6 The Australian Alps: opportunities and challenges for geotourism

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Introduction

Geotourism, as the concept of tourism based on geological features, has gained growing traction in recent years as evidenced not only from contributions in this book, but also from the geopark movement and the number of recent conferences on the subject. Geotourism and particularly the geopark concept build on the notion that fundamentally, geology is the underlying, defining and connecting factor for many natural and even social features of a region, including aspects such as biodiversity, landscape, patterns of human occupancy and use and even architecture. However, today these links are seldom explored or made explicit in the general tourism product even though they have the potential to provide an avenue for a holistic view of a region and its activities, landscapes and people.

This chapter focuses on mountain areas as geotourism destinations, with specific focus on the Australian Alps. The first part of the chapter highlights the importance of mountain areas and in particular the Australian Alps for their ecological, economic and cultural values. The latter part of the chapter explores the case of Mount Kosciuszko, Australia's highest peak, as a geotourism destination. The region has a diversity of tourism attractions based on geological features which lend themselves to providing a holistic approach to the interpretation of the region's features. The chapter concludes with a discussion of some of the opportunities and challenges for geotourism and tourism in general to the region.

Importance of mountains

Geological formations such as entire mountain ranges, individual peaks and associated land formations underpin tourist attractions in many parts of the world. Mountain areas cover about 27 per cent[1] of the earth's land surface (UNEP WCMC 2002). The greatest component (12.2 per cent; 17.9 million square kilometres) is in Eurasia, while only one per cent (1.4 million square kilometres) covers the Australasian and Southeast Asia region. Mountain areas have important economic, cultural and ecological values. About 10 per cent of the world's population live in mountain regions and more than 40 per cent depend in some way on mountain resources such as water from mountain catchments for drinking and irrigation (Hamilton 2002; Messerli and Ives 1984). Some mountain areas, such as the European Alps, have been utilized sustainably for agri-

1 Using the UNEP WCMC definition based on elevation and slope (cf. UNEP WCMC 2002).

cultural purposes for millennia, while other areas, such as the Australian Alps, have experienced little anthropogenic alteration until relatively recently (since the arrival of Europeans) (Bock *et al.* 1995; Patzelt 1996).

Mountains are prominent geotourism destinations worldwide. The highest mountains in a range, in a country, on a continent and in the world, tend to attract far more interest than smaller peaks. At a continental scale this is seen in the focus on climbing the 'Seven Summits': the highest mountain on the seven continents. Continental Australia's highest mountain, Mt Kosciuszko at 2228 metres in the Australian Alps, is by far the lowest of the traditional 'Seven Summits'. It is much lower than the highest peaks that are at similar latitudes in New Zealand and in South America and is only a quarter of the height of Mt Everest (8848 metres) (Körner 2003).

The Australian Alps

Mt Kosciuszko is part of the Australian Alps which form the southern end of the Great Dividing Range that runs parallel to Australia's east coast for over 2000 kilometres, about 50 to 150 kilometres inland. The Australian Alps extend from the high country of the Australian Capital Territory (ACT), through the Snowy Mountains in New South Wales (NSW) to the highlands of Victoria, with some alpine areas in Tasmania (Figure 6.1).

The Australian Alps are distinctive in many ways in relation to mountain areas worldwide (Kirkpatrick 2003). Important characteristics include aspects of geology, flora, fauna, climate, and particularly their comparatively low-set topography. Many of the values of the Australian Alps are found in the differences from, rather than conformity to, the stereotypic images of steep slopes, high rocky outcrops and towering mountain peaks, which are often associated with alpine areas elsewhere (Kirkpatrick 2003). Australia's mountains are much older and, unlike the mountains of New Zealand or New Guinea which are still being uplifted, have experienced considerable weathering since their major periods of uplift (Ollier and Wyborn 1989). With milder Pleistocene conditions than in many other mountain regions, the Australian Alps experienced only weak glaciation (Good 1992). These factors all contributed to the area's rounded, soil-mantled character that stands in contrast to the icy, rugged and sawtooth-like features of alpine areas in Europe, Asia, America or New Zealand (Kirkpatrick 2003). In late 2008, the Australian Alps National Parks and Reserves were placed on the Australian Government's National Heritage List on the basis of the significance of the landscapes including its glacial features, its distinctive snow adapted flora and fauna and its human history including indigenous, pastoral, recreation and scientific use (DEWHA 2008).

The highest and largest alpine area in Australia, centred around Mt Kosciuszko, consists of an undulating plateau that gradually rises from the east to a series of north–south aligned peaks along the Main Range, and rapidly drops off towards steep valleys along the western side. The tree line is around 1850 metres which, like in many other mountain environments, coincides with a mean temperature during the warmest month of about 10°C (Costin *et al.* 2000; Körner 1999). Some of the outstanding natural features include 21 endemic flowering plant species (i.e. 10 per cent of the native flowering plants); periglacial and glacial features (which show the only clear evidence of mainland glaciation during the last glacial period and are an example of glaciation under marginal conditions); and great scenic values (Good 1992; Kirkpatrick 2003).

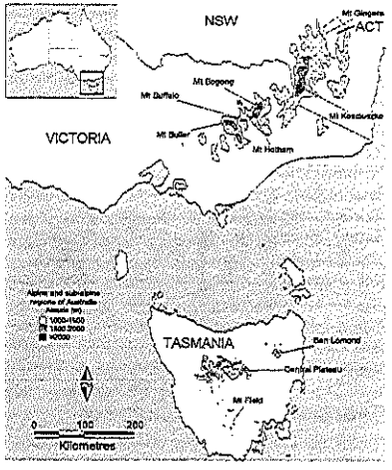

Figure 6.1: Distribution of the Australian alpine and subalpine zones across the Australian Capital Territory, New South Wales, Victoria and Tasmania (adapted from Green 1998).

The extraordinary landscape of great ecological, economic and scientific importance of the alpine area around Mt Kosciuszko is internationally recognized under the UNESCO Man and the Biosphere Program as a World Biosphere Reserve (Costin *et al.* 2000; Good 1992; Kirkpatrick 2003). In 2008, the Australian Alps were also included in Tourism Australia's National Landscapes programme and as such will feature strongly in Australia's international tourism marketing.

Human history

The Australian Alps, like most of Australia, have a long history of human use, with evidence of habitation in the general region from around 21,000 years ago during a period of glaciation (Good 1992; Sullivan and Lennon 2004). More extensive use of the higher altitude areas dates from 4000 to 3000 years ago (Good 1992; Sullivan and Lennon 2004). At least 13 linguistic and social groups visited the region with the most prominent social festivals associated with harvesting the Bogong Moths (*Agrostis infusa*) which seasonally congregate in caves and rock crevasses (Sullivan and Lennon 2004). There are also important current cultural links with the region for local Aboriginal communities. Nevertheless, unlike the region's grazing history, past and present Aboriginal association with the area is not given much prominence in tourism in the region.

Use of the region for pastoralism dates back to as early as 1823, when some of the first grazing stations were established in the region (Good 1992; Sullivan and Lennon 2004). Use of the alpine region during summer for grazing cattle and sheep was originally unregulated until the introduction of grazing leases in the 1880s, although even then illegal grazing still occurred (Good 1992). Damage to vegetation, soils and aquatic systems was extensive, with a range of impacts documented as early as the 1890s with damage still evident today (Good 1992). Some were due directly to grazing, but annual burning to promote a 'green pick' compounded impacts. It was not until the 1940s that control

of grazing was instigated, with the establishment of the Kosciusko State Park in 1944 (Good 1992). Nevertheless, the legend and regional image of mountain pastoralism and brumby[2] running, instilled into the Australian psyche and folklore through the words of the poem 'The Man from Snowy River', continues to this day (Sullivan and Lennon 2004).

The main factor that resulted in limitations, and then the end of grazing, in the alpine area around Mt Kosciuszko, was the development of the Snowy Hydro-electric Scheme. Soil erosion and its impacts on water quality and potential siltation of dams lead to both the cessation of extensive grazing and the start of programs by the Soil Conservation Service of New South Wales to actively revegetate existing damage. The Snowy Hydro-electric Scheme was one of the largest-ever engineering projects in the southern hemisphere, involving the building of numerous dams and an extensive tunnel system connecting them (Collis 1990). During the construction phase from 1949 till 1972, thousands of European workers migrated to the region, contributing to the region's community fabric. The scheme and numerous sites throughout the region also lend themselves to geological interpretation from macro (e.g. landscape formation) to micro level (e.g. mineral composition of tunnel spoils).

Tourism to Mt Kosciuszko

Today, the key tourism attractions of the Australian Alps include Mt Kosciuszko and its surrounds (for its height, scenic values and hiking), snow skiing, features of the snowy hydro scheme and its development, and significant karst systems and caves. Tourism to the Kosciuszko alpine area (Figure 6.2) really commenced with the completion of the 53 km Summit Road from the town of Jindabyne to the top of Mt Kosciuszko in 1909. In 1930 (rebuilt in 1939) a Chalet was built at Charlottes Pass on the edge of the alpine area, principally to provide accommodation for ski tourism. It was also used in summer for a range of activities including bushwalking, horse riding and car touring (Walkom 1991). A small 'emergency' hut was built in the alpine area in 1929, followed by the Lake Albina and Kunama ski lodges completed in 1951 and 1952 (Hueneke 1987). Ski tourism took off in the 1950–60s partly as a result of the interest of post war migrants who worked on the Snowy Hydro-electric Scheme. Several ski resorts in the subalpine areas were established and developed during this time including Thredbo Village (1958), and Perisher Valley (1959) (Hueneke 1987). The Kunama lodge was destroyed by an avalanche in 1956. Lake Albina Lodge was acquired by the parks service in 1969, and removed in 1984 (Worboys and Pickering 2002).

The Summit Road was the main access route in summer to Mt Kosciuszko with private cars initially able to access the very summit. An informal walking track was also used from Thredbo, with the completion of a Chairlift from Thredbo Village to the edge of the alpine area in around 1962 (Worboys and Pickering 2002). In 1972, a car park was constructed below the summit of Mt Kosciuszko at Rawson's Pass, with people walking to the summit using a direct walking track through sensitive snowbank vegetation. In 1976, the Summit Road was closed between Charlotte Pass and Rawson Pass to private vehicles, with buses providing tourist access during peak periods (Worboys and Pickering 2002).

2 A brumby is a wild horse which descended from domestic horses introduced to Australia by European settlers. The management of brumbies in Kosciuszko National Park today is a highly controversial issue. The hard-hoofed feral animals cause considerable damage to the native alpine environment although they have a highly romanticized place in Australian history and are seen by some as a cultural asset.

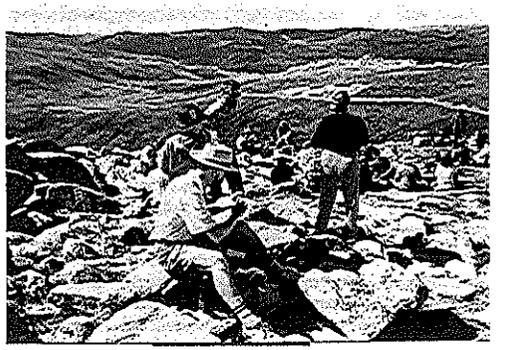

Figure 6.2: Summit area, Mt Kosciuszko, Australian Alps

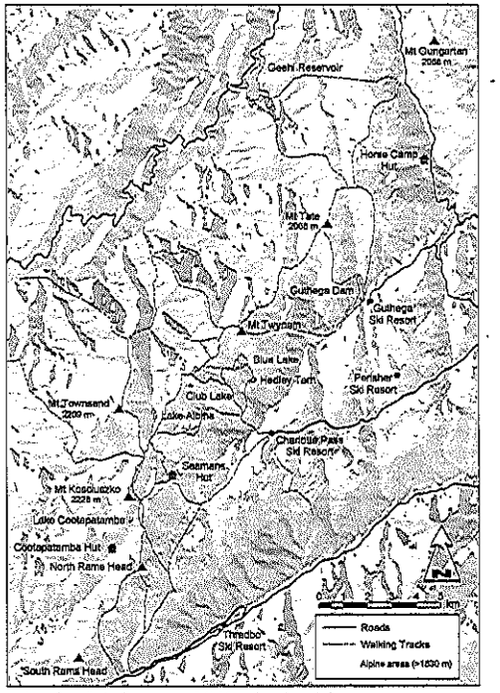

Figure 6.3: Road and walk trail access, Mt Kosciuszko alpine area

In 1978, the direct walking route from Rawson Pass to the summit was closed, with access via the old closed road. The Summit Road was closed to all vehicles (excluding management access) in 1982, and construction of a new steel mesh walkway from the top of the chairlift at Thredbo to Rawson's Pass started, with associated rehabilitation of the old track (Worboys and Pickering 2002). As a result, the main route for people walking to Mt Kosciuszko changed from Charlotte Pass to Thredbo Village, and from a car–bus–short walk, to a chairlift ride and six-kilometre walk (see Figure 6.3). At Charlottes Pass, a short interpretative raised wooden boardwalk was installed along with other upgraded facilities. Other upgrades of walking tracks also occurred between the early 1980s and the present, with the use of a range of materials including cement pavers, gravel, gravel and geoweb, and stonework paths and steps (Hill and Pickering 2006).

Winter use of the alpine area was mainly for ski touring. Reflecting changes in tourism trends in the ski resorts, snowboarding in the alpine area is increasingly popular, with some ski touring, and a limited amount of ice climbing around Blue Lake. Little detailed information is publically available about winter use of the alpine area, compared to two detailed surveys that have been conducted during the snow-free period. The first of these surveyed general visitors to the alpine region during the snow free period of 1999/2000 (Johnston and Growcock 2005), while the second focused on collecting information about visitors on top of Mt Kosciuszko itself during peak time of summer visitation (2005–2006, Dickson 2007).

Summer is the main period of visitation to the alpine area with an estimated 100,000 people visiting during the snow free period (Johnston and Growcock 2005). Walking is the most popular activity (43 per cent long walks, 36 per cent short walks), with other activities including sightseeing (12 per cent), mountain biking (3 per cent) and camping (2 per cent) (Johnston and Growcock 2005). The most popular route to access the alpine area is from the top of a commercial chairlift from Thredbo Village (67 per cent), with about a third of people accessing the region from Charlotte Pass (32 per cent) and the summit of Mt Kosciuszko being by far the most popular destination (Johnston and Growcock 2005). For general visitors to the alpine area, climbing Mt Kosciuszko was the third most common motivation for visiting the area (27 per cent, Johnston and Growcock 2005). For people surveyed on Mt Kosciuszko, 78 per cent had decided to climb the mountain before leaving home (Dickson 2007). For summiteers, important motivations for their visit were *scenic beauty/naturalness*, *to enjoy the outdoors*, and *to climb Mt Kosciuszko* (Dickson 2007). The more often people reached the summit, the less important climbing the mountain became. Of particular interest is that 63 per cent of summiteers expected wilderness on the mountain, and 62 per cent experienced wilderness, even though the area is not a designated wilderness area and often they were on top of the mountain at the same time as hundreds of others. Visitors were highly satisfied with their visit and many had a strong attachment to the region, particularly if they were return visitors (Dickson 2007). This is an important consideration for successful geotourism interpretation as it could further build on linking the area's geoheritage with people's personal values and experiences. Indeed, while Mt Kosciuszko and the surrounding national park already offer many visitor attractions/destinations that focus on geological features, including Australia's highest peak and surrounding glaciated landscapes, caves, and the Snowy Hydro-electric Scheme, current visitation is not focused on geotourism *per se*.

Environmental impacts of tourism

Impacts of tourism use of Mt Kosciuszko include direct impacts such as damage to vegetation, soil hardening and the introduction of weeds, while there are also indirect impacts such as those associated with the construction and maintenance of the infrastructure provided for tourists (Pickering *et al.* 2003; Scherrer and Pickering 2001). As walking is one of the most popular activities in the region, a major direct impact of visitors is from trampling on native vegetation. This results in reduced cover of native vegetation, reduced native species diversity compaction of soils, changes in hydrology and soil erosion (Growcock 2005). Although the main vegetation type, tall alpine herbfield, is relatively resistant to trampling compared to other vegetation types in the region and vegetation in many other areas (Hill and Pickering 2009), it is also very slow to recover once damaged (Growcock 2005; Scherrer and Pickering 2006). For example vegetation and soils on the old walking track from the Thredbo Chairlift to Rawson's Pass remained highly degraded after more than 15 years since closure and rehabilitation efforts, with significant differences to adjacent natural vegetation in terms of soil nutrients, species composition and cover (Scherrer and Pickering 2006).

The main management response to trampling damage has been to harden walking tracks using a variety of materials. However, the construction and use of these tracks have their own impacts, with some requiring the removal of all vegetation along the track and with some introduced track materials resulting in distinct weedy verges. As a result, the area of impact varies from negligible for the steel mesh walkway to 4290 square metres per km for wide gravel tracks and 2940 square metres per km for narrow gravel tracks (Hill and Pickering 2006). For non-hardened tracks there was an average of 270 square metres of disturbance per km of track (Hill and Pickering 2006).

The cover and diversity of weeds in the alpine area is strongly associated with visitor use and infrastructure (Hill and Pickering 2006; Johnston and Pickering 2001, Pickering *et al.* 2007). Eleven exotic plant species have been recorded in the alpine area (Bear *et al.* 2006), predominantly along road and track verges (Pickering *et al.* 2007). Eight of these that are common in the Kosciuszko alpine area are also recorded in other alpine areas of the world, indicating they are part of a general alpine weed flora (Pickering and Hill 2007). Although weeds introduced during grazing period and then for restoration of eroded areas, tourists themselves, as well as the equipment, materials used for the provision of infrastructure are also sources of weed seed (Johnston and Pickering 2001; Whinam *et al.* 2005). For example over 1700 seeds were collected from the socks of ten people going out for a half day walk in the Kosciuszko alpine area (Mount and Pickering, 2009).

Future of this geotourism destination

The future of geotourism to Mt Kosciuszko will be very dependent on the direct and indirect impacts of climate change. The latest climate change scenarios for the Kosciuszko area are based on the CSIRO temperature and prediction models for 2001. As current climatic conditions are at the high end of predictions, it is likely that future climatic change will parallel high impact scenarios. Based on these values, changes in temperature of +1°C by 2020 and +2.9°C by 2050 under a high impact scenario are predicted (Hennessy *et al.* 2002). Consequent reductions in snow cover resulting from changes in temperature and precipitation will be dramatic with a 60 per cent (2020) to 96 per cent (2050) reduction in the area that experiences more than two months snow cover a year.

For Mt Kosciuszko, the predicted changes in climate include a change in the duration of snow cover from around 183 days to 169 days by 2050. But even more dramatic is the change in the peak snow depth from over 2 m to under 50 cm by 2050 (Hennessy *et al.* 2002). Another way of viewing the change is to consider that +2.9°C is approximately the equivalent of a 377 m change in altitude (using a 0.77°C lapse rate; Brown and Millner 1989). Therefore under the worst case scenario in 43 years, conditions equivalent to the current tree line at around 1830 m altitude would be found a metre above Mt Kosciuszko.

The predicted changes in winter and summer temperatures and the duration of snow cover are likely to have dramatic effects on the flora and fauna of the alpine region (Pickering *et al.* 2004). Changes in specialized vegetation such as that found under late lying snowbanks appear to be occurring (Green and Pickering, 2009). Increased diversity of birds and mammals (both native and exotic mammals) are likely (Green and Pickering 2002). Other changes will include an increase in the diversity of weeds (Scherrer and Pickering 2001; Pickering *et al.* 2004). But how will changes in snow cover, temperature and the flora and fauna effect tourism in the region?

One of the biggest changes to tourism is likely to come from the response of ski resorts in the adjacent area to decreases in natural snow cover. Like their counterparts in Europe and North America, they are planning for increasing summer tourism, and hence changing from snow-based resorts to more year-round destinations. Thredbo Village already heavily promotes a wide range of activities during the snow-free period including climbing Mt Kosciusko. Therefore it is likely that there may be increases in visitation to the region beyond that already occurring. However, paralleling the changes in winter that are motivating resorts to promote summer tourism, temperatures in summer will be higher and there will be less rainfall (Hennessy *et al.* 2005; Hennessy *et al.* 2002). This will result in a dramatic increase in the number of days of high fire risk weather in the region (Hennessy *et al.* 2005).

The extensive bushfires in 2006 illustrate the potential impacts of such fires on tourism in the region. The fires, started by a series of lightning strikes, burnt 1.75 million hectares of the Australian Alps in January to February 2003 (Jacobs and Walker 2004; Worboys 2003b). Only 46 per cent of the area above 1850 m burnt, reflecting the relatively low flammability of alpine vegetation (Ken Green, personal communication, 2007). However, all visitors to the Kosciuszko Park had to be evacuated the day before the fires arrived. This occurred on the start of the January long weekend, one of the busiest periods for tourism in the snow-free period. It involved the cancellation of a range of tourism events including a Jazz festival at Thredbo Village. It was estimated that the fires might have cost AU$121 million in lost income to the local tourism industry just in the state of New South Wales (Worboys 2003a). During the period of the fire, and for several weeks after, the Park was closed, with many areas within the Park remaining closed for years as the vegetation regrew. The risk of bushfires has again resulted in Thredbo Village being evacuated in 2007, even though the area did not burn in the end.

The risk of bushfires is likely to increase during the peak period of summer visitation, while there is likely to be greater promotion of the region as a summer destination. How these two factors interact, including how the park service, tourism operators, and visitors respond to these changes is not clear.

Conclusion

As visitation to the geotourism destination of Mt Kosciuszko and the Australian Alps has grown and developed, and landuse of the area has shifted from grazing to tourism, conservation and water catchment, management approaches to the area have continually had to develop, respond and adapt. The geology of the area can provide a common thread for interpretation of the region's history and its natural and human-made features to visitors. Geological features could be used to individually develop as well as link social and ecological themes such as Aboriginal festivals centred on harvesting Bogong moths (which seasonally gather in caves and rock formations); vegetation diversity and patterns (based on the underlying geology) and the effects of livestock grazing, tourism and climate change (which are linked to soil and hydrological characteristics); and the Snowy Hydro-electric Scheme and stories of the migrant workers involved in the construction of this vast network of tunnels and dams. To further develop the geotourism theme of the Australian Alps, interpretation can draw on these events and links to engage with people's individual values and instill relevance with visitors.

Climate change, nevertheless, may pose the biggest challenge to tourism management yet. Increasing visitation through an extended tourism season is likely to result in a rising demand for tourism infrastructure, increasing management responsibilities and costs and creating additional pressures on an already stressed ecosystem. At the same time, increasing risks such as from extreme weather events are predicted to further add to the expanding list of management costs and responsibilities. Given the important and in many ways unique environmental and social values at both a national and international scale of Australia's highest geotourism destination, proactive planning and management backed by a commitment for longer term resourcing of research and tourism impact prevention and mitigation measures is required.

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