

# Assessing the Environmental Impact of Mountain Tourism. The Case of Elatochori Ski Centre, Greece

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**Abstract.** The development of mountain tourism in Greece is a recent phenomenon and one that has been affected by the economic crisis. Key factor to its development was the ski resorts that spread through the country especially in the last twenty years. The present paper focuses on a ski resort in Greece, Elatochori Pierias, attempting to assess the impact of mountain tourism on the sustainable development of the area. Apart from the obvious economic benefits, the ski resorts have negative impact on the environment and the society. Therefore, ski resorts cannot be characterized as sustainable according to the spirit of the three pillars of sustainability.

**Keywords:** mountain tourism, sustainable development, environmental protection, ski centre, Greece

## 1 Introduction

Mountain tourism has gained popularity over the last years in Greece, especially through the development of ski resorts all over the country.

According to Butler (1993), sustainable tourism was a key concept for the researchers since the early 1990s. Although there is broad consensus that tourism development should be sustainable, the way of achieving this is an object of debate. (Gössling et al., 2005).

The development of mountain tourism has been mentioned by several researchers (e.g. André, 1998; Godde et al., 2000) as a way to reinforce the income of the residents in mountainous areas, because the traditional practices (agriculture, livestock breeding and forestry) were not profitable enough. The development of ski resorts was a key factor in the development of mountain tourism in Europe (Moser and Moser, 1986; Price, 1987; Laguna and Lasanta, 2001).

Tourism development has both positive impacts, such as job creation and income raise, as well as negative ones, especially on the environment and the society (Zhong et al. 2011). The operation of a ski resort in an area has many benefits, such as economic growth, improvement of services and infrastructure and the feeling of positive psychology among the locals (Snowdon et al., 2000; Lindberg et al., 2001). A population increase is also observed (Daumas, 1986), along with a decrease of the average age of the population (Buckley et al., 2000; Pechlaner and Tschurtschenthaler, 2003), since residents from nearby areas (especially young

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people) relocate in order to take advantage of the job opportunities offered as a result of the development of a ski resort. On the other hand, there are also consequences such as environmental decline (Needham and Rollins, 2005), landscape change (Pignatti, 1993), social conflicts (Tooman, 1997; Weaver and Lawton, 2001) and cultural decline (Jamal and Getz, 1999; Billet, 2003). Moreover, special aspects of mountain tourism, such as seasonality of visitors and environmental fragility, render mountain areas more vulnerable compared with other tourism destinations (Geneletti and Dawa, 2009).

While it is broadly accepted that sustainable development relies on three pillars: economic growth, environmental protection and social progress (Gibson, 2006; Murphy, 2012), most researchers focus on short term benefits connected to the pillar of economy, ignoring environment and society (Drexhage and Murphy, 2010). It is only recently that the importance of environmental protection in sustainable development has been pointed out (Muntean and Cunglesan, 2008; Dogaru, 2013). The environmental impact of tourism has been widely studied in countries such as the United States of America, the United Kingdom and Australia (Pickering and Hill, 2007). In many mountain regions, the environmental impact of tourism is critical, because of the lack of infrastructure (Singh and Mishra, 2004).

The aim of this paper is to assess the environmental impact of mountain tourism in a ski centre in Greece, Elatochori Pierion. Although the paper focuses on the environmental pillar of sustainability, the pillars of economy and society are also examined.

## 2 Materials and Methods

### *Study area*

The study area is Elatochori, a mountain village in Northern Greece, which gained popularity over the last years as a mountain tourism destination. The ski resort in Elatochori that started operating in 2001, played a crucial role in that development. Apart from mountain tourism, the local population is involved with agriculture and livestock breeding.

The Elatochori ski centre is located in the north-east side of Pieria Mountains. Its distance from the second-largest Greek city (Thessaloniki) is 105 km, from Larissa 120 km and from Katerini 36 km. The altitude in the ski centre starts at 1.400 meters and ends up at 1.975 meters. The ski centre has ten (10) slopes of 13.800 m total length. Slope classification is presented in Table 1.

**Table 1.** Slope classification in Elatochori ski centre

Slope classification	Number of slopes	Total Length (m)
Green (Very easy)	4	6.750
Blue (Easy)	2	1.950
Red (Intermediate)	2	3.900
Snow board slope	1	500
Sledge slope	1	700

The ski centre has five lifts (aerial double seat, two sliding lifts and two baby lifts) with a capacity of 1.200 persons per hour. The chalet can host 400 persons. Other facilities include snow bars, ski learning schools, ski equipment shops, first aid, and parking.

The ski centre facilities operate from December to March depending on the weather conditions. The average tourist season is from 90 days to 120 days. In Europe the “100-day rule” applies (König and Abegg, 1997; Elsasser and Bürki, 2002), meaning that a ski centre has to be open for at least 100 days per year in order to be profitable.

#### *Methodology*

Statistical data regarding the population of the study area and CO<sub>2</sub> emissions by vehicles were collected from the Hellenic Statistical Authority (EL.STAT.). Pertinent data on the Elatochori ski centre were collected from local authorities (Pierion Municipality and Elatochori ski centre management). Indicators of tourism load (number of tourist beds in the study area, Defert's Tourist Function Rate) are used in order to assess the impact of mountain tourism.

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### **3 Results and Discussion**

Mountain tourism has always been an expensive pastime. The average cost for a four-member family that arrives in the ski centre from the nearest city of Katerini and dines in the area is estimated at 100 €.

Indicators of tourist load refer to: a) number of tourist beds in the study area and b) Defert's Tourist Function Rate (DTFR), first used by Defert (1967) and often used by tourism researchers (Smith, 1995; Laguna and Lasanta, 2003).

$$DTFR = \frac{x}{y} \times 100 \quad (1)$$

Where  $x$  is the number of tourist beds and  $y$  is the number of inhabitants in the study area.

The first hotel in the study area was established in 1998. Since the census in Greece is being held every ten years, the DTFR rate was used for the years 2001 and 2011 for comparison purposes.

**Table 2.** Population in the study area (Source: EL.STAT.)

Pierion Municipality	2001	2011
Population	2.547	2.085

Between the years 2001 and 2011, the population in the study area has dropped about 22% (Table 2). Similar reduction of population is observed in many mountainous, less favoured areas during the same period.

**Table 3.** Tourist indicators in the study area

Indicators	2001	2011	Percentage
DTFR	3	25	733,33%
Number of beds	86	520	504,65%

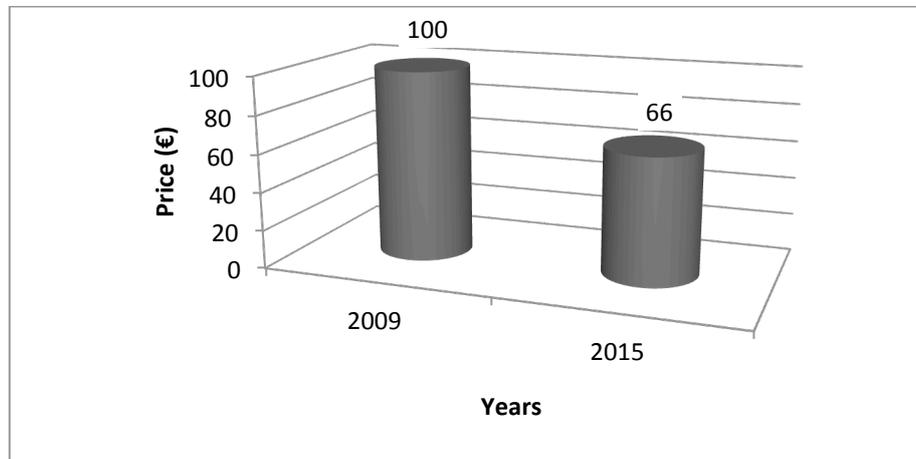
The last column indicates the raise % of each indicator in 2011, compared to 2001. Both tourist indicators show significant increase compared with the year 2001. Only ten years later, the Defert's Tourist Function Rate has increased by 733% and the number of beds has increased by 505% (Table 3).

**Table 4.** Comparison of ski resort prices between years 2009 and 2015 (€).

Year	2009	2015
Day ticket	15	11
Day ticket (discount)	11	8
Year card	150	120
Year card (kids)	100	80

The economic crisis in Greece has affected mountain tourism as all other sectors of Greek economy. The prices in the ski resort since the beginning of the economic crisis (2009-2015) have dropped at a range from 20% to 25% (Table 4).

In 1998, there was only one (1) hotel in the study area with 26 bed capacity (Tsiaras and Andreopoulou, 2015). In 2004, three years after the opening of the ski resort, the number of the hotels raised to eleven (11). In 2009, mountain tourism in the area reached its peak: Twenty one (21) hotels and accommodation units were available in the area, and the total bed capacity had greatly increased (159% raise compared to 2004).



**Fig. 1.** Comparison of the average price of a two-bed room in the hotels of the study area between years 2009 and 2015.

Since then prices have been reduced by 34% (Fig. 1), as the economic crisis affected the price policy of the accommodation units. A significant price drop was deemed the only way to survive.

Gross income from touristic activities in the area is assessed around 2.000.000 € per year. The aforementioned number was assessed by calculating the average occupancy rate of the hotel, as well as usual patterns regarding dining, shopping etc. The average occupancy rate per year is estimated at 30% (personal research). Gross income was about 2 to 3 times larger before the crisis.

**Table 5.** Assessment of the impact of mountain tourism in the study area based on the three sustainability pillars

Sustainability pillar	2000	2015
Economic Growth	S1	+
Environmental Protection	S2	-
Social Equity	S3	+/-

Table 5 shows the evolution of the sustainability pillars between year 2000 (base year) and the present situation (year 2015). In order to describe this evolution, plus (+) and minus (-) signs are used. The economic growth of the study area generated by tourism is obvious, although the economic crisis has affected the rate of this growth. At the same time, an environmental decline is observed. According to Elatochori ski centre management, more than 90% of the visitors arrive at the ski resort by car; this was verified through personal research (Tsiaras and Andreopoulou, 2015). As a result, the transportation of the tourists causes a major environmental pressure, due to a high amount of CO<sub>2</sub> emissions. Taking under consideration the average tourist

arrivals in the area per year, CO<sub>2</sub> emissions are estimated at around 195-210 tn per year (Table 6).

**Table 6.** Total CO<sub>2</sub> emissions by transportation in the study area (year 2014)

CO <sub>2</sub> Emissions	Distance covered	Number of cars	Total emissions
195-210 g / km	50 km	20.000	195-210 tn

Total CO<sub>2</sub> emissions by vehicles in the study area, shown in the fourth column, are estimated by multiplying numbers in the first three columns of Table 6 (CO<sub>2</sub> emissions\*distance covered\*number of cars). Average distance covered per vehicle moving within the area is estimated at about 50 km (personal research). The number of cars for the year 2014 has been estimated taking under consideration the average tourist arrivals in the study area (data collected through interviews conducted with hotel owners and the ski centre management).

Obata et al. (2005) outline the necessity to preserve the environment with the sustainable use of resources. Therefore, the local authorities should seek measures to reduce that number either by embracing more green ways of transport or by raising forested area in order to absorb more CO<sub>2</sub> emissions.

Agrotourism based business contribute to income improvement of the locals. However, when economic enlargement is its exclusive goal there is no space for sustainable development (Lasanta et al., 2007).

## 4 Conclusions

There are certain economic benefits that satisfy one pillar of sustainability (economic growth), but at the same time, there are major environmental consequences that affect another pillar of sustainability (environmental protection). The third pillar (social equity) is affected in a complicated way: on the one hand people involved in tourism based businesses are highly benefited by the ski centre and on the other people involved in the primary sector of production are negatively affected. Taking that into consideration, it can be concluded that the ski centre of Elatochori does not contribute to the sustainable development of the area according to the spirit of Brundlant Report (1987).

The economic crisis that caused the collapse of Greece economy during the last years, has also affected the tourism in the study area. More specifically, during the crisis eight hotels were forced to seize their function, while the number of the bed capacity in the area has dropped in the half (51% reduction). The losses for the tourism related business are estimated in two million euros (2.000.000 €). Tourism related business were forced to reduce prices for their services at percentages that vary from 20% up to 35%, compared with the prices in the year 2009 (the beginning of the crisis).

The competitive relation between tourism and primary sector of production has been pointed out by researchers all over Europe (Oberacher, 1995; Snowdon et al.,

2000). Lasanta et al. (2007) conclude that ski resorts benefit only a restricted area; because of their negative effects in the primary sector, land management, environment and society, the strategy of the development of mountain tourism with the development of ski resorts is unsustainable in the medium term. A recent study (Strom and Kerstein, 2015) provides an exception to this rule: in Asheville, North Carolina, USA, sustainability of the tourism growth was achieved through mutual conciliations among all the interested parties: residents, industry, local authorities, focused on common benefits. Since sustainable development in mountainous areas is a difficult and complex task, Tzanopoulos et al. (2011) propose a combination of sustainability assessment and scenario analysis in order to achieve sustainable development strategies.

Tourist destinations affect the lives of the residents both positively and negatively at the same time (Jurowski et al., 1997). A fundamental condition for the integrated development of mountainous areas is the correct use of the local advantages of the area (Soutsas et al., 2006), taking in consideration the crucial role of the local society in sustainability (Abaza and Baranzini, 2002; Uphoff, 2002). It is obvious that the ski centre in Elatochori has a positive economic impact in the area. However, it is also evident that it has a negative environmental impact. The local community should decide whether the economic growth, the environmental protection and the social equity can coexist and to what extent.

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