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# Perceptions of climate change and water availability in the Mediterranean tourist sector

## A case study of the Muga River basin (Girona, Spain)

The Mediterranean tourist sector

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### Abstract

**Purpose** – The purpose of this paper is understand these perceptions and identify main problems associated to climate change in order to design effective mitigation and adaptation strategies to guarantee the sustainability of tourism and natural resources. The Mediterranean basin is a leading international tourist destination and one that is particularly vulnerable to the effects of climate change. Although these effects are largely known, in-depth studies of how they and the associated risks are perceived by key tourism stakeholders have not been performed.

**Design/methodology/approach** – Interviews were held with 31 hotels, campsites and rural lodgings in the Muga River basin in north-east Catalonia, in which both owners and managers were asked about their perceptions of climate change, effects and countermeasures.

**Findings** – Perceptions of climate change and its effects varied according to the type of establishment and location (coast, cities or inland). Significant differences were observed for perceptions of how responsibilities for implementing mitigation and adaptation measures to counter the effects of climate change, including water shortages, should be shared out between the main agents with an interest in guaranteeing the sustainability of tourism, namely, government bodies, tourist establishments and clients. The predominant opinion, however, was that the bulk of the responsibility should lie with government bodies.

**Practical implications** – Only when those responsible for running tourist establishments are aware of the risks of climate change, it will be possible to design and implement effective short-, medium- and long-term strategies aimed at strengthening the resilience of the tourist industry.

**Originality/value** – The originality of this study lies in its novel methodology and approach, which involved analyzing perceptions of climate change, including water shortages and its effects among owners and managers of different types of tourist accommodation establishments in distinct parts of the same area.

**Keywords** Climate change, Lodging industry, Perception, Mediterranean basin, Water resources

**Paper type** Research paper

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## 1. Introduction

Climate change represents a major environmental challenge. Data and projections from all levels indicate that climate change will have a major impact on, practically, all sectors of the economy, including the tourist industry. The Mediterranean basin, together with other leading tourist destinations, is likely to be among the most seriously affected areas (Perry, 2006; Ruty and Scott, 2010; Estrela *et al.*, 2012; March *et al.*, 2014; Roson and Sartori, 2014; Klontza *et al.*, 2016). Effects could change holiday destination choices and demand, with the Mediterranean losing out to other destinations with more desirable or stable climate conditions (Gössling *et al.*, 2006; Ruty and Scott, 2010; Roson and Sartori, 2014). It is, thus, crucial to take measures to help at-risk destinations prepare for new environmental conditions in which water availability will be an even more critical issue than it is today (Gössling and Hall, 2015).

It is first necessary, however, to know how local stakeholders perceive the effects of climate change and to identify the steps they have taken or would be willing to take to adapt to this changing scenario and mitigate potential effects. Very few studies have performed an in-depth analysis of how the general population or specific sectors of society perceive climate change and its possible effects. A greater understanding of public perceptions is necessary to inform mitigation and adaptation strategies and help stakeholders prepare for the risks (Gómez *et al.*, 2017), including water shortages. The actions taken by different stakeholders, whether now or in the future, will determine whether the effects of climate change are magnified or diminished (Bord *et al.*, 1998).

The main aim of this study was to analyze perceptions of climate change effects among owners and managers of tourist accommodation establishments (hotels, campsites and rural lodgings) in the Muga River basin and determine what countermeasures they have implemented or are planning on implementing. The Muga River basin is located in the extreme north-east of the Iberian Peninsula, in the Mediterranean basin. Regional and local climate projections show rising temperatures and sea levels and more erratic rainfall, leading to an increase in drought frequency and severity. An additional concern is a progressive increase in demand for water, which in the tourist industry peaks in the summer months, when water is scarcest (Third Report on Climate Change in Catalonia, 2016). Water shortage problems have increased in recent years and look set to continue to do so. According to data from the MEDACC Life project on the impacts of climate change on water resources in the Mediterranean Basin, the period between 1970 and 2015 saw a 60 per cent reduction in rainfall during the summer months and a 6.5 per cent overall annual reduction (Pascual *et al.*, 2016). In the same period, the mean flow of the Muga River fell by almost 50 per cent. Projections for 2050 indicate an additional decline of 7.6 per cent in summer rainfall and 20 per cent in mean river flow. Models also forecast an increase in the frequency and intensity of drought periods, particularly between 2021 and 2051, which will increase the risk of forest fires in an area that is already high-risk.

## 2. Theoretical framework

The need to promote sustainability criteria as a means of ensuring the future of tourism was highlighted during the first world conference on sustainable tourism held in Lanzarote in 1995. This need is even more evident now in view of how changing climate conditions have and will continue to affect tourism. The first studies on climate change mitigation and adaptation measures applied to the tourist industry appeared at the beginning of the twenty-first century and it became increasingly evident to some authors that such measures were essential if tourism was to be sustained (Kaján and Saarinen, 2013).

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Studies on public perceptions of climate change started to appear at the end of the 1990s (Bord *et al.*, 1998), but it was not until the early twenty-first century that authors started analyzing how different stakeholders perceived the potential effects of climate change on tourism. This shift is reflected in a literature review by Kaján and Saarinen (2013) on topics such as tourism, climate change and adaptation. Another example is the work of Gössling *et al.* (2006), who, following interviews with 252 tourists in Zanzibar, found that climate perception was one of the main determinants of choice of holiday destination. Morrison and Pickering (2013), in turn, interviewed government representatives, researchers and local associations in the Australian Alps. Although all the social agents interviewed saw climate change as a reality, their perceptions of potential impacts varied enormously according to their employment and social profile. In 2014, March *et al.* (2014) published a study on similarities and differences in perceived effects of climate change among people living in the Catalan Pyrenees and in coastal areas of Catalonia and the Balearic Islands. Their findings, based on 906 telephone interviews, showed that those living in the mountains were more aware of and more concerned about the effects.

Studies such as the above have helped to understand climate change perceptions among residents, tourists and tourism stakeholders in different geographic locations. Nevertheless, much of the research from recent years has focused on hotels and on beach and ski resorts. Examples include the work of Hill *et al.* (2010), who assessed climate change vulnerability in the Swiss Alps; Brouder and Lundmark (2011), who analyzed perceptions among 63 entrepreneurs of the effects and threats of climate change in Northern Sweden; and Paunovic and Jovanovic (2017), who analyzed tourism stakeholder views on efforts to promote sustainable tourism in the German Alps.

This predominance of studies of coastal and ski resorts is understandable, considering that these destinations largely depend on local climate (Gössling *et al.*, 2006) and accordingly are more vulnerable to extreme changes, such as rising sea levels (Buzinde *et al.*, 2010), excessively hot temperatures during the summer (Amelung *et al.*, 2007), more frequent drought periods (Olcina Cantos, 2012) and a loss of snow quality, quantity and the duration during the ski season (Rutty and Scott, 2010). In our review of the literature, we did find a small number of more recent studies focusing on nature-based tourism. Tervo-Kankare (2018), for example, interviewed 19 tourism entrepreneurs in Finland about their views of roles and responsibilities related to climate change adaptation and mitigation measures and factors influencing behaviors and attitudes.

Although the perceived effects of climate change vary from study to study, rising temperatures are nearly also mentioned, although they are perceived very differently depending on where the study is performed. Studies undertaken at seaside resorts, for example, have found that rising temperatures are not necessarily thought to be negative and in some cases are even seen as positive (Moreno, 2010; Moreno and Amelung, 2009). Effects perceived as potentially detrimental to seaside resorts are a loss of natural resources (e.g. water), rising sea levels and a loss of sand (Buzinde *et al.*, 2010). In a study of the impact of climate change on the sustainability of Mediterranean tourism, Perry (2006) analyzed whether rising temperatures could lead to a slump in demand due to a perceived loss of comfort. The author found that this notion of the Mediterranean becoming too hot could lead tourists from northern Europe to stay north, causing a slump in demand for Mediterranean holidays, particularly in the peak summer months. Similar claims were made by Gössling *et al.* (2006) for Zanzibar and by Rutty and Scott (2010), who tried to determine whether the Mediterranean basin might become too hot to attract tourism in the near future.

Based on interviews with different tourism stakeholders, Becken (2005); Hall (2006) and Valls and Sardá (2009) showed that while there is a general awareness of the potential

effects of climate change in the industry, individual stakeholders do not seem to understand how their particular business could be affected. [Saarinen and Tervo-Kankare \(2006\)](#) conducted interviews with nature-based tourism entrepreneurs in Finland and found that while they were all aware of climate change, fewer than half believed that they would be directly affected and as such had no plans to implement countermeasures. [Hoy et al. \(2011\)](#), based on telephone interviews with 59 representatives of downhill skiing areas and winter tourism towns in Saxony, Germany, reported that half of those interviewed did not foresee any negative effects in the coming 15-20 years, although most of them did acknowledge that climate change was one of the most world's most serious environmental problems. [Trawöger \(2014\)](#) also interviewed local winter tourism stakeholders, including companies and government body representatives, in a mountain resort in the Alps and found that although 83 per cent of the 24 people interviewed recognized that climate change was an issue, only 21 per cent perceived it as a short-term risk and priority. Studies such as those by [Scott and Gössling \(2015\)](#) and [Gómez et al. \(2017\)](#) have found that in tourist establishment, the owners and managers believe that adaptation and mitigation strategies should be implemented by public bodies.

In conclusion, much remains to be learned about climate change perceptions in the tourist industry and about what local stakeholders believe should happen to ensure environmental sustainability and economic viability ([Bord et al., 1998](#); [Gómez et al., 2017](#)). In this study, we analyze perceptions of climate change effects and countermeasures among owners and managers of tourist accommodation establishments located in north-east Catalonia, in the Mediterranean basin.

### 3. Methodology

This study is based on semi-structured interviews with owners and managers of hotels, campsites and rural accommodation properties in the Muga River basin. We first consulted the Catalan Government's website to determine the number of tourist accommodation establishments in the area ([Diputació de Girona, 2017](#)). Once these had been located and characterized, we contacted each establishment by e-mail to inform them about the aim of the study and invite them to participate. Those who agreed were contacted to arrange a face-to-face interview. Those who did not respond to the initial email were gradually contacted by telephone and asked to participate to guarantee a sufficiently representative sample of the different types of establishments and locations. Some of those contacted declined to participate for reasons related to a lack of time or a lack of interest in the topic of the study. A total of 31 owners and managers contacted by email and, in some cases, telephone agreed to participate, thus, ensuring a representative sample. With the 31 interviews, we found that we had reached the theoretical saturation point, which is the point at which no new information or points of view are expressed. The interviews, held on site, were tape-recorded with the consent of the interviewees and lasted for an average of 52 min. They were conducted between May and July and between September and December 2017. They were structured into seven main sections, namely, owner/manager profile; characteristics of establishment; facilities that require water; water consumption and water management systems; identification of water-saving measures, barriers and incentives; water management policies; and perceptions of climate change and adaptation and mitigation measures. The information collected in sections 1, 2 and 7 are relevant to the present study. Of the 31 interviews conducted ([Table I](#)), 18 corresponded to hotels (14 owners and 4 managers), 5 to campsites (3 owners and 2 managers) and 8 to rural lodgings (owners in all cases). In the rest of this article, the term manager is used to refer to owners and managers indistinctly.

The audio-recordings of the interviewees were transcribed using EasyTranscript software and the content was then coded and analyzed using computer-assisted qualitative data Analysis software. The content was coded, processed and analyzed using the grounded theory research method, which consists of collecting, coding and categorizing information and then interpreting the results to generate a new theory (Saldaña, 2009).

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### 4. Study area

The case study was conducted in the Muga River basin (Figure 1), which is located in the extreme north-east of the Iberian Peninsula, just south of the French border. The area contains 52 municipalities and covers an approximate surface area of 1,150 km<sup>2</sup>. The basin contains several sub-drainage basins corresponding to the rivers Arnera, Manol, Llobregat d'Empordà, l'Anyet and l'Orlina and the canals Sirvent and Madral. The Boadella reservoir is the main source of water for the villages and towns in the region and it has an important role in regulating the flow of the Muga River. The reservoir was built in 1969 and has a

Establishment type	Total no.	No. interviewed
Hotels	117	18
Campsites	14	5
Rural lodgings	86	8
Total	217	31

**Table I.**  
Tourist accommodation establishments in the study area in 2017 (total number and number interviewed)



**Figure 1.**  
Tourist accommodation establishments by type and location in the Muga River basin (2017)

storage capacity of 60.2 hm<sup>3</sup>. It has been affected by periods of severe drought that have caused conflicts between different sectors that depend on water (agriculture, industry, tourism and natural reserves) (Ventura-Pujolar, 2004).

At the time of the study, the study area had 117 hotels, 14 campsites and 86 rural properties offering a total of 23,055 places. Over 80 per cent of these places were located on or near the coast (Figure 1).

We distinguished between three main geographic areas, namely, the coast, cities and surrounding areas and inland. The coastal area is formed by the towns of Roses, Cadaqués, Llançà and Castelló d'Empúries. It receives the majority of visitors to the area, particularly during the summer months (beach tourists). The cities and surrounding areas mostly receive cultural visitors and business travelers. The two main cities are Figueres, the capital of the region and La Jonquera, a city located on the Spanish-French border. The inland area consisted of inland and mountain villages and towns, most of which have fewer than 1,000 inhabitants. The bulk of inland accommodation establishments were rural properties that were generally much smaller than the hotels and campsites on the coast and in cities (Table II).

Overall, 81 per cent of the beds available in the Muga River basin are located on the coast, 12 per cent inland and just 7 per cent in and around Figueres and La Jonquera (Table II). The city hotels, however, offered almost 15 per cent of all available places. The areas also differed in terms of the type of accommodation available. The bulk of accommodation was offered by hotels and campsites on the coast and by hotels in the cities. The number of beds offered by hotels, campsites and rural lodgings in the inland area was similar (Table II).

Table II shows annual occupancy rates, overnight stays and number of visitors for the entire Alt Empordà region. Although the data are not exact (they correspond to 68 municipalities vs 52 in the Muga River basin), they give a good idea of recent trends in occupancy and demand. In the five years, ranging from 2012 to 2017, there was a progressive and significant increase (of around 20 per cent) in overnight stays, number of visitors and occupancy rates (Table III).

## 5. Results

### 5.1 Perception of climate change effects

One of the key findings to emerge from the interviews was the high level of unawareness about what climate change involves, and in particular, about how it could affect the study area. This lack of awareness was particularly manifest in the answers to the question "Do you think that climate change has affected or could affect the Muga/Alt Empordà area? If so, how?" The main effects mentioned were those that appear most in the media and those that have directly affected the study area in recent years (Figure 2), such as drought (mentioned by 51.6 per cent of respondents) and changes in climate and rainfall patterns (45.2 per cent). The respondents, however, did not go into detail on how these changes could affect local tourism, indicating that they held a general view of climate change effects and did not perceive specific risks to tourism and business. Other effects mentioned were changes to

**Table II.**

Establishments and beds available in the Muga River basin according to type and geographic area (2017)

	Establishments				Beds			
	Coastal	Inland	Urban	Total	Coastal	Inland	Urban	Total
Hotels	69	28	19	117	8699	818	1640	11157
Campsites	9	5	0	14	9927	995	0	10922
Rural lodgings	0	82	4	86	0	929	47	976
Total	79	115	23	217	18626	2742	1687	23055

Year	Hotels			Campsites			Rural lodgings			Total		
	% Annual occupation	Overnight stays	Visitors									
2012	43.5	1,691,898	765,884	40.2	2,175,969	281,719	22.1	70,808	25,107	40.9	3,938,675	1,072,710
2013	45.3	1,692,641	715,026	40.5	2,124,858	290,855	19.9	53,098	22,149	41.8	3,870,597	1,028,030
2014	47.9	1,596,180	713,767	42.1	2,223,988	332,345	21.6	66,772	22,833	43.6	3,886,940	1,068,945
2015	52.1	1,796,868	717,510	43.3	2,307,024	344,169	26.3	80,901	32,074	46.1	4,184,793	1,093,753
2016	53.8	1,816,834	749,830	42.7	2,314,502	346,404	25.4	92,911	29,637	46.1	4,224,247	1,125,871
2017	57.3	2,037,606	854,961	46.7	2,492,596	376,492	29.0	113,177	38,546	50.0	4,643,379	1,269,999

The  
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tourist sector

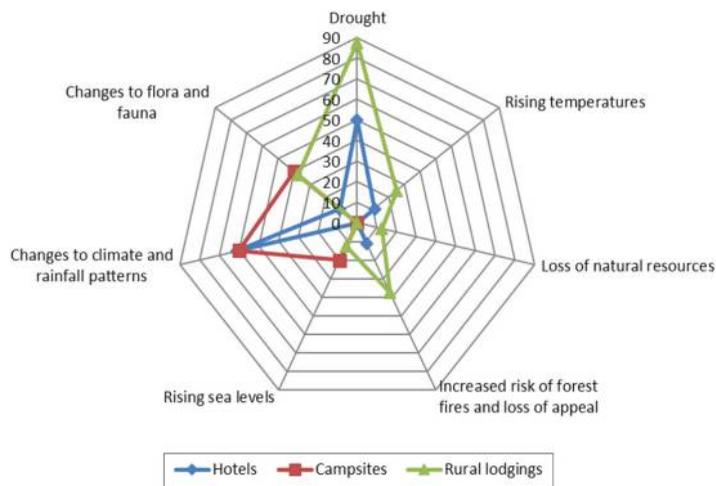
**Table III.**  
Changes in annual  
occupancy, overnight  
stays and number of  
visitors to L'Alt  
Empordà 2012-2017

local *flora* and *fauna* possibly resulting in the decline of native species and the introduction of invasive species (22.6 per cent), a loss of scenic appeal and an increased risk of forest fires (16.1 per cent), rising temperatures (12.9 per cent) and rising sea levels (6.5 per cent).

Significant differences were observed on analyzing the answers by type of establishment. Drought, for example, was mentioned by 87.5 per cent of rural lodging managers and 50 per cent of hotel managers, but was not perceived as a threat by campsite managers, who expressed greater concern about other effects, such as changing weather patterns, including changes to winds, rainfall frequency and distribution and hotter temperatures in the summer (60 per cent). They also mentioned that alterations to local *flora* and *fauna* (40 per cent) could detract from the attractiveness of the countryside and lead to a decline in native species. This loss of biodiversity and appeal, not to mention the increased risk of fire, was scarcely mentioned by the hotel managers, possibly because they are less concerned about changes to the countryside. The local landscape is one of the main tourist draws in the Muga/Alt Empordà area, and those interviewed confirmed that most of their clients were nature tourists.

In brief, 87 per cent of all those interviewed mentioned at least one effect that climate change could have in the area. The remaining 13 per cent showed a complete lack of awareness and stated that they had no idea what could happen.

Another key finding to emerge from the interviews is that the perceptions of how climate change could affect local tourism varied according to who gave the answer (Figure 3), with hotel managers envisaging more benefits than campsite or rural lodging managers. One in two hotel managers mentioned that the changes might even lead to an increase in visitors to the area. Almost a quarter of the group (22.2 per cent), however, also recognized that climate change could lead to a shortage of natural resources that could cause conflicts between different user groups, particularly in the case of water. The same group also mentioned the following as possible risks: a loss of attractiveness, increased water supply problems and an increased risk of forest fires. The remaining 22 per cent did not answer the question or could not envisage how climate change could affect tourism. In other words, almost one in four hotel managers had no opinion on this matter, which is in itself a significant finding.



**Figure 2.** Main effects of climate change perceived by the representatives of the tourist accommodation establishments interviewed in the Muga River basin (%)

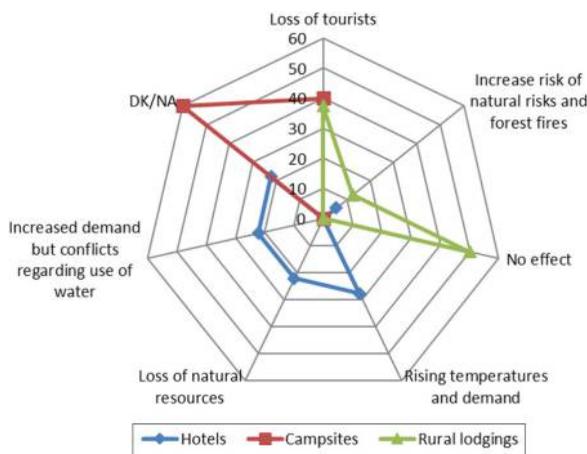
The perceptions of campsite managers were quite different. A surprisingly high 60 per cent stated that they did not know how changes to local climate could affect tourism in the area or did not answer this question. The remaining 40 per cent were of the opinion that changes could lead to a reduction in the number of tourists because of hotter temperatures in the summer months or a loss of scenic appeal due to an increase in temperatures and drought.

The opinions of the rural lodging managers were split; 50 per cent of those interviewed did not think that climate change would have an impact on tourism, while 40 per cent thought that it could lead to a loss of visitors. The remaining 10 per cent mentioned environmental and fire risks and believed that these could indirectly lead to a loss in demand due to a loss of scenic appeal and uniqueness. In brief, half of the rural lodging owners considered that climate change would have no effect on the area while the other half considered that it would. They all, however, had an opinion.

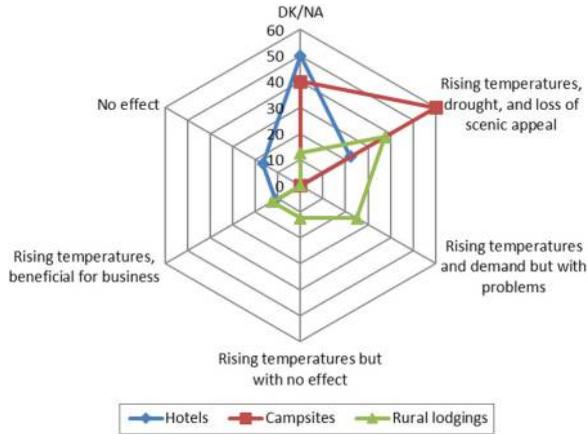
In conclusion, perceptions of how climate change might affect local tourism varied according to establishment type, and there were also differences in terms of whether certain effects, such as rising temperatures, would have a positive or a negative impact.

Opinions on how climate change might affect specific businesses also varied according to the type of establishment. As shown in Figure 4, 50 per cent of hotel managers and 40 per cent of campsite managers did not answer this question or could not perceive how their business might be affected. The corresponding proportion of rural lodging owners was much lower, at 12 per cent. A majority of campsite managers (60 per cent) were of the opinion that climate change could lead to increased temperatures and longer or more frequent drought periods, which would detract from the surrounding area and ultimately lead to a decrease in tourists, with a direct impact on the viability of their business. Just 22 per cent of the hotel managers and 37.5 per cent of the rural lodging managers shared this opinion.

Of those interviewed, 15 per cent of hotel managers and 37 per cent of rural lodging managers believed that climate change might ultimately lead to an increase in visitors. There were, however, differences in this respect, as 25 per cent of this group of rural lodging managers were also of the opinion that the changes would have negative environmental effects, such as water shortages.



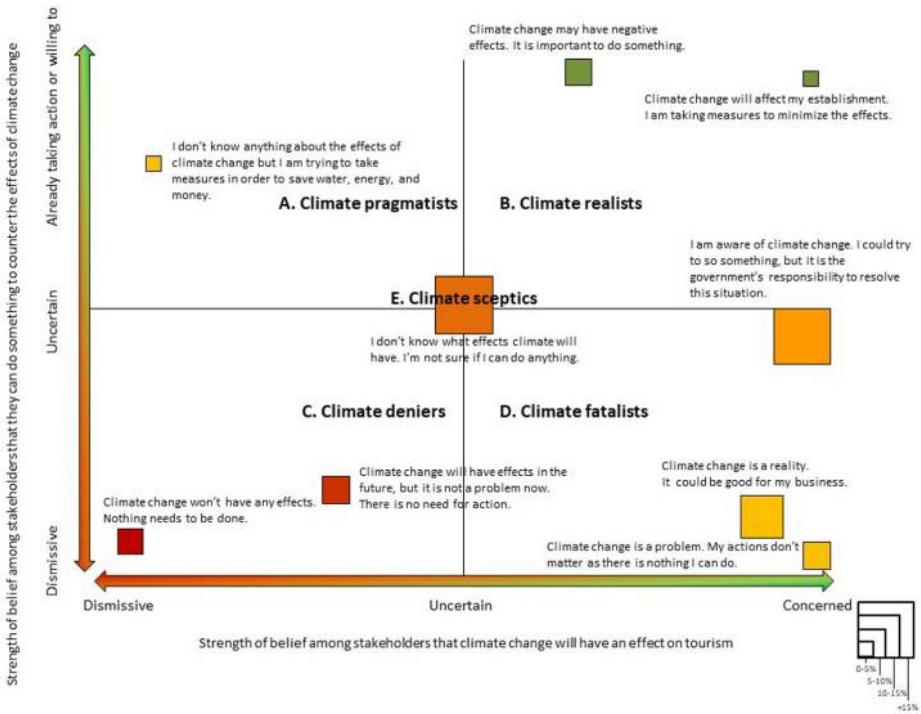
**Figure 3.**  
Perceived effects of  
climate change in the  
Muga River basin  
among owners and  
managers of different  
accommodation  
establishments (%)



**Figure 4.** Perceived effects of climate change on business according to the hotel, campsite and rural lodging managers (%)

Considering that 67 per cent of those interviewed believed that climate change could affect the tourist industry in general, it is surprising that just 42 per cent believed that it could affect their business (either positively or negatively).

Finally, we identified five manager profiles characterized by different perceptions of climate change effects and countermeasures. These profiles are illustrated in Figure 5 and



**Figure 5.** Profiles of the hotel, campsite and rural lodging managers in the Muga River basin based on perceptions of effects of climate change on the area, tourism and business and of the need for mitigation and adaptation measures

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were established by synthesizing perceptions of the effects of climate change on the Muga/Empordà region, local tourism and business and of the need for mitigation and adaptation measures.

The largest group by far (46 per cent of those interviewed) was formed by climate fatalists. These were managers who, while aware that climate change was a reality, either saw potential benefits or considered that there was nothing they could do about it, as the changes were inevitable. Most of the members of this group were hotel managers, particularly those located on the coast, and they believed that rising temperatures might bring more business by extending the holiday season (38.9 per cent). Climate fatalists, thus, perceived climate change as a reality that may, actually, be beneficial for their business. They did not think that countermeasures were necessary or would be effective.

The second group was formed by *climate skeptics*. These accounted for 19.5 per cent of all those interviewed and are located in the center of Figure 5. They were managers, who did not know what effects climate change might have or who were not sufficiently informed to determine how tourism and the area, in general, might be affected. Accordingly, they had no opinion on what mitigation or adaptation measures were needed. The climate skeptics had not implemented and were not planning on implementing any countermeasures.

The third group (again, 19.5 per cent of those interviewed) was formed by climate realists. These were environmentally aware managers, who accepted that climate change would have a clear negative impact on the area, the tourist industry and their business. They were of the opinion that it was – and would continue to be necessary to implement measures to at least try to mitigate possible effects. The climate realists perceived negative climate change effects and believed that rising temperatures could lead to a loss of scenic, and hence, visitor appeal, affecting their businesses and the local tourist industry in general. They were of the opinion that it was important to promote and implement water-saving measures to safeguard the viability of their business and the area. The people in this group made the most mentions of countermeasures, such as water-saving mechanisms (e.g. tap aerators and dual flush systems).

The fourth group, which accounted for 13 per cent of those interviewed, was formed by climate deniers. They considered that climate change had neither occurred as they had noticed no effects in their area or on business nor expected to notice any in the short term. Accordingly, they did not consider it necessary to implement mitigation or adaptation measures.

The fifth group, labeled climate pragmatists, accounted for the smallest proportion of all those interviewed (2 per cent). They did not have a strong opinion on the possible effects of the climate change but had, nonetheless, decided to implement mitigation or adaptation measures, such as water-saving mechanisms, in anticipation of negative effects on the area and their business. The decision to implement water-saving measures can also probably be explained by other variables, such as an attempt to reduce costs through a more efficient use of water.

### 5.2 *Adaptation measures to prepare for water shortages*

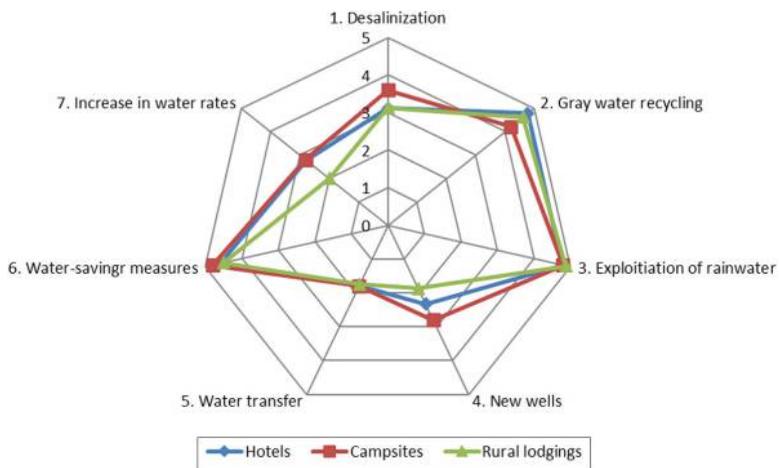
The main climate change problems perceived by the representatives of the tourist accommodation industry in the Muga River basin, apart from rising temperatures, were an increase in drought frequency and severity and water conflicts. Reductions in water availability are expected to affect all sectors of the economy and create increasing competition for an increasingly scarce resource, with tourism, agriculture, industry and conservation movements all vying for their share. Numerous conventional and less conventional measures exist that can help to adapt to diminishing supplies, such as

exploitation of underground water, construction of dams and reservoirs, water transfers, desalination, gray water recycling, rainwater collection, etc. Each of these methods differs in terms of economic viability, technical difficulty and impact on the environment.

In Section 7.2 of the interview, the hotel, campsite and rural lodging managers were asked to indicate on a five-point Likert scale their level of agreement or disagreement with a series of measures designed to mitigate the impact of diminishing water supplies in the future. The best-received measures were rainwater collection, use of simple, affordable, water-saving measures and recycling of gray water. All three measures were rated with a mean score of 4.5 out of 5 (Figure 6).

Desalination and water rate increases were rated with respective scores of 3.28 and 2.53. The least popular options were the opening of new wells (2.34) and water transfers between drainage basins (1.78). As the results show, people's ratings of the different measures decreased with increasing complexity, cost and potential impact on the environment. It should be noted that some of the measures listed would have been met with certain resistance due to negative experiences in the area with the salinization of water wells and opposition to water transfers across many sectors of society. Two particularly controversial issues in Catalonia are the (now abolished) plan to transfer water from the Ebro River to other parts of Spain and the salinization of the local aquifer in Castelló d'Empúries, which has occasionally caused major problems for users. As shown in Figure 6, the opinions on the above measures did not vary significantly from one type of establishment to the next.

Although those interviewed were clearly in favor of implementing water-saving measures, when asked if their particular establishment could implement measures to counter future water shortages due to climate change, just 40 per cent answered "yes." The remaining 60 per cent stated that there was little that they could do and that the government should take the bulk of responsibility for facilitating or directly implementing such measures. This opinion was further confirmed in the answers to the question of who should assume the greatest responsibility for implementing water-saving measures: government



**Figure 6.** Mean scores given by establishment managers according to their acceptance of measures that could minimize water shortage problems due to climate change in the Muga River basin

**Note:** Likert scale of 1-5, where 1 indicated strongly against and 5 strongly in favor

(understood as the Spanish or Catalan Governments, city or town councils and provincial governing bodies), tourist establishments or clients. Overall, those interviewed were of the opinion that 59 per cent of the responsibility lay with the government, while 22 and 19 per cent lay with tourist establishments and clients, respectively.

There were, however, some differences in opinion depending on the establishment concerned. In total, 50 per cent of hotel managers considered that the bulk of responsibility lay with the government, while 28 per cent thought that it should be divided equally between the three parties. The remaining 22 per cent believed that clients or tourist establishments should take the greatest responsibility.

The opinions expressed by campsite owners and managers varied considerably, with 60 per cent stating that government bodies, establishments and clients should share the responsibility equally. The other 40 per cent considered that the government should take most responsibility for ensuring the implementation of water-saving measures.

The opinions of rural lodging managers were even more varied. Although overall, like the hotel managers, a majority (58 per cent) thought that the government should take the greatest responsibility, they were also of the opinion that tourist establishments and clients should share some of the responsibility (22 and 20 per cent, respectively). They mentioned that the government had the power and the obligation to draw up legislation and regulations to facilitate change and that tourist establishments should follow suit by implementing these changes.

## 6. Discussion

The main findings of this study are consistent with reports from previous studies, although they also provide some novel insights. Most studies, to date, have focused almost exclusively on the hotel sector and on beach and ski resorts. Our study offers a broader perspective, as we examined perceptions of managers of the hotels, campsites and rural lodgings located on the coast, inland and in cities.

The first notable finding is that some of those interviewed believed that climate change might have beneficial effects, as it could extend the tourist season. Specifically, 30 per cent of hotel managers mentioned that rising temperatures could have a positive impact by increasing demand throughout the year. This opinion is reflected in the work of [Moreno \(2010\)](#) and [Moreno and Amelung \(2009\)](#), who found that beach tourists saw hotter weather as something positive and concluded that it could result in longer maximum occupancy periods in coastal regions. In addition, our results show that inland establishment managers seemed to be more aware of and concerned about the potential effects of climate change on tourism. This is probably because their businesses depend on the scenic appeal of the local landscape, unlike those located on the coast, which could, in the opinion of those interviewed, theoretically benefit from hotter temperatures. Nevertheless, a variable proportion of those interviewed (60 per cent of campsite managers, 37 per cent of rural lodging managers and 20 per cent of hotel managers) also recognized that climate change could lead to a reduction in demand and changes in holiday destination choice, supporting previous findings by [Gössling \*et al.\* \(2006\)](#) for Zanzibar. The campsite managers, followed by the rural lodging managers, appeared to be most aware that excessively hot, uncomfortable summers could have a negative impact on business. These results coincide with reports by [Wall and Badke \(1994\)](#); [Perry \(2006\)](#); [Rutty and Scott \(2010\)](#) and [Roson and Sartori \(2014\)](#), who concluded that certain leading tourist destinations in the Mediterranean could lose their appeal by becoming too hot, especially during the peak summer months.

Our findings also show that loss of scenic appeal and increased vulnerability and risk of forest fires due to drought were among the main concerns expressed by the campsite and

rural lodging managers. This observation coincides with reports by [Gómez \*et al.\* \(2017\)](#), in their study of rural tourism in the Empordà region. Loss of scenic appeal was perceived as a real threat to business, unlike rising temperatures, which were seen as less of a risk because most of the establishments' clients were nature tourists.

Coinciding with previous reports by [Saarinen and Tervo-Kankare \(2006\)](#), another notable finding from our study is that 66.7 per cent of the hotel managers and 40 per cent of the campsite managers either believed that climate change would not have any negative effects on their business or were unable to envisage how it could be affected. This inability to perceive negative effects and lack of awareness were much less common among rural lodging managers, at just above 12 per cent. Similar findings were reported in the study of Tyrolean ski tourism stakeholders by [Trawöger \(2014\)](#), in which 83 per cent of those interviewed perceived climate change as a global problem, but just 21 per cent saw it as a potential short-term problem for their business. [Hoy \*et al.\* \(2011\)](#), in their study of ski resorts in six mountain areas in East Germany, also found that approximately 50 per cent of those interviewed did not expect climate change to have a negative impact on the area in the coming 15-20 years, although the majority did acknowledge that climate change was one of the world's largest problems.

We can, therefore, conclude that perceptions of climate change effects vary significantly according to the type of establishment and location. In our study, those running establishments located on the coast seemed to be more worried about overall effects on the tourist industry, while those in charge of inland properties appeared to be more aware of what climate change might involve.

There was, however, widespread agreement that the government should lead the process required to promote and facilitate water-saving measures and climate change mitigation and adaptation measures in general. This call for government leadership has been echoed in other studies, which, like ours, have found that the vast majority of establishments have received no help, funding or advice on the implementation of mitigation and adaptation measures ([Gómez \*et al.\*, 2017](#)). [Dinarès and Saurí \(2015\)](#) listed a series of strategies that should be promoted at the government level, including software and other tools to help companies develop water adaptation and saving measures, policy incentives and general risk mitigation actions. One problem mentioned by those interviewed was that small- or medium-sized businesses (like those analyzed in this study) do not have the financial means to invest in water-saving measures. Additional problems are a lack of technical know-how or simply a general inability to identify climate change risks. Many establishments, thus, have a low adaptive capacity and as such are particularly vulnerable ([Chan, 2011](#); [Kasim \*et al.\*, 2014](#)) and need support to reduce risks and increase resilience ([Scott \*et al.\*, 2012](#)). This support should largely come from the government, which has the necessary powers and tools. Those interviewed in our study were of the opinion that it would only be possible to reduce water consumption and prevent future shortages if the government led the way. Once this has occurred, businesses and clients should be brought on board, as argued in the [World Wildlife Fund \(WWF\) \(2001\)](#) report on tourism threats in the Mediterranean in 2001.

Those interviewed were also of the opinion that government authorities were not doing enough to inform about and prepare for the effects of climate change and called for greater levels of commitment and responsibility. Similar findings have been reported by [Gómez \*et al.\* \(2017\)](#). None of the managers in our study mentioned any climate change actions taken by the Catalan or Spanish Governments. Perceptions of climate change effects in the tourist sector will change only when the diverse stakeholders involved become truly aware of the potential issues and understand how these could affect tourism and water availability. This increased awareness should lead to a greater recognition of active measures being taken at

the government level. Strategies are, thus, required first to increase awareness and then to promote action. None of the establishments analyzed in our study have implemented or are planning on implementing mitigation or adaptation measures and this is probably largely because they are unaware of what is at stake.

## 7. Conclusions

The first conclusion of our study is that climate change effects are perceived and interpreted differently across the accommodation establishments analyzed in the Muga River basin. First of all, a considerable proportion of those interviewed were of the opinion that climate change could have a negative impact on the area in general. There was also a perception that changes could negatively affect tourism and business, although this was held by fewer managers and most of these were running hotels and coastal businesses.

Those interviewed also expressed different preferences in relation to the promotion and implementation of mitigation and adaptation measures. We identified five manager profiles with different levels of awareness and proactivity in relation to the implementation of countermeasures to mitigate the effects of climate change by the tourist industry in general and their own establishments (Figure 5). The largest group, the climate fatalists, accounted for 46 per cent of those interviewed. They were aware that climate change was inevitable, but did not think that they could or should do anything about this. Some of the members of the group also believed that climate change could increase demand for tourism, particularly in coastal areas where hotter temperatures would attract more tourists throughout the year.

At the other end of the spectrum were the climate pragmatists (19.5 per cent) and realists (2 per cent), who were aware of climate change and its effects and as such were willing to act and apply countermeasures. In between these two positions were the climate deniers (19.5 per cent) and the skeptics (13 per cent), who were not planning on taking action as they were unaware of or did not believe in the negative effects of climate change.

Apart from a loss of scenic appeal due to more frequent and intense drought periods, the hotel, campsite and rural lodging managers interviewed did not seem to be particularly concerned about future water scarcity problems. In brief, we found low levels of knowledge and awareness about how climate change could affect water supplies in the Muga River basin. We believe that this is partly due to the little research that has been done to investigate the association between climate change, water resources and tourism; and partly due to a failure to inform local stakeholders of potential risks. Greater efforts and resources are, thus, needed to promote research, awareness and actions to mitigate water shortages that could directly affect the maintenance, consolidation and improvement of tourism in the area.

The most appealing water-saving measures in the opinion of those interviewed were rainwater collection, gray water recycling and measures that require little investment and technical know-how (e.g. tap aerators, double-flush systems and good-practice campaigns targeting clients and staff). In general, the managers considered that the government should be responsible for implementing more ambitious, costly and sophisticated measures and for dealing with their potential environmental impacts. These measures included, by order of preference, desalinization, opening of new wells and water transfers. Those interviewed also largely agreed that it was the government's duty to facilitate anticipatory adaptation measures and ensure sustained water supplies for the tourist industry. They did not see tourist establishments or clients as having the same level of responsibility, although they did recognize that both had a role to play and that responsibilities should be shared, albeit not equally.

Although there was a general perception among the accommodation establishment managers that climate change could have serious, worrying consequences, those interviewed did not appear to view these consequences as a threat for their businesses or for local tourism in general.

Finally, our findings clearly show that it is crucial to increase levels of awareness and knowledge of climate change effects among owners and managers of tourist accommodation establishments and to help them see the need for mitigation and adaptation measures that will ensure a sustainable use of resources with a particular focus on water-saving measures.

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