

MOUNTAIN TOURISM: CLIMATE CHANGE AND SUSTAINABILITY

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Abstract. *Mountainous areas may tend to occupy a marginal position on present day economic priority lists, but they are runner-up favorites as touristic destinations. Due to climate change these areas used up earlier by ski resorts will diversify and open towards other, land- and waterbased, snowless services. The central challenge is maintaining a triangle of sustainability: ecological, economic and socio-cultural elements must be balanced in order to keep tourism sustainable.*

Key words: *mountain tourism, climate change, sustainable tourism*

1. Mountains and ecosystem

„The primary source of flowing waters, energy, and biodiversity are the mountains. Forestry, agricultural and mineral products with pivotal importance also come from the mountains, which furthermore serve as recreation areas. Mountainous environments are part of the complex and intertwining network of ecological systems on our planet, and are vital for maintaining its integrity.” (Mountain Institute)

The mountains of the world occupy around 24 percent of the Earth's total surface, present on all continents except for the Antarctica, and represented in all major ecological systems from deserts to tropical forests and icy polar ranges. Whichever the location, they share an important property: the climate, the vegetation and the soil change in a rapid pace within limited distances, corresponding to the scale of elevation and contributing to the dramatic variation of biodiversity. It is exactly this versatility that makes defining mountainous environments difficult. As a general rule, mountainous environments lie more than 300 meters above sea level, but it is more expedient to divide them into zone systems with custom features based on height, inclination and natural landscape (eg. subalpine, rainforest).

About 12 percent of the planet's human population live in the mountains, and an additional 14 percent live in their close proximity and in dependence on resources originating from there. About half of all mountaineers are concentrated in the Andes, the Hengduan-Himalaya-Hindu Kush system, respectively in

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the African mountains. While mountain ranges in the Northern hemisphere are sparsely populated, the population density can grow over 400 souls/km² in some mountainous tropical areas. The population and economic impact of mountain regions in the EU bear great importance, especially in agriculture, tourism and forestry. 20% of all agricultural areas in Europe lie on high ground, as well as 27% of all operating farms. The territory of five EU member states – Austria, Greece, Italy, Portugal and Spain - is covered with mountains in more than 50% (Dax, 2004).

Most of the people living on the mountains make a rather miserable living doing agricultural field work. These groups of people have no or minimal political influence, and the local economies are bound to agricultural production and relies on barter exchange. The social, cultural, environmental and economic influence of mountain ecosystems determines the living standard and health of the population. Due to their heavy reliance on their immediate environment, they have developed a pronounced cultural identity, as well as specialized skills and knowledge.

In recognizing the significance of the mountains, the first step was the Agenda 21 13. chapter entitled „**Management of Vulnerable Ecosystems: Sustainable Development of Mountains**„. In the 1992 United Nations conference on Environment and Development in Rio de Janeiro, it was stated that mountainous areas have an impact on the lives of more than half of Earth's total population, hence the issue of local resources like waters and biodiversity should be treated with due seriousness.

Considering the growing international interest towards mountain tourism, The Mountain Forum organized an electronic conference in 1998, entitled **Community-based Mountain Tourism: The Connection between Sustainability and Enterprise in Practice**. By the end of the conference, the parties had agreed to the following practical points, aiming at a more balanced distribution of touristic resources and proceeds, and emphasizing local governance, partnership, sustainable development and conservation:

1. Holistic management strategies,
2. Local governance and management of resources,
3. Supportive national and regional policies,
4. An evenly balanced resource utilization and decision making regarding the low-lying and high-lying territories,
5. Utilization of the local traditional and knowledge base in social and cultural management,
6. Utilization of external knowledge and technology,
7. Infrastructure development in underdeveloped areas,

8. Reinvestment of touristic proceeds in conservation,
9. A balanced distribution of touristic profits and possibilities,
10. Full scale integration of women,
11. An organized capacity expansion,
12. Practical education based on talents,
13. Attracting the attention of potential investors,
14. Partnership, and
15. Continuous research and information flow.

At the basis of the European co-operation stands the Alpine Convention signed by eight alpine states in 1999. The main issues discussed were as follows: population and culture, area development, air quality, soil protection, water quality, nature protection, landscape rehabilitation, agriculture, forest conservation, infrastructure development, energy and waste management and tourism.

There was an increased international and political interest towards the development of mountain ecosystems and the dependent low-lying territories in 2002, in the International Year of the Mountains (IYM). In the same year, the co-operation platform entitled Partnership for the Sustainable Development of Mountains was initiated on the Johannesburg World Summit on Sustainable Development (www.johannesburgsummit.org, United Nations 2002, para 42), inspiring the transnational co-operation of several international networks on behalf of the mountainous areas.

Still, mountainous areas tend to occupy a marginal position on present day economic priority lists, with few investments reaching fruition, locals being economically disadvantaged and resources becoming increasingly degraded due to exhaustion. In such conditions, tourism seems to represent the only feasible solution for development in the eyes of many.

2. Tourism

Tourism is the determining factor of the mountain services industry. The mountains are runner-up favorites as touristic destinations, second only to beaches and islands. In 1999, 15 to 20% of all international tourist traffic took place in the mountains, which equals to an annual commerce of about 80 billion US dollars (Lama-Sattar 2002).

According to Godde (1995), in the broader understanding of mountain tourism one will find the mass tourism of popular areas, ski tourism, adventure tourism (trekking, mountaineering and rafting), cultural tourism, ecotourism and

pilgrimage. Motivation for travel can be the climate, the fresh air, the unique wildlife of the areas, the panoramas, the local cultural and historical heritage, the attraction of the snow, as well as winter sports and nature-based activities.

Grouped by the utilized natural factors, touristic activities in the mountains are as follows:

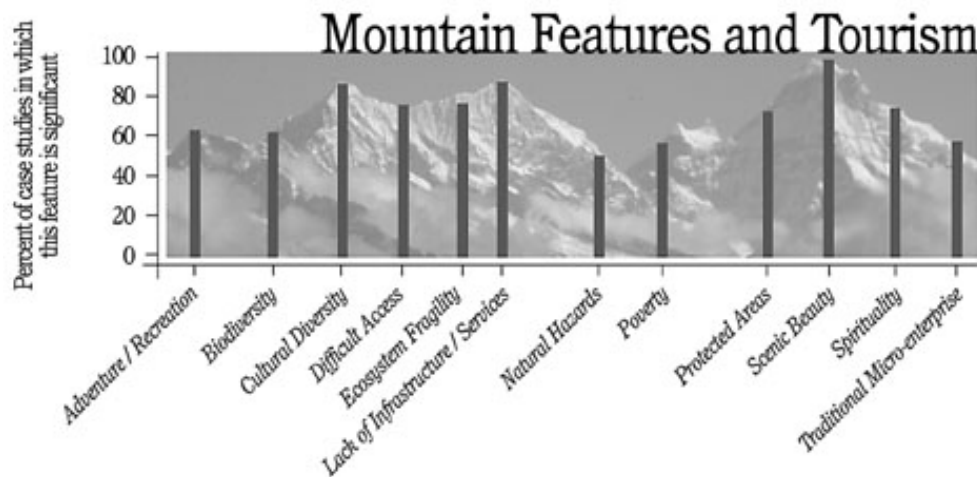
Land-based adventure activities: cycling (Mountain bike, quadbike), riding, trekking, rock- and ice climbing, potholing and nordic walking.

Although the weather conditions (snowfall or dry weather and the size of the areas covered by snow or ice) and the accessibility of activity areas (eg. frozen rivers or blocked rail traffic) greatly affect all these activities, they can be pursued in both snowy and snowless seasons.

Freshwater-based recreational activities: water touring (kayak, canoe), sailing, surfing, kite surfing, rafting and angling.

Snow-dependent recreational activities: crosscountry skiing, coasting and glacier skiing, snowboarding, sledding, motor sleigh riding, tobogganing.

As shown on picture 1, mountain tourism is greatly affected and determined by the elevation scale and relative isolation of the area in question.



Picture 1: Features of mountainous areas and tourism (Godde, 1995)

The priority issues of sustainable development of mountainous areas are directly or indirectly related to the touristic value of the areas in question.

Although modern means of transportation have made even the most remote mountainous areas reachable for visitors, mountain tourism is still unequally balanced: mountain destinations with significantly developed touristic infrastructure represent only a fraction. In the Alps, for example, with more than 100 million visitors a year, 40% of the local communities have no connection at all with tourism, and only 10% of the communities are expressly specialized in it.

The depth of involvement of alpine communities in tourism is well demonstrated by their categorization into being intensive/less intensive and mountainous/not mountainous (chart 1). Moreover, it can be stated that the regional processes of touristic development further entrench the concentration.

Chart 1: The intensity variation of tourism in the Alps between 1975 – 1995

Touristic reception zones	Nights a year/population		
	1975	1985	1995
Not mountainous ¹⁾	2.86	3.52	4.06
Mountainous, less intensive ²⁾	20.12	20.07	19.30
Mountainous, intensive ³⁾	155.38	165.27	162.17

¹⁾ reception zones outside/bordering the Alps

²⁾ alpine reception zones where the touristic activity of the local population is less than 25%

³⁾ alpine reception zones where the touristic activity of the local population is more than 25%

(Source: ÖSTAT, Schindegger et al. 1997)

3. Climate change

Climate change is a considerable source of danger to mountain tourism. It may result in final closure of ski resorts, further impacting the network of services and employment. In the same time, this will not bring about the end of all kinds of high mountain tourism. The areas used up earlier by ski resorts will diversify and open towards other, land-based and snowless services. The disappearance of the snow will make place for more trekking. In turn, this will lead to greater exposure of the wildlife and vegetation to human interference, especially so in the case of fragile alpine vegetation, previously protected by snow. Security issues will also arise as tourists going trekking in a snowless zone might still easily find themselves enveloped in snowstorms, common under the milder weather conditions of higher-lying areas.

In fact at elevations above 1000 metres the decline in snowfall rates is expected to be much slower, because the general warming is being accompanied by an increase in precipitation, which could lead to more prolonged snow on the highest ground.

Scotland and Australia are hardest hit because of their relatively low elevations. Visitors to the European Alps, on the other hand, enjoy skiing and snowboarding up to as high as 4,000 metres. the climate is changing. Winter temperatures in the Alpine region are now 2°C higher than at the beginning of the century – a rate of warming about three times faster than the global average. And despite a rash of stories predicting the imminent death of the Alpine skiing industry, experts point out that the real situation is actually far more complex. Climatic variability is very high, and there's no direct link between average warming and snowfall in a particular winter. (**Beniston**, 2006)

Another major concern comes not from snowfall but from the melting of the very mountains themselves. Much of the highest ground in the Alps is permanently frozen – known as permafrost – with sediment, earth and rock held together by a glue-like layer of ice. For as long as it stays frozen, permafrost can be as hard as concrete. But once it begins to thaw, the whole mass can begin to slide downhill under its own weight. It's a danger that is taken seriously in Switzerland: the small town of Pontresina is currently spending large sums building a giant wall to catch any landslide triggered by permafrost degradation on the slopes above.

Although permafrost occurs all over Europe, with patches even as far south as the Spanish Sierra Nevada, it is the Alps which are most at risk. Rising temperatures have a dual effect on permafrost, acting directly to warm the ground in summer, and bringing heavier snow in winter which insulates the ground from the coldest nights and retains warmth. A gigantic rockfall on the eastern face of the Matterhorn in July 2003 – after which 70 climbers had to be rescued – could show the shape of things to come, arriving as it did during record-breaking summer temperatures.

“But the greatest implication of the melting is for hydrology, because the glaciers feed the rivers flowing off the Alps during the driest part of the summer.” It's a familiar problem, and one which isn't unique to Europe: major cities in both South America and the Indian subcontinent depend largely on mountain-generated water, which will become a diminishing resource as global warming accelerates glacial wastage during the century ahead (Lynas 2004). The process is already well underway in the Peruvian Andes, where several

glaciated mountain ranges have lost up to a half their snow and ice in the last thirty years alone. Peru's Cordillera Blanca ('White Range'), a climber's Mecca which boasts some of the best ice mountaineering opportunities in the world, has lost 111 square kilometres of glacier area since 1970.

These changes are replicated in every glaciated mountain range in the world – with the single exception of some of the maritime glaciers in Norway where melting caused by rising temperatures has been offset by heavier snowfall. In total mountain glaciers are now losing a hundred cubic kilometres of water every single year, more than the entire volume of Switzerland's Lake Geneva. This includes glaciers in the highest latitudes like Alaska and Canada, which contain some of the largest ice masses outside the Greenland and Antarctic ice caps. Recent studies using airborne laser altimetry found 95% of these glaciers to be thinning, adding water to the oceans at a rate equivalent to an annual sea level rise of 0.2mm per year. Tourist cruise ships now visiting Alaska's Glacier Bay are able to travel tens of miles into a previously ice-bound fjord.

4. The impact of tourism on mountain ecosystems

Tourism has great impact on mountain ecosystems, communities and economies. Hereafter, we provide a summary of the 2007 UNEP reports:

Environmental impacts:

Mountain landscapes are particularly fragile and susceptible to change and degradation. Landslides, avalanches, lava flows, earthquakes, torrents and rock falls can alter the landscape unexpectedly. Mountain ecosystems include a wide range of small and unique habitats, with flora and fauna that may have very short growing and reproductive seasons, and may be particularly sensitive to disturbance by human activity. Tourism activities often involve the development and intense use of tracks, paths and sports slopes by vehicles, non-motorized transport and pedestrian traffic. Visitor presence is also usually concentrated in small areas, contributing to increased noise and waste. The negative environmental effects of poorly managed tourism activities can include vegetation clearing and soil erosion, removal of scarce habitat, altering of critical landscapes and water flows, water and air pollution, and wildlife relocation or behavioral changes. The introduction of exotic and invasive species and diseases can also have a significant negative impact on local plant and animal species.

- Removal of vegetation both on the large scale (i.e., for roads, land clearance for ski areas or hotel construction, etc.) or the small scale (i.e., collection of plants, trampling and disturbance to sensitive vegetation by uncontrolled tourism), even by benevolent “ecotourists” watching for wildlife or studying plant-life.
- Disturbance to wildlife and reduction of wildlife habitat area: Mountain tourism is fast growing: tourists (and tourism infrastructure) are going further into remote and isolated high altitude areas. Tourism managers “sell” opportunities to view wildlife, which, unless properly managed, can interfere with their critical needs and life cycles. Some wild creatures may respond by retreating; others become accustomed to humans and human food.
- Wildlife poaching and trade in wildlife parts is sometimes masked by the increased presence of tourists in wilderness areas where local people work as tour guides or porters and smuggle illegal wildlife parts out for sale.
- Increased incident of forest and grassland fires from tourist activities: a tossed cigarette is all it takes. With increased numbers of visitors, unaccustomed to high fire dangers, forest fires are a real and serious impact of tourism in mountain areas.
- Degradation of forests from cutting of timber to firewood for tourism: The increasing number of local trekking lodges in the high Himalaya promotes firewood cutting by the local people, resulting in forest degradation (Bhattraï 1985, Puntenney 1990). Firewood is used to cook food and provide hot showers to tourists. Trekking porters uproot high altitude shrub to burn for cooking and keeping warm, causing serious damage to the exposed slopes (Byers 1999). The number of tourists, with porters and staff, visiting the Everest region each year is four to five times the local population; hence more pressure is exerted on the forest, particularly outside of park boundaries where forests are unprotected. Impacts are evident down slope as well, i.e., soil erosion and reduction in land productivity. Moreover, the villagers are compelled to spend more time in meeting their own needs of firewood from a rapidly receding forest.
- Improper and inadequate garbage and human waste management: Tourism generates a high volume of garbage and waste which mountain communities are unprepared to process. High altitude temperatures inhibit the natural decomposition of human wastes at base camps. Improperly sited toilets pollute mountain streams, affecting water sources downstream as well as the sanctity of sacred lakes and streams. Garbage piles up outside trekking villages and ski villages alike, and is dispersed by wind.

- Simplification of agro-diversity: Sustainable practices that promote agro-biodiversity become geared to tourism market demands, creating a chain effect on cropping patterns, loss of soil productivity and soil erosion, and ultimately destruction of habitats and ecosystems.

Socio-cultural impacts:

The cultural variety and uniqueness of local communities, representing thousands of different ethnic groups, is especially attractive for tourists. Adequately managed ecotourism may help protect the values of these cultures, contributing in the same time to the improvement of their social and economic situation. On the other hand, unadequate management may result in identity loss and assimilation of the “invaded” population. In this eventuality, the accumulated economic capital is moved somewhere else, leaving exhausted resources and inflated local prices behind. (Mountain Forum, 1995).

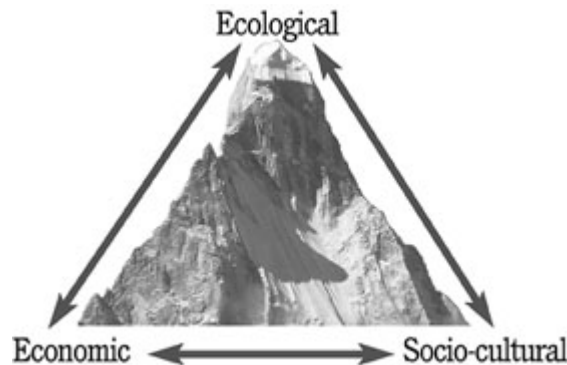
Mountain communities can also be very susceptible to impacts and change from tourism activities. The negative social impacts of poorly managed tourism can include disturbances from high levels and concentrations of visitor noise and activity, and reduced availability of scarce shared resources such as firewood, fish and fresh water. In addition, exposure to and adoption of foreign traditions, lifestyles and products can pose a threat to the unique culture, traditions, knowledge and livelihoods of mountain populations, particularly in remote and indigenous communities.

Impacts as it can serve as a supportive force for peace, foster pride in cultural traditions, help avoid urban relocation by creating local jobs, increase visitor awareness and appreciation of natural, cultural and historical values and assets.

Economic impacts:

While tourism can provide significant local employment, if not properly managed, it can be short-term and seasonal, providing little skill-building or training to local people. Working conditions can be poor, and revenue can easily pass from the local economies to externally owned companies. However, well-managed tourism can play an important role in attracting revenue and supporting poverty alleviation. It can also improve infrastructure, provide community services and help diversify local economies. Employment and income can, in turn, improve the self-sufficiency and sustainability of mountain communities.

The central challenge is maintaining a triangle of sustainability (Picture 2), as discussed by Andri Bisaz and Uli Lutz (1998). Ecological, economic and socio-cultural elements must carefully integrated into community-based mountain tourism, but they must also be balanced in order to keep tourism sustainable.



Picture 2: Traingle of sustainability (Bisaz-Lutz, 1998)

The World Tourism Organization has identified core indicators of sustainable tourism. These indicators can be applied to all destinations and include: site protection, stress, use intensity, social impact, development control, waste management, planning process, critical ecosystems, consumer satisfaction, local satisfaction and tourism contribution to local economy. Supplementary indicators specific to mountain environments are listed as (WTO 1995):

- reproductive success of indicator species (loss of flora and fauna)
- extent of erosion caused by tourists (erosion)
- length of vehicle line-ups (lack of access to key sites)
- consumer satisfaction (lack of solitude)
- site attraction (loss of aesthetic qualities)
- pollution counts (diminished water quality)

Summary

Community leadership and a favorable national or regional policy environment are two central components of successful community-based mountain tourism initiatives. Policies and actions that link conservation, enterprise development and community control in mountain tourism have the potential to address one of the most important challenges facing the 21st century—sustainable management of mountain resources and a sustainable future for mountain populations.

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