

# Tourist Perceptions of the Environmental Quality of Piedmont's Ski Resorts

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**Abstract**— This work is based on tourist perceptions of the environmental quality of Piedmont's ski resorts. This paper also reviews the literature of the relationship between a skiing station and climate change. To achieve these main goals, this study involved 1,270 tourists who answered a questionnaire through a semi-structured interview technique, measuring the individual evaluation/orientation of the tourists regarding affirmations (items) on a Likert scale. The data analysis shows that the feedback from the tourists on aspects such as air quality, the landscape, the relationship between the buildings and surrounding landscape was satisfactory. Meanwhile, there has been difficulty in obtaining an opinion for some items, such as the consumption of water that is used to produce artificial snow or for electromagnetic pollution, therefore, these items fall into the category “don't know/no answer”.

**Keywords**— environmental quality – winter tourism – ski resorts – tourist's perception – sustainability

## I. INTRODUCTION

Since the 1970s, the Alps have seen intense development of its winter tourism industry, which is primarily related to the practice of skiing. There are currently over 600 ski resorts located in France, Switzerland, Austria and Italy [1], totalling more than 10,000 lifts [2]. According to Becken and Hay [3], the European Alps generate about 7–10% of the annual global income from all year tourism, with some 100 million tourists visiting the Alps each year. The large number of domestic and international skiers visiting the European Alps shows the dominance of this region in the global winter tourism industry.

In 2016, there were 400 million global skier visits. The Alps account for 176 million skier visits per year, representing 44% of the total visits [2].

Most of the Italian ski resorts are concentrated in the northern regions of Piedmont, Aosta Valley, Lombardy, Trentino Alto Adige (Südtirol) and Veneto. The Italian industry is quite fragmented and there is currently no major operator. It relies primarily on domestic customers and presents the lowest rate of foreign participants among all of

the Alpine countries [2]. There are 349 Italian ski resorts, 4,918,584 national skiers, and 25,848,000 skier visits [2]. Although it is evident that tourism related to ski resorts plays a fundamental role in local communities, it is necessary to highlight the difficulties of managing such an important activity in a fragile context that requires various consumers with different behaviours to cohabit in the same location.

Starting from these considerations, this paper develops the literature on the tourists' perceptions of the environmental quality of the ski areas [4], [5] and it considers the observation of the judgment of those who benefit from the goods and services of the ski areas (i.e. respondents).

The rest of this paper is organised as follows: Section 2 contains the literature review which starts with an analysis of how the relationship between the ski resort and the environment is interpreted. It will then focus on the tourists' perceptions of these themes. Section 3 contains the data and methods, it summarises the methodological approach of this research.

Section 4 contains the results and discussion, it presents the main results of the study. Finally, the conclusion highlights the strengths and weaknesses of this work, and it proposes some ideas for further research.

## II. LITERATURE REVIEW

Since the publication of the Charter of Lanzarote in 1995, sustainability in tourism has become a topic of much debate.

The WTO (World Tourism Organization) defines tourism as sustainable when “(...) responding to the needs of tourists and regions that receive them, by protecting and improving opportunities for the future. Must lead to an integrated management of all the resources that allows to satisfy the economic needs, aesthetic and social, and at the same time preserve the cultural integrity, ecosystems, biodiversity and the basic conditions for life”[6].

As specified by the WTO, sustainable tourism should be a participatory and monitored process and it must ensure a high

level of satisfaction for tourists. Therefore, sustainable tourism involves numerous actors and analyses multiple aspects, such as the responsible use of natural resources, the environmental impact of activities, the use of clean energy, the protection of natural and cultural heritage, the integrity of tourist destinations and the quality of hospitality. As far as the ski resorts are concerned, some critical issues of concern arise, such as air quality, water availability, snow precipitation with direct consequences on the management of snowmaking and coverage of the ski slopes.

Tourism activities can be threatened by changes in the environment. This has been particularly debated for winter tourism, where an intensive literature on the consequences of climate changes has been developed [7]-[11] in terms of the vulnerability of the winter tourist activities [12], [13] and the related adaptation strategies [14], [15].

There are many different forms of adaptive responses to climate change. Smit *et al.* distinguish between primarily technological, behavioural, financial, institutional and informational adaptations [16], while Scott *et al.* provide a more detailed classification scheme of technical, economic, policy, institutional, managerial, planning, legal and behavioural climate adaptations [13].

The ski industry has historically mainly focused its attention on passive adaptation strategies that are based on technical measures (snowmaking), including the introduction of alternative tourism products for skiing in the winter season [8], [13], [17]-[19]. The adoption of proactive tools is relatively more recent, such as the observation of international standards and ecolabels suitably designed for ski resorts [20]-[23]. The stakeholder's perception is another crucial aspect in reducing vulnerability to climate change. Indeed, the perceptions of individuals and interest groups are also crucial for the development of public policies [24], [25].

The complex interactions between climate change and tourism have become a much-discussed issue in the science community, in the industry and amongst the public [26]. In this context, the question of how the tourism industry can and will adapt to climate change is significant [27]. Until recently, the tourism sector was characterised by low awareness of climate change, with little evidence of sustainable adaptation strategies to future changes [28], [29].

In the context of winter tourism, this paper reports on the tourists' perceptions of the environmental quality aspects of selected cases of ski resorts in the Piedmont Region. In particular, this study examines the tourists' perceptions of the environmental quality of ski resorts related to air quality, water, landscape, the relationship between buildings and surrounding landscape, snowmaking and water consumption for artificial snow.

The analysis also measures the tourists' awareness of the management of the local resources and services in terms of traffic, noise, light pollution, electromagnetic pollution, water drainage and purification, and so on (as reported in Section 4: results and discussion). It is necessary to consider that the impact generated by tourist activity is strictly dependent on the type of tourism that is predominant in the destination, as

well as on the tourists' behaviours. Nowadays, it is becoming increasingly important to directly understand the visitor's perceptions of the management of environmental resources of the tourist destinations.

Tourism can generate both positive and negative effects on the areas where visiting and leisure activities take place. It can be a positive element for the local economy but it can also generate some externalities (positive or, more frequently, negative) that are not included in the local economic balance and which can affect the quality of the visitors' experience [30]-[32]. Tourism does not only allude to the efforts of individual operators to improve the environmental performance of their business and tourists carrying ecological and responsible choices but it also alludes to the overall capacity of an area to organise themselves, so that each element of the supply chain contributes to a collective sustainability goal.

Therefore, pursuing sustainable tourism development means definitely aiming at the sustainable development of an area that is a tourist destination.

The environmental sensitivity of tourist demand has been increasing in recent years. Most importantly, tourism in mountain areas has produced extensive opportunities but at the same time it requires a more efficient and effective management of resources [33]. If managed in a responsible and sustainable way, tourism can be a motivating force for the conservation of local heritage. On the other hand, if the strategy adopted for tourism development has the sole aim of getting large and immediate economic results through the uncontrolled growth of the tourist flow, then it will lead to a rapid exploitation of the destination, which, after a short period, will become spoilt and no longer attractive [34].

### III. DATA AND METHODS

The tool used for data collection in this study has been the preparation and distribution of a questionnaire that was conducted through a semi-structured interview technique on site in order to obtain qualitative data. To facilitate the respondents, a set of "cards" has been issued as a tool for explaining the items. This has made it possible to involve a particular category of guests—the hikers (which are normally difficult to involve because they do not spend the night on the place and, consequently, they are not recorded in accommodation). Thanks to the semi-structured interviews, it has been possible to recognise in detail the opinions, expectations and lifestyles that guide the fruition of ski resorts.

The data campaign was conducted during the skiing season 2015/2016 in five ski resorts of the Piedmont Region (i.e. Sestriere, Bardonecchia, Claviere, Prato Nevoso and Ceresole Reale). In each of these ski resorts, interviews have been made depending on the size of the ski area.

Thanks to a dedicated section, the survey allowed me to highlight how the improvements can be widespread in the tourism sector, the environmental quality and the promotion of good practices in sustainable resource management in these ski areas. To evaluate the aspects related to the quality of the place and the management of the local resources, a set of

statements were proposed to evaluate the tourists' level of agreement in accordance with the Likert scale [35]. For the first set of statements—concerning air quality, water, landscape, waste collection, the relationship between buildings and the surrounding landscape, the artificial snow of ski slopes and water consumption for artificial snowmaking—the Likert scale adopted is from 1 (non satisfied) to 7 (completely satisfied). For the second set of statements—regarding local services as traffic, water drainage and purification and the different forms of pollution (noise, light, electromagnetic)—the Likert scale is from 1 (bad management) to 7 (excellent management).

#### IV. RESULTS AND DISCUSSION

The analysis carried out in this paper may provide useful information to the local stakeholders, who might be able to develop a better use of resources. Responsible tourism management must conform to some strategic directions and it should make interventions capable of matching, in both the short term and long term, the expectations of tourists and residents without decreasing the quality of the tourist experience and without damaging the environmental aspects of the region.

One of the first stages of the project development was the selection of mountain resorts where ski tourism represents an important economic sector, particularly the Vialattea, Bardonecchia, Mondolè Ski e Ceresole Reale. The Mondolè Ski, which includes the resorts of Artesina, Frabosa and Pratonevoso, consists of 23 lifts, the Vialattea is the largest ski resort in the region and it is also one of the largest in the world, with some 50 lifts, while Bardonecchia consists of 24 lifts.

The survey involved 1,270 respondents, the gender profile shows that 53% were male and 47% female (see Table I). The age data showed that 21% of the respondents were aged between 19–25 and 21% were aged between 45–65 years, 7% were over 66, while 50% of the respondents were aged between 26–45 years. Hence, it is possible to conclude that more than 70% of the respondents were aged under 50 years. The respondents' level of education shows that 54% held a high school diploma, 38% were graduates or postgraduates, and 7% had attended compulsory education (see Table I). A total of 26.5% of the respondents were employees and 26.5% were teachers, and 22.7% were students, while 13.8% were freelance.

TABLE I  
PROFILE OF THE RESPONDENTS

Variables		Frequencies	Percentage of Total (%)
Gender	Man	673	53.2%
	Woman	593	46.8%
Age class	19-25	273	21.4%
	26-45	644	50.6%
	46-65	269	21.1%
	>66	87	6.8%
Qualification	Compulsory education	95	8.0%
	Higher diploma	687	54.0%
	Graduate/Post Graduate	483	38.0%
Profession	Manager/ Entrepreneur	82	6.4%
	Freelance	176	13.8%
	Employee/ Teacher	337	26.5%
	Trader/ Craftsman	85	6.7%
	Worker	55	4.3%
	Student	289	22.7%
	Pensioner	102	8.0%
	Housewife	68	5.3%
	Unemployed/ Job-seeker	59	4.6%
	Other	20	1.6%

Not only does this study give feedback on certain aspects (such as air quality, water, the landscape) but it also considers the managerial assessments in resorts (such as traffic management, noise and light pollution). With respect to the sustainable criteria, damaging results may turn against the destination itself, causing them to lose their value, attractiveness and damaging the factors involved in this area of interest.

The level of quality of life is moving towards higher standards, implying greater attention to the definition of environmental requirements in order to ensure proper welfare conditions in tourist destinations. Good quality drinking water, air, and landscape are all factors that help to guarantee a higher level of social welfare. These are key elements of the environment and they have potential consequences on human health and, more in general, on peoples' well-being.

TABLE II  
DISTRIBUTION OF ANSWERS ON THE LIKERT SCALE

	1	2	3	4	5	6	7	Do not know/ No answer
Air quality	0	0	15	42	140	421	570	85
Quality of drinking water	1	3	16	30	92	313	255	563
Waste collection	1	5	13	53	150	233	132	686
Quality of the landscape	2	2	10	76	212	361	535	75
Relationship between buildings and the surrounding landscape	21	81	151	143	192	319	258	108
Artificial snow of ski slopes(snowmaking)	12	18	49	138	230	181	100	545
Water consumption for artificial snow	10	11	36	99	111	114	65	827
Traffic	4	10	79	236	298	241	140	265
Noise pollution – level of daily noise	6	16	128	198	219	255	174	277
Noise pollution – level of night noise	8	45	94	127	146	199	143	511
Light pollution	6	55	121	142	239	201	119	390
Electromagnetic pollution	3	13	58	85	69	97	82	866
Water drainage and purification	7	5	46	71	64	68	39	973

Although there are numerous oriented solutions for sustainability that are proposed for traffic in mountain resorts, there is a need to promote the best innovations in mobility management through the introduction of traffic management tools.

Noise pollution in the external environment causes annoyance or disturbance to the environment and human activities.

Meanwhile, light pollution disturbs visual perceptions due to the dispersion of light produced by human activities in the external environment. Over the past few years, there has been a significant increase in electric and magnetic field sources in these areas and this has led to serious worries about possible health risks associated with their use, especially related to mobile phone base stations and power lines [36]. In addition, there is no doubt about the importance of efficient water drainage and purification for the protection of water resources in mountainous areas. The resolution of the problems of water drainage and purification in mountain areas often depends on the difficulty of access to infrastructure, the procurement of electricity, the management modality and the consumers' frequency. The data analysis shows that the interview feedback from the tourists on aspects such as air quality, the landscape, the relationship between the buildings and surrounding landscape was satisfactory. A total of 45% of respondents were completely satisfied with the air quality and 42% were completely satisfied with the quality of the landscape at the ski resorts. Even the perception of the relationship between building and surrounding landscape was satisfactory, 45% placed their answers between 6 and 7 on the Likert scale. As far as waste collection is concerned, 50% do not have an opinion in terms of degree of satisfaction. One of the reasons for this value may be related to the respondents' profile

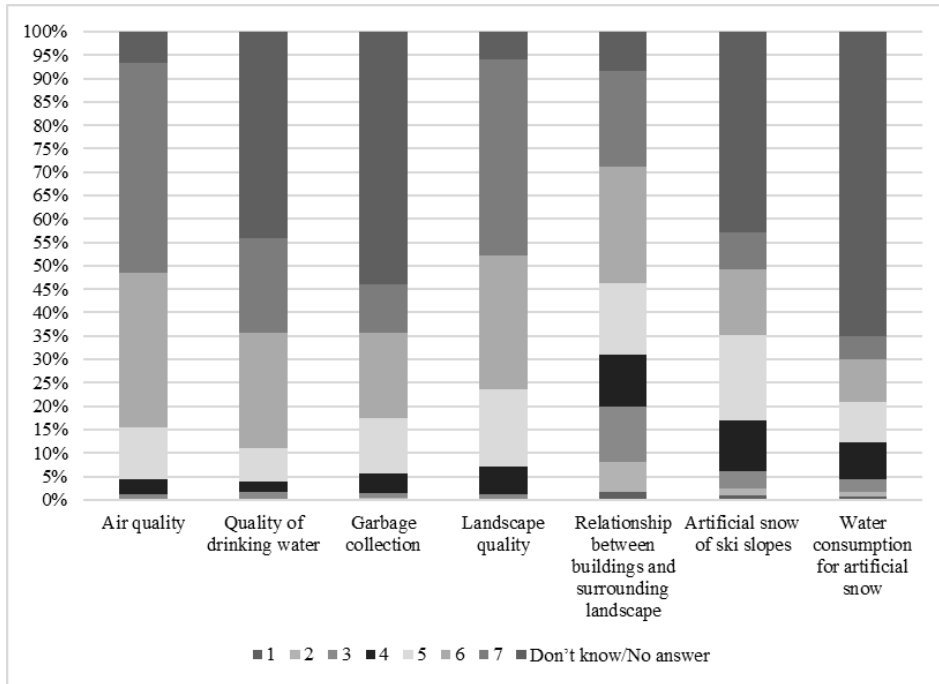
composed for the 32% by hikers, who do not use or rarely use this service.

It was found that the great majority of the respondents were not aware of the consumption of water used for artificial snow.

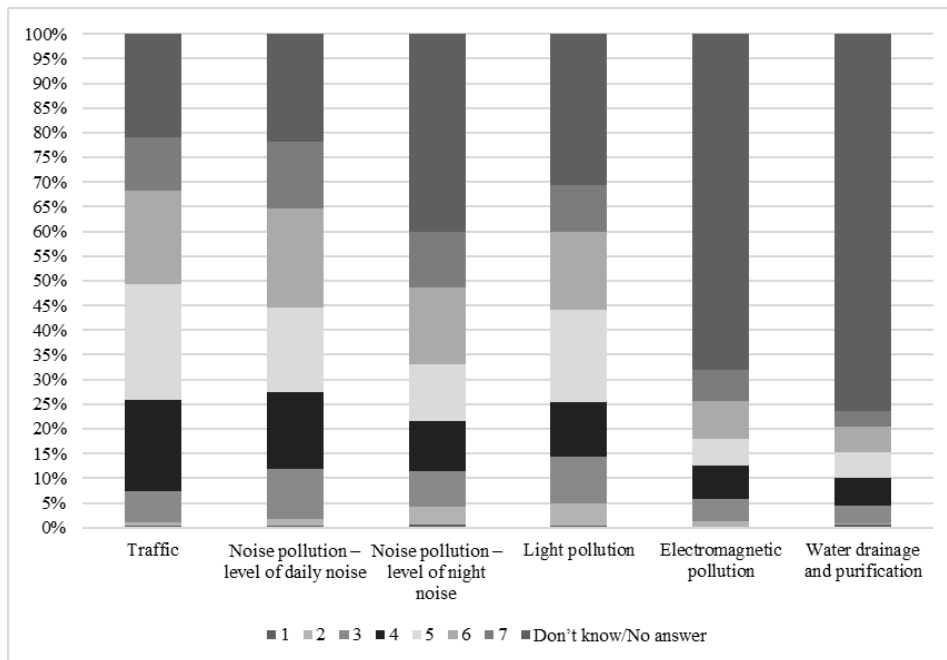
In fact, 65% had not expressed an opinion in terms of satisfaction and, therefore, they join the "do not know/no answer" category. Moreover, even among the "do not know/no answer" respondents, 43% noted how the natural snow during the winter season (2015/2016) was very poor in the considered areas. In view of climate change, the question is whether rising temperatures will be compensated by a more intense use of snow machines. Several research studies [37–39] have moved in this direction. CIPRA's [40] report has shown how the consumption of water for snow units depends on the locality, the weather conditions and the efficiency of the systems used.

Teich et al. [38] speculate that snowmaking of one hectare of track (30 cm) requires from 600 to 1500 cubic meters of water. The respondents' evaluations of the management of the local resources/activities show that 80% were aware of the situation relative to traffic management and more than 50% indicated a value from 5 to 7 on the Likert scale. Considering daytime and night-time noise pollution, the perception is higher during the day and distributed on the scale; for example, 20% of the respondents gave a value of 6 on the Likert scale. As far as the level of night noise pollution is concerned, 40% preferred to abstain and responded "do not know/no answer". This happens because the hikers only remain at the resort during the day and they do not stay overnight. Light pollution management was perceived as 5 on the Likert scale by 19% of the respondents, 6 by 16%, and 7 by 10%. Therefore, for 45% of the respondents, this aspect can be considered as "good". For electromagnetic emissions (68%), and water

drainage and purification (76%), the respondents were not able to give an opinion. Consequently, they join the “do not know/no answer” category.



Graphic 1: How do you assess the following aspects of this ski resorts?



Graphic 2: How do you assess the following aspects of local management?

TABLE III  
DISTRIBUTION OF ANSWERS ON THE ENVIRONMENTAL QUALITY OF THE RESPONDENTS

Aspects	Number of responses	Mean	Standard deviation	Differences by Education (Kruskal-Wallis $\chi^2$ )	Differences by Age (Kruskal-Wallis $\chi^2$ )
Air quality	1,188	6.25	0.888	2,810	3,674
Water quality	710	6.05	0.981	6,639*	4,132
Waste management	587	5.68	1.058	3,093	4,743
Quality of the Landscape	1,198	6.10	1.006	10,381**	5,742
Landscape and surrounding environments	1,165	5.05	1.648	2,102	10,868**
Snowmaking	728	5.06	1.320	3,076	15,481***
Water consumption for snowmaking	446	5.00	1.403	3,298	2,167

Level of significance: \*\*\* p<0.01; \*\* p<0.05; \* p<0.10

TABLE IV  
DISTRIBUTION OF ANSWERS ON THE ENVIRONMENTAL MANAGEMENT OF THE RESPONDENTS

Management	Number of responses	Mean	Standard deviation	Differences by Education (Kruskal-Wallis $\chi^2$ )	Differences by Age (Kruskal-Wallis $\chi^2$ )
Traffic	1,008	5.08	1.221	7,883**	12,507***
Noise (daily)	1,380	5.08	1.380	3,907	10,716**
Noise (night)	762	5.00	1.541	8,880**	13,295***
Light	883	4.85	1.458	15,173***	20,223***
Electromagnetic pollution	407	5.02	1.494	3,774	0,269
Water Drainage	300	4.80	1.445	2,754	4,465

Level of significance: \*\*\* p<0.01; \*\* p<0.05; \* p<0.10

We used the non-parametric Kruskal-Wallis  $\chi^2$  test to identify the role of Education and Age in the evaluation of the environmental aspects (Table III) and the evaluation of aspects of local management (Table IV).

The education does not influence the evaluation of the environmental aspects (none of the  $\chi^2$  values is statistically significant at p<0.01). Age has only marginal impact in terms of snowmaking (15,481, at p<0.01). Interestingly, by crossing the categories relating to age with snowmaking (see Table V), we see that the average rating on snowmaking perception increases in relation to age. Between 19–45 years of age, the average is 4.96 on the seven-point Likert scale, and for the 46–65 and >66 age groups the average perception rises to 5.31.

TABLE V  
COMPARISON BETWEEN AGE AND SNOWMAKING

Age classes	Snowmaking	
19-25	Number	156
	Mean	4.96
26-45	Number	371
	Mean	4.96
46-65	Number	162
	Mean	5.32
>66	Number	39
	Mean	5.31

Age classes	Traffic		Noise (night)	Light
	Number	Mean		
19-25	Number	197	141	179
	Mean	4.93	4.86	4.56
26-45	Number	501	383	435
	Mean	5.03	4.87	4.76
46-65	Number	234	186	212
	Mean	5.21	5.24	5.13
>66	Number	76	52	57
	Mean	5.41	5.52	5.33
Total	Number	1,008	762	883
	Mean	5.08	5.00	4.85

BETWEEN AGE AND TRAFFIC, NOISE AND LIGHT

Comparing the same data but attributing to the local management at the resort, which is subject to analysis, traffic, noise night and light pollution (see Table VI) are detected for all three variables to have a positive increase in the perception of management with increasing age (at p<0.01). The overall average of each variable is 5 on the Likert scale, so perception is “sufficient”.

By crossing the answers related to items required by the respondents’ education, in terms of air quality, 50.5% of the respondents with a compulsory education, which represents 8% of the total respondents, assign a value of 7 on the Likert scale.

While for respondents with a higher degree (54% of respondents), as many as 42.5% gave a value of 7 on the

Likert scale. Finally, for respondents with a graduate or postgraduate degree (38% of respondents), 46.8% gave a value of 7 on the Likert scale. While for the level of daily and night noise pollution, it is of note that those who have a graduate or postgraduate degree consider it as good and give a value of 6 on the Likert scale, or 22.8% for daily noise pollution and 17.2% for night noise pollution.

For those who have a compulsory school education, 50.5% of the respondents refrained from giving an answer for night noise pollution and as many as 80% gave a “do not know/no answer” for water drainage and purification.

TABLE VII  
HOW MANY DAYS WILL REMAIN AT THIS SKI RESORTS DURING THIS STAY?

0	1	2	3	4	5	6	7	more than 7	total
32.4%	16.9%	18.4%	9.7%	5.5%	4.2%	4.8%	3.8%	4.3%	100.0%

By crossing the data of the distributions of answers for the questions about the quality and environmental management with their stay at the resort, 32.4% of the sample stayed at the locality only during the day and did not stay overnight, while 35% stayed from two to three days (see Table VII). These figures are relevant because the duration of the visit allows us to compare the opinions of the hikers and tourists about the environment and territory management. The questionnaire asked the respondents about how many nights they had spent at the resort, the data was aggregated over seven nights because it was not significant to consider them individually. For those staying only for the day, for some of the required variables, the “do not know/no answer” corresponds to a high enough percentage; for example, for night noise pollution, garbage collection, electromagnetic pollution, water drainage and purification.

#### V. CONCLUSIONS

This paper explores the tourists’ perceptions of environmental and management variables related to environmental quality in some important ski areas of the Piedmont Region. The approach to the sustainability of the perception of tourism demand has been evaluated as a key element of the strategic development of these mountain tourist destinations.

The present study has found that tourist development should take clear consideration of sustainability and pursue the aim of developing high quality tourism, which is sufficiently managed, without causing damaging the natural environment or the local economy. The tourists’ perceptions of environmental quality are an important factor because they can influence the decision to return to the same destination.

According to the data, it is possible to affirm that tourists seem to be aware of the relationship between a ski resort and the environment especially for the implications that tourist is able to “see” in his everyday experience. On the other hand, the analysis reports lack of knowledge and consciousness, showed by the high number of “do not know/no answer” answers (in some cases - water drainage, water consumption for snowmaking, electromagnetic pollution and waste management - more than the 50% of the respondents) that is necessary to take into consideration in future researches.

Therefore, it is important that ski resorts improve their efficiency and develop sustainable strategies that provide a competitive advantage as well as plan a correct communication of this effort to the stakeholders, *in primis* tourist.

As all the research project, this study has some limitations.

Firstly, it is recommended that, using qualitative methodologies, future research could involve the resort managers to compare their perceptions of the same aspects in order to support a sustainable development strategy.

Secondly, it would be useful to repeat the analysis in order to sharpen the results and conclusions.

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