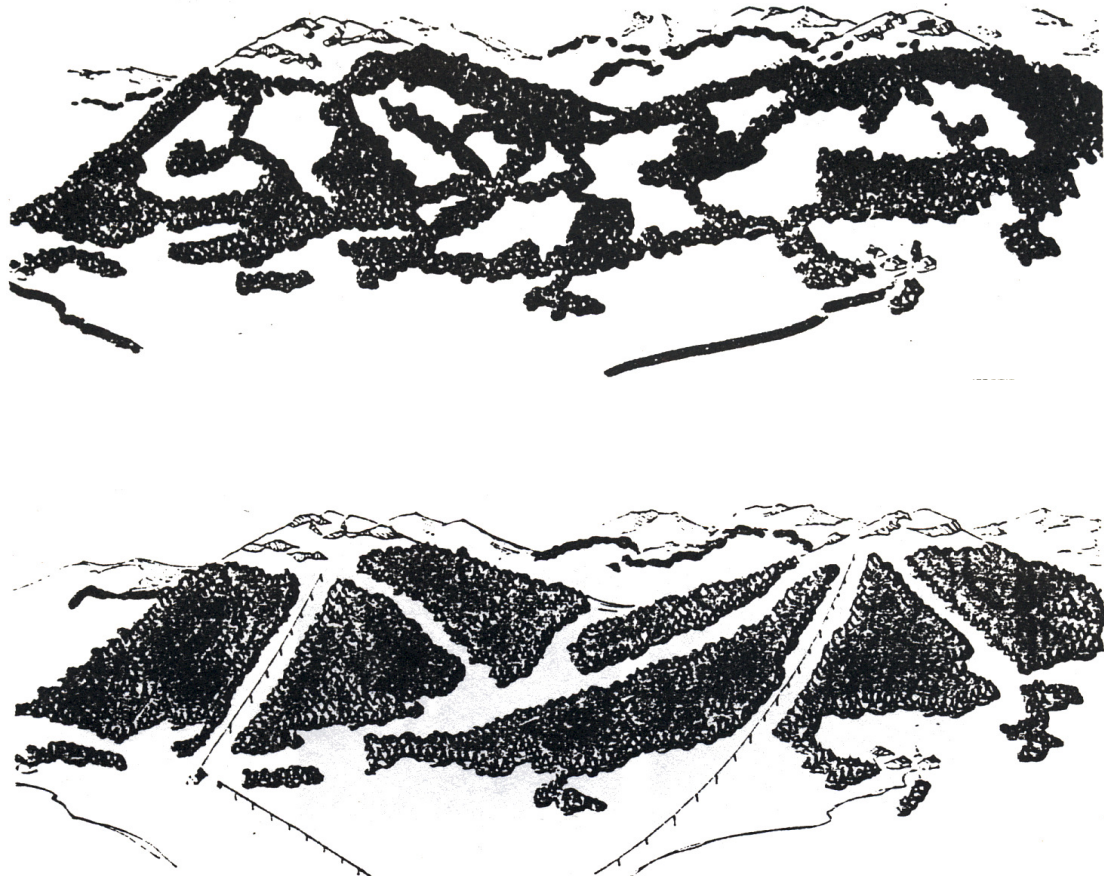
Map of Rhône-Alpes region



Source: http://europa.eu/abc/maps/regions/france/rhone_en.htm

APPENDIX C

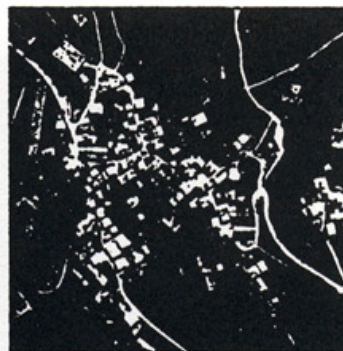
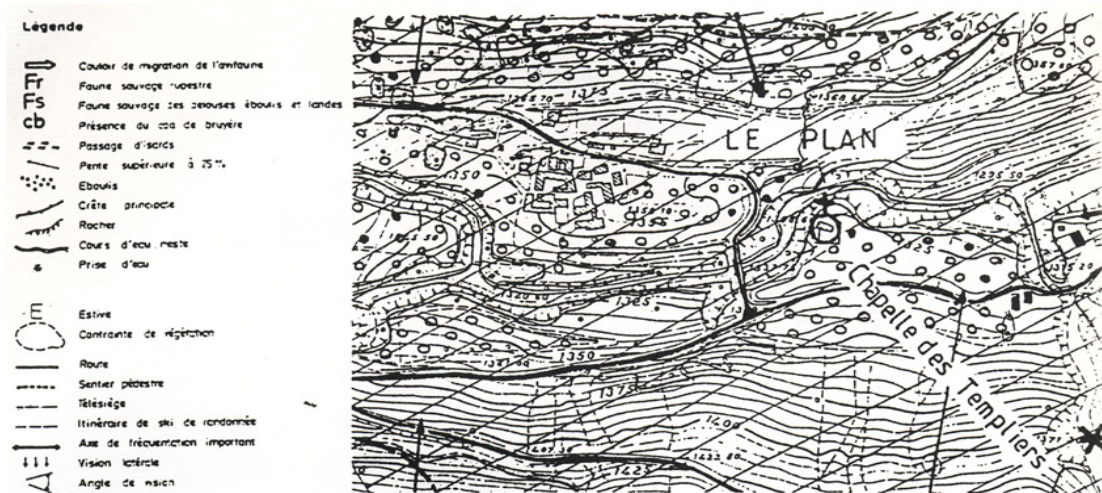
Graphical simulation of mountain before and after piste development



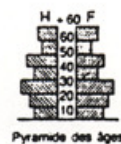
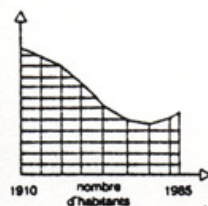
Source: Travaux en Montagne: 9 études de cas (Toulouse, 1990)

APPENDIX D

Example of a thematic map and analysis documents used during planning stage of mountain development



Exemples de documents d'analyse du contexte communal



Données démographiques

	81	82	83	84	85
Dépenses					
• fonctionnement					
• investissement					
Recettes					
• fonctionnement					
• investissement					
Excédent					
Déficit					

Budget communal

Source: U.T.N.: Mode d'emploi: Développement et protection de la montagne (La Ravoire, 1987)