

Article

Incentives and Barriers to Water-Saving Measures in Hotels in the Mediterranean: A Case Study of the Muga River Basin (Girona, Spain)

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Abstract: Decreasing water availability and growing demands due to climate change and increasing tourist numbers in the Mediterranean basin are likely to result in worsening conflicts between socioeconomic sectors that depend on water to survive. We conducted 19 in-depth interviews with hotel owners and managers in the Muga river basin (Girona, north-east Spain) to analyze their use of water-saving measures and explore perceived incentives and barriers. Hotel size, category, and year of construction/renovation were all directly associated with the implementation or lack of implementation of certain measures. The hoteliers did not perceive any strong incentives to adopt water-saving measures, but there were clear indications of cost and technical barriers and a lack of awareness about possible options. Efforts are clearly needed to improve incentives and increase awareness and knowledge about water-saving measures among hoteliers in this part of the Mediterranean basin, where water is a necessary resource for the tourist industry and many other sectors.

Keywords: hotels; water scarcity; water-saving measures; incentives and barriers; Mediterranean basin

1. Introduction

The future of the tourist industry hinges largely on the effects of climate change and the availability of natural resources [1,2]. Rising tourist numbers and increasing water demands, combined with growing concerns about water shortages as a consequence of climate change [2,3], are likely to give rise to conflicts between different socioeconomic and environmental sectors that depend on water, such as agriculture, industry, households, tourism, and ecosystem management [4–7]. These conflicts could become particularly intense in areas where tourism is an important part of the local economy, as is the case with most tourist destinations in the Mediterranean basin [8], which is one of the most seriously threatened regions in the world in terms of climate change effects and water scarcity [9–11].

Hotels and other tourist accommodation establishments can play an important role in guaranteeing sustainable water use and helping to preserve the local economy by introducing measures that result in efficient water use and encouraging greater water-saving awareness among staff and guests. To do this, however, they first need to be aware of the problems that exist and lie ahead [12–14].

The Muga river basin is a West Mediterranean region located in the extreme north-east of the Iberian Peninsula. It is an ideal location for studying water-saving measures adopted by hotels and investigating perceived barriers and incentives among owners and managers. Water supplies in this area have become increasingly scarce in recent years and the trend looks set to continue. Data from the European MEDACC Life project show a mean annual reduction of 6.5% in rainfall between 1970 and 2015 and a corresponding reduction of approximately 60% in summer months [15]. Headwater flows also fell by almost 50% in the same period and projections for 2050 indicate an additional reduction of

7.6% in summer rainfall and 20% in river flow. Data from the same project [15] also indicate that the area will experience more frequent and intense drought periods, particularly between 2021 and 2050, increasing the already high risk of forest fires. Climate change models for the Muga river basin paint a picture of increasing water scarcity and growing water demands due to declining rainfall, rising temperatures, and increasing use of water for irrigation, tourism, and the conservation of aquatic ecosystems [15–17], particularly in the summer months, which is a critical period in the Mediterranean marked by increasingly severe drought and peaks in demand by all end users.

The popularity of the Muga river basin as a tourist destination has increased steadily since the mid-1900s [18], and the increase has been particularly evident since 2012. In 2017 alone, over 4.5 million overnight stays were recorded for the wider Alt Empordà county. These overnight stays correspond to 1,200,000 tourists [19] and numbers look set to continue to rise in coming years. The Muga river basin has 117 hotels offering a total of 11,231 beds: 14 one-star hotels with 1317 beds, 32 two-star hotels with 1545 beds, 48 three-star hotels with 6211 beds, 21 four-star hotels with 1317 beds, and 2 five-star hotels with 8174 beds [19]. The number of places available to tourists has risen steadily since 2007, and this increase is even more noteworthy considering that the earlier years were marked by a harsh economic recession that hit the construction sector particularly hard. Demand for water is also high in other sectors, with conservationists, farmers, and local residents all competing with the tourist industry for this valuable resource. Shortages have been further aggravated by groundwater nitrate contamination. According to the MEDACC project, agricultural use accounts for 75% of all water use in the river basin, and an additional 20% is required to meet the needs of urban populations, including hotels [15]. Overall, conflicts generated by increasing pressure on water availability are likely to increase in both frequency and intensity [20]. Successive drought periods over the past three decades have sparked serious conflicts between different sectors. The most notable of these was the “water well war” in 1984, which was marked by serious confrontation between the agricultural and tourist sectors over the use of groundwater supplies from the lower stretch of the Muga river. In the summer of 1996, conservationist groups blamed the tourist sector when the environmental flow of the Muga river fell below the minimum level established by law. Low water levels in the Darnius-Boadella dam also led to an irrigation ban that affected farmers in the Muga river basin (the situation was particularly critical in 1999 and 2007–2008) and triggered tensions between the agricultural and tourist sectors [21–23]. Overall, the situation is worrying and calls for continued research and efforts to promote the implementation of water-saving measures across the hotel and other sectors.

In a previous study of tourist accommodation establishments in the Muga river basin by our group, we found that hotel owners/managers were the least concerned and aware about climate change, water scarcity, and the need to urgently implement water-saving strategies in this sector [17], highlighting the need for more studies investigating attitudes towards water conservation and perceived incentives and barriers among hoteliers in this part of the Mediterranean.

2. Theoretical Framework

Hotels need large volumes of water to cover the needs of a wide range of facilities, such as laundry rooms, kitchens, pools, gardens, and bedrooms [24,25]. Increasing concerns about the growing scarcity of this natural resource have given rise to numerous studies of water-saving measures being implemented by hotels, with the bulk of studies analyzing beach [26,27] and ski resorts [1].

A reduction in water use by the tourist industry is crucial for ensuring both the future of this industry [28] and the global sustainability of water resources in coming years [29,30]. In response to environmental laws and increasing social pressure to apply sustainable, environmentally friendly measures, some hotels have opted for obtaining environmental certification or minimizing waste [31]. These actions also serve to satisfy the demands of an increasing number of environmentally aware tourists seeking to stay at establishments that use natural resources responsibly and have environmental certification [32,33]. By adopting and fostering environmentally sound measures thus, a hotel is not only responding to social and governance pressure, but is also adding value to its services [34], building

customer loyalty, and satisfying the demands of both staff and guests [35]. Not all hotels, however, choose to “go green”, and the main reasons given are cost barriers and difficulties engaging staff [36].

Water use varies significantly from one hotel to another depending on a range of factors, including location and climate [37–39], category, size, number of beds [40–43], year of construction or renovation [43], range of services and facilities [11], and ownership (e.g., family run or part of a chain) [44]. Not all factors, however, have been found to have the same effect on water consumption. Bohdanowicz and Martinac [45], for example, found that higher-category hotels and hotels located in hotter regions, such as the Mediterranean basin, use more water. They also found that consumption rates were influenced by hotel size, number of overnight stays, and type of board (full-board, half-board, etc.). Charara et al. [40], in a study of the hotel sector in Barbados, found that the main predictors of water consumption were number of overnight stays and number of employees, which are both indicators of size.

Few studies have analyzed the benefits of implementing water-saving measures, and fewer still have investigated whether these factors vary according to factors such as location, category, and size [11,40]. Water-saving efforts by hotels mainly consist of towel and bed linen reuse programs, placement of cards or signs at key water consumption points advising guests to use water in moderation, staff engagement in good water practices, and installation of faucet aerators and dual-flush toilet systems [46–48]. These measures require little investment and have a much shorter payback period than more sophisticated measures such as rainwater harvesting systems or water meters to measure consumption in specific areas. An additional benefit of these low-cost measures is that they reduce operating costs and hence increase profit margins. Han and Hyun [31] studied strategies used by hotels to promote responsible water use in a survey of 321 hotels in the United States. Their findings confirm that towel reuse programs and strategies encouraging more responsible water use, such as signs in bathrooms, are among the most widely used water conservation practices in the tourist industry. Bohdanowicz [29] also analyzed environmental awareness and initiatives in Swedish and Polish hotels via an e-mail-based survey of 349 hoteliers. Again, they found that the most common measures, in order of decreasing frequency, were towel reuse programs, the installation of faucet aerators, and placement of signs encouraging clients to help to save water.

In a study of 100 resorts in the United States, Bruns-Smith et al. [49] found that the most popular measures for reducing water consumption were faucet aerators, low-flow devices, and dual-flush toilet systems; other measures such as graywater recycling systems were associated with reductions of up to 23%. Chan et al. [34] conducted in-depth interviews with 23 hoteliers in Hong Kong and found that the most common water-saving measure was the installation of low-flow tap fittings and sensors. Only a few hotels had towel and linen reuse programs and fewer still had rainwater harvesting systems, largely due to the investment and space required. Page et al. [47], like Han and Hyun [31], found that encouraging clients to use less water was by far the most effective strategy.

Hotel gardens and pools are an important feature as they consume large volumes of water. One way of reducing the amount of water needed by gardens is to use native and in particular drought-tolerant plants [12]. As pointed out by Gössling [50], however, these gardens may be less attractive than gardens with green lawns or evergreen perennials typically found in tropical climates. The most widely implemented system for saving on irrigation is the replacement of traditional sprinkler systems with more efficient drip and moisture systems [49].

Whether or not a hotel decides to implement water-saving measures is closely linked to its perception of incentives and barriers. The most frequently identified barrier, particularly by small, largely family-run, hotels [40], is the cost associated with introducing and maintaining many measures [51–54]. A second set of barriers relates to technical or knowledge barriers [36,55–57], which refer to a general lack of knowledge among hoteliers about possibilities for reducing water use and/or a general lack of environmental awareness [58]. Additional barriers are concerns about image and quality (publicity and marketing barriers), as certain measures are thought to negatively affect guest comfort and satisfaction [40]. Facilities that require large volumes of water, such as gardens, pools, and

bathbubs, for example, are typically associated with higher-category hotels offering top-quality services. Other significant barriers identified in the literature are difficulties engaging staff in water-saving programs [51,59] and a lack of support from government and other official bodies [52,60–62].

There are also a series of incentives that explain why some hotels are more likely to implement and foster water-saving measures. The main incentives are cost incentives in the form of government grants or subsidies or increased profit margins through a lowering of operating costs [26,37,51,52]. Hotels might also be motivated to implement water-saving measures to attract tourists with increasingly high expectations in terms of how hotels should contribute to protecting and sustaining the environment [26,37,52,56]. This incentive would fall in the category of marketing and publicity incentives. Finally, decisions to introduce improved water conservation practices may be motivated by the need to comply with local or national legislation [63] or awareness of the importance of reducing the hotel's water footprint [26,45,52,55,64–66].

3. Study Area

This case study was conducted in the Muga river basin located in Girona, north-east Spain. The basin encompasses a surface area of approximately 1130 km² and has 52 villages, towns, and cities. It has three geographically distinct areas that attract different types of tourism (Figure 1). The first area is coastal, and hotels in this area are mainly located in the resort towns of Castelló d'Empúries, Roses, Cadaqués, and Llançà; 64% of the hotels are small (<50 rooms), 26% are medium-sized (51–150 rooms), and 10% are large (>151 rooms). The hotels are family run and business is highly seasonal, with most tourists arriving between April/May and October.

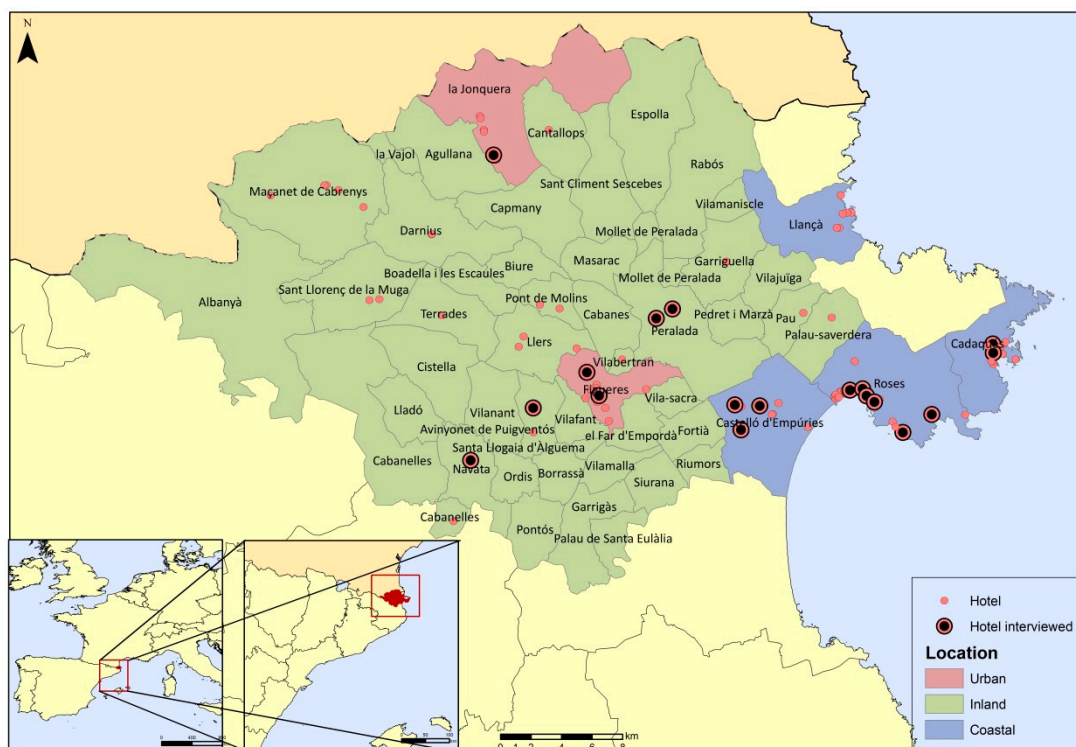


Figure 1. Location of hotels in the study area. Source: Compiled by authors.

The second area is urban and formed by the cities of Figueres and La Jonquera. Figueres is the capital of the region and attracts large number of tourists, drawn to the Dalí Museum. The profile of tourists here contrasts sharply with that of La Jonquera, which is located on the Spanish-French border and mainly draws business visitors. All the urban hotels are small (55%) or medium-sized (45%). The third area is a rural, inland area that attracts visitors interested in outdoor pursuits and

families looking to combine nature, culture, and the outdoors. With the exception of one medium-sized hotel, all the hotels in this area have 50 or fewer rooms and they are all family run.

The water needs of the three areas are met by the Darnius-Boadella reservoir and/or the River Muga through surface water capture systems or wells (aquifers). Figueres and most of the towns near Figueres and along the coast for example, are supplied directly by the Darnius-Boadella reservoir (61 hm³ capacity), while Peralada and Castelló d'Empúries are supplied by wells, which also provide water to nearby villages and towns.

4. Methodology

Our methodology consisted of a literature review followed by an interview-based survey of hotels in the Muga river basin. The literature review was performed to identify the main water-saving measures employed and/or fostered by hotels and the barriers and incentives perceived by owners and managers. We performed an exhaustive review of the Scopus and Web of Science databases and grouped the articles retrieved according to the main topic analyzed and the methodology used. Search terms included "hotels", "water-saving measures", "incentives" and "barriers". The initial search retrieved 95 articles, 53 of which were excluded after screening their titles, keywords, topics, and abstracts. The information provided in the 42 remaining articles was used to identify key topics and guide the conduct of the study. The literature review was performed using the systematic literature method described by Pickering et al. [67], which involves 10 steps that include definition of research aims, hypotheses, and keyword search terms and the creation of a database to collect the data identified. The review was exploratory and descriptive and was designed to identify existing knowledge on the topic of water-saving measures in hotels. It also helped us to refine the different topics for discussion in the interviews with hoteliers in the study area and guide the discussion of our results.

The interview questions, designed to collect data on water-saving measures and perceived incentives and barriers among hoteliers in the region, were validated by a group of experts. The hotels were identified by consulting the Catalan Government's online guide to tourist establishments [68]. Once we had located and characterized the hotels ($n = 117$), we contacted them by e-mail to inform them of the purpose of the study and invite them to participate. We then arranged interviews with those who agreed to take part in the study ($n = 5$) and followed up with another 43 hotels by telephone to ask them again if they would like to participate. In total, we interviewed 19 managers and owners. The interviews, held on site, were tape-recorded with the consent of the interviewees and lasted for an average of 52 minutes. They were held in 2017 (between May and July and September and December) and in 2018 (July). The interview was structured into seven parts: (I) Owner/manager profile, (II) Characteristics of hotel, (III) Facilities that require water, (IV) Water consumption and water management systems, (V) Identification of water-saving measures, barriers, and incentives, (VI) Opinions on existing water management policies, and (VII) Perceptions of climate change and management strategies. The first five sections were relevant to the present study. Thirteen of the interviews were held with hotel owners and six with managers. They were all thus very knowledgeable about the characteristics and needs of their hotels.

The audio-recordings of the interviews were transcribed using EasyTranscript software. The content was coded, processed, and analyzed using a grounded theory approach and Computer-Assisted Qualitative Data Analysis Software (CAQDAs). Grounded theory is a research method that consists of collecting, coding, and categorizing information and then interpreting the results to form a new theory [69]. It consists of four main steps: (1) Open coding, (2) axial coding, (3) selective coding, and (4) delimitation of the emerging theory, which includes the results and conclusions of this study.

Table 1 shows the total number of hotels in the Muga river basin and those included in the study by category and location.

Table 1. Hotels by category and location.

	Available Population (num)	Interviews Conducted (num)
Category		
*	14	5
**	32	6
***	48	3
****	21	4
*****	2	1
Total	117	19
Location		
Inland	27	4
Urban	19	3
Coastal	71	12
Total	117	19
Total number of beds	11,231	1786

Source: Compiled using data from the Catalan Government's Guide to Tourist Establishments [68].

Interviews were held with the owners or managers of 19 hotels, i.e., 16% of the total hotels (and beds available) in the area. We did not actively seek more interviews after this point as we found that with these interviews, we had reached an information saturation point (i.e., no new information or arguments were emerging). In addition, the number of interviews held is comparable to numbers reported for cases studies of the hotel industry in Taiwan and Barbados by Teng et al. [70] and Charara et al. [40].

All the hotels surveyed are family run and are therefore free to take decisions on how to run and develop their businesses, unlike franchised or chain hotels that may have to follow policies or procedures emanating from above. Year of construction or last renovation is also an important factor in terms of which measures hotels will have been obliged to introduce. Ten of the hotels were built before 1970, one between 1970 and 1989, three between 1990 and 1999, and four after 2000. The hotels thus were relatively old, particularly the coastal and urban ones. All the inland hotels were built after 1995. Most of the hotels have undertaken considerable renovation work over the years to modernize their facilities or adapt them to current legislation and 60% completed this work after 2000.

Of the coastal hotels that participated in the study ($n = 12$), eight had <50 rooms, three had 51–150 rooms, and one had >150 rooms. The three city hotels had <50 rooms, and of the four inland hotels, three had <50 rooms and one had 50–150 rooms.

All the hotels but one (a hotel in Cadaqués with its own well) were connected to the mains water supply.

5. Results

5.1. Implementation of Water-Saving Measures

The most widely implemented water-saving measures by the hotels surveyed were low-cost, low-tech, and legally enforceable measures. The main measures were dual-flush toilet systems and improved towel and bed linen reuse policies (both present in 78.9% of hotels) and faucet sensors, timers, or aerators (73.7%). Some of the lower-category hotels did not have dual-flush toilets and those interviewed stated that they were not familiar with these toilets or that they did not need them as their guests used water responsibly. Failure to install water-saving faucet fittings was not specific to any particular type of hotel and we did not identify any reasons to explain their absence, although we presume that it was due to a lack of awareness.

Over half of the hotels (58%) had replaced bathtubs with showers. This measure was less common in four- and five-star hotels, which were located mainly in urban and inland areas. The reason given for the conversion was improved client comfort, as many hotels and particularly those on the coast

(e.g., Roses) have an elderly clientele. The reason given for not switching to showers was that bathtubs were associated with quality (more stars) and as such needed to be maintained as they were an important feature for certain clients.

Another popular measure, implemented by 68.4% of the hotels interviewed, was the placement of save water signs or cards in bedrooms and other key areas. The 31.6% of hotels that did not use these reminders had <50 bedrooms. The main reasons given for using these optional signs were to reduce the hotel's ecological footprint and to save money, as water consumption is closely linked to energy consumption, a major cost in the hotel industry. Hotel size was therefore an important determinant of the use of signs encouraging clients to help to save water. Training on good water practices for staff was also more common in the larger hotels. Overall, just 42.1% of hoteliers stated that their workers received training on water-saving practices, whether in the form of specific programs or informal training by the owners or managers. All the large hotels and some of the medium-sized hotels provided training and the hoteliers were of the opinion that this was crucial for helping to save water and reduce operating costs.

The questions regarding the use of water-saving strategies for swimming pools and gardens were only applicable in seven and six cases, respectively. These features require large volumes of water and therefore strategies designed to reduce consumption can result in significant environmental and economic benefits. Strategies include salt water pool conversions (water needs to be renewed much less frequently in salt water pools than in traditional chlorinated pools), installation of shower shut-off timers or sensors, and use of pool covers to reduce evaporation. The most common measure in our series was the installation of shower sensors or timers (71%) followed by salt water pool conversions (27%). None of the hotels used pool covers.

Of the six hotels with gardens, 4 (66%) had installed more efficient irrigation systems (sprinkler or computerized irrigation systems), and just two (16.7%) had planted native or drought-tolerant plants. None of the hotels had replaced lawns with paving or synthetic grass. The maintenance of natural lawns requires large volumes of water as they are typically composed of non-native species.

None of the hotels had introduced systems for graywater reuse, rainwater harvesting, water consumption monitoring in key areas, or leak detection. All four measures require greater investment and technical knowledge and have a longer payback period (see Figure 2).

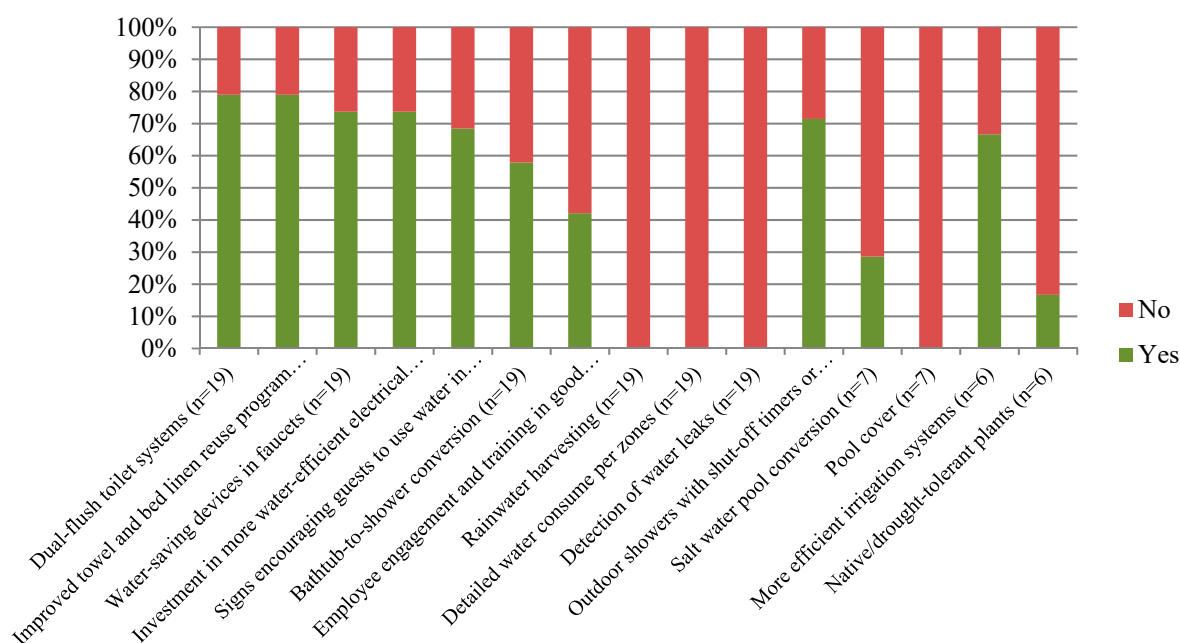


Figure 2. Implementation of water-saving measures at hotels surveyed.

5.2. Incentives, Barriers, and Perceived Responsibilities

In this section, we look at perceived incentives and barriers to the implementation of water-saving measures among the hoteliers interviewed and examine who they believe should be responsible for encouraging hotels to use water responsibly and thereby contribute to ensuring the future of tourism and the overall sustainability of water resources in the region.

The main incentive mentioned (Figure 3) was the incentive to reduce operating costs, particularly in relation to measures that require low investment, but environmental awareness was also an important incentive. The two incentives go hand in hand, as even if a hotel's main reason for saving water is to reduce the hotel's water footprint, it will benefit from reduced water and energy costs. Of the hotels that had installed dual-flush toilets, 31.5% had done so to meet regulatory requirements (i.e., they had no choice) and 21% to reduce costs. An additional 15.8% mentioned both reasons, while 10.5% were motivated purely by environmental reasons. The same reasons were given for the decision to install water-saving faucet fittings, although in this case, regulatory requirements were less important. Over 75% of hotels had improved their towel and linen reuse policies and the main reason mentioned was to save water and energy.

It should be noted that some of the hotels had installed more efficient systems (faucets, toilets, electrical appliances, etc.) simply because when it came to replacing existing systems, the products available on the market already incorporated water-saving features (e.g., faucet aerators, dual-flush systems) or because they were required to do so by law. This point was made by almost 32% of those interviewed. In Catalonia, which is the autonomous community in which the Muga river basin is located, some hotels are legally obliged to implement water-saving measures. The Catalan Government's Decree 21/2006 of 14 February, which regulates the implementation of environmental and eco-efficiency criteria in buildings (including newly built hotels, reconversions, and large renovation projects) states that "due to the increasing pressure on water consumption and waste, measures must be taken to rationalize water consumption and reuse water where possible [. . .] taps, bidets, sinks, and showers must be designed to save water or fitted with a water-saving device. In all cases, they should produce a maximum flow of 12 liters per minute with a minimum flow of 9 liters per minute at a minimum dynamic pressure of over 1 bar [. . .] toilet cisterns must have a dual-flush or an interruptible flush system."

Marketing and publicity incentives were not mentioned by any of the hotels. As we will see in the next section on barriers, some measures, rather than being seen as a means of attracting a new set of clientele interested in quality certifications and environmentally responsible hotels, were seen as measures that could result in a loss of clients.

Cost constraints, such as a lack of investment capacity, were mentioned by over half of the hoteliers to explain why they had not implemented water-saving measures (Figure 3). This was particularly true for more costly and technically sophisticated measures, such as rainfall harvesting and graywater reuse systems, for which cost was mentioned by all those interviewed.

The second barrier detected was a lack of awareness about water shortage problems and their potential impact on hotels in the future: Almost 60% of those interviewed were of the opinion that their hotel did not have water problems and believed that this would continue to be the case. They were also unaware that the implementation of water-saving and efficiency measures could be both beneficial for the environment and profitable for their business. Four of the hoteliers, for example, were surprised that pool covers could save water, while six out of seven hoteliers had not considered the possibility of planting native or drought-resistant species in the garden. We therefore detected clear knowledge and awareness barriers in our sample.

Barriers related to marketing and publicity were mentioned by several managers. In particular, faucet flow restrictors, bathtub-to-shower conversions, and towel and bed linen reuse programs were perceived as measures that could lead to a loss of business.

Regulatory and/or administrative barriers were also mentioned. Those responsible for small, generally family-run, hotels were of the opinion that the lack of grants and support for their businesses could damage their competitiveness and result in a loss of clients to larger hotels with a greater capacity for investment. Differing opinions were observed in the case of bathtubs. The representatives of two of the higher-category hotels stated that converting to showers was not an option as they were legally required to have a certain number of bedrooms with bathtubs. Three of the lower-category hotels, by contrast, were not interested in making the switch for fear of client dissatisfaction. This situation calls for more robust legislation to level out the playing field across the hotel sector and prevent grievances (see Figure 3).

	INCENTIVES				BARRIERS			
	Cost	Environmental awareness	Legislation and regulation	Marketing and publicity	Cost	Lack of environmental awareness and technical knowledge	Legislation and regulation	Marketing and publicity
Dual-flush toilet systems (n=19)								
Improved towel and bed linen reuse program (n=19)								
Water-saving devices in faucets (n=19)								
Investment in more water-efficient electrical appliances (n=19)								
Signs encouraging guests to use water in moderation (n=19)								
Bathtub-to-shower conversion (n=19)								
Employee engagement and training in good water-use practices (n=19)								
Rainwater harvesting (n=19)								
Detailed water consume per zones (n=19)								
Detection of water leaks (n=19)								
Outdoor showers with shut-off timers or sensors (n=7)								
Salt water pool conversion (n=7)								
Pool cover (n=7)								
More efficient irrigation systems (n=6)								
Native/drought-tolerant plants (n=6)								

Figure 3. Main incentives and barriers to the implementation and fostering of water-saving measures perceived by hoteliers interviewed.

None of the hotels that had implemented water-saving measures had received financial or technical support, i.e., they had acted on their own initiative, suggesting that external support mechanisms could enhance wider implementation.

It is noteworthy that 77% of hotel managers stated that all the measures implemented had been effective and had resulted in a real reduction in water consumption. This noted effectiveness, however, does not appear to be enough on its own to drive hoteliers to voluntarily implement new measures to protect the environment and ensure the sustainability of the tourist industry. Eighteen percent of the hoteliers claimed that certain measures would not be noticed or appreciated by guests, therefore reducing their effectiveness. The remaining 5% who had not yet implemented any measures were of the opinion that water was cheap and/or plentiful and that it was preferable to invest in other more profitable initiatives, such as energy-saving measures.

Regardless of the reasons that led one hotel or another to implement water-saving measures, it is clear that the incentives perceived are insufficient. Almost three-quarters of those interviewed (73.7%) called for more help from government to overcome what were seen as insurmountable barriers

without this help. Those interviewed suggested various ideas during the interviews, such as grants and subsidies, technical training for owners and managers, awareness-raising programmes, improved environmental and water policies and legislation, and strategies highlighting the benefits of measures implemented by the hotel industry to overcome marketing and publicity barriers. The hoteliers believed that the government had the financial, administrative, and legal means to introduce and promote changes and should lead the way in facilitating the transition to a more efficient and sustainable use of water resources by the hotel and tourist industry at large.

Of the 14 hoteliers who claimed that government support was needed, three said that without this help (in the form of legislation, for example), they could not contemplate introducing measures to save water. They were also of the opinion that absence of support would create a divide between hotels that chose to implement certain measures and those that did not, and even mentioned that some changes could result in a loss of clients and reputation. (The most common examples mentioned were bathtub-to-shower conversions, water flow restrictions, and stricter towel and bed linen policies.)

6. Discussion

Water consumption varies according to different factors, such as hotel size and category [43], year of construction, and facilities and services offered. As shown by Bohdanowicz [37], Warren and Becken [41], and Charara et al. [40], hotels with more rooms, more stars, and more services tend to consume more water. In this study, we investigated whether the implementation of water-saving measures might also vary according to similar factors. Hotel size was the strongest determinant of staff training and the use of signs to encourage good water use, while category provided the best explanation of why some hotels opted for bathtub-to-shower conversions and others did not.

Low-cost measures were the most popular. Over 75% of the hotels had installed faucet aerators and introduced stricter towel and bed linen reuse policies, supporting findings by Bohdanowicz [29] for Sweden and Poland and Bruns-Smith et al. [49] for resorts in the United States. Twenty-one percent of the hotels did not encourage towel and linen reuse and 26% did not have taps with aerator systems. The main reasons were a lack of awareness and cost, even though Meade and Gonzalez-Morel [71] have shown that these measures in Jamaica cost around just €10 to install per room, meaning that the investment is recouped in under 2 months. Bruns-Smith et al. [49], in turn, showed that the installation of faucet aerators in US hotels resulted in daily savings of €1.50 per room. In a study of a hotel with 117 rooms in Zaragoza, Spain, Barberán et al. [72] found that the use of water-saving devices in taps throughout the hotel could lead to a return on investment of 932%, with a service life of at least 12 years.

Client and staff engagement is also essential if water-saving measures are to be successful. Over two-thirds of the hotels in our study had improved their towel and linen reuse programs and placed signs providing tips on how to save water or reminding guests about the importance of doing this in bathrooms and other key consumption areas. In addition, half of the hoteliers interviewed said they would be willing to reward guests who used water responsibly (through a reduction in price or other perks) if they were able to monitor water use in each room. Measures such as encouraging guests to use their towels for more than one day will work only if the guests are willing to do this. However, even when they do indicate that they are happy to reuse their towels (by leaving them hanging, for example), this may not prevent the cleaning staff from changing them. This problem was mentioned by two of the hoteliers interviewed and is consistent with the lack of environmental awareness observed by Page et al. [47] in the tourist industry in Zanzibar, Gambia, and the Dominican Republic. In a similar study, Charara et al. [40] found that policies implemented by hotels in Barbados were often not followed by staff or clients.

None of the hotels in our study had installed more costly, sophisticated water-saving measures, such as systems to detect leaks, recycle gray water or rainwater, or monitor water use in key consumption areas. Meade and Gonzalez-Morel [71] reported that even though reliable water monitoring programs were one of the most cost-effective water-saving measures a hotel could implement, unfortunately,

they were used by very few small and medium-sized hotels. Similar to us, Chan et al. [34] found that very few hotels in Hong Kong used water recycling systems.

The findings of our interviews support reports by Tzschentke et al. [66] that the main incentive for introducing measures to improve water efficiency and save water is to reduce operating costs, even in the absence of state grants or subsidies.

Environmental incentives were mentioned much less frequently than cost incentives, although the implementation of water-saving measures will benefit the environment, regardless of the reason. Olcina-Cantos et al. [39] highlighted the close association between water-saving measures and energy savings, and indicated that actions designed to save water and promote better water practices could cut energy costs by a quarter. Han and Hyun [31] reported that while hotels were mostly interested in encouraging more responsible water use among guests to reduce operating costs or comply with legislation, the measures implemented also indirectly reduced the impact on the environment and use of water resources. This wider impact, however, was not known or sufficiently appreciated by the hoteliers in our study.

It is also interesting that none of the hotels had installed water-saving measures to improve their image or respond to client demands, and there were even cases where those interviewed said that they did not want to introduce certain measures (such as replacing bathtubs with showers or changing towels and bed linen less frequently) because they thought that this would reduce guest satisfaction. Kelly and Williams [12] found that certain technological innovations, such as water flow timers, could be rejected by higher-category or more expensive hotels as they are associated with reduced comfort and satisfaction. None of the hotels in our area had sought environmental certification. The literature, however, indicates that more and more hotels are opting to obtain certification and participate in good practice schemes to respond to growing demands from clients and to motivate these to use resources more wisely [73].

Cost was the main barrier to implementing water-saving measures in our study, supporting findings from studies of other small and medium-sized hotels [36,74] and contrasting with the situation of larger hotels or hotels that belong to a chain, which generally have greater investment capacity and may also have to introduce certain measures as part of a broader policy. What is clear, however, is that client satisfaction is a crucial factor when it comes to decisions on which water-saving measures, if any, to implement. Concern about customer complaints regarding flow restrictions or being urged to reuse their towels or bed linen, for example, may act as a deterrent.

Active engagement of staff and guests in good water-use practices was not common at the hotels in our study. The staff at almost half of the hotels had not received any training, and just a third of the hotels had placed save water signs in key consumption areas. Contrasting with reports that the success of water conservation initiatives largely depends on the behavior of staff and guests [55], the hoteliers in our study believed that the responsibility of implementing and promoting water-saving measures lay with the government and other official bodies.

7. Conclusions

The main aims of this study were to analyze the implementation of water-saving measures at hotels in an increasingly popular tourist area in north-East Spain, to investigate factors associated with the implementation of these measures, and to explore incentives and barriers perceived by hotel owners and managers.

A range of factors were associated with the implementation and fostering of water-saving measures, including hotel size and category, and year of construction. The conversion of bathtubs to showers, for example, was largely linked to hotel size and category, and was more common in small, lower-category hotels. Size, by contrast, was the strongest determinant of staff training and the use of signs to encourage responsible water use, as both measures were more common in medium-sized and large hotels. The use of dual-flush toilet systems was associated with category

(less common in lower-category hotels). There was thus no single factor that explained any of the measures implemented.

The second main finding to emerge from our study is that cost incentives are more important than environmental incentives in most cases. There are, however, other cases when hotels have no choice but to implement certain water-saving measures if they are to comply with legal obligations.

There is no doubt that greater efforts are needed to encourage and help hotels to implement water-saving measures as part of a strategy that will result in a more sustainable use of water resources and provide hotels with a competitive edge by reducing costs. On a larger scale, these efforts will help to preserve the environment and ensure the future of the tourist industry, particularly in the current scenario of climate change. By reducing their water footprint, becoming more sustainable, and preparing for the effects of climate change, hotels will play an important role in shaping the future of the tourist industry. Efforts, however, are needed to increase guests' awareness of the role they can play in preserving the natural environment and to find a balance between the need to save water and the need to ensure guest satisfaction. Increased environmental awareness among hoteliers, clients, and employees is needed to facilitate the transition, as are strategies to combat the perception that placing restrictions on water use or adapting features that use large amounts of water will damage a hotel's image. Support from the government and other official bodies can facilitate and accelerate the adoption of necessary water-saving measures and help to reduce perceived barriers.

Our findings have several practical implications. First of all, they show a clear need for greater cooperation between government and the hotel sector regarding the creation of technical support and advisory services and programs to increase knowledge and awareness of climate change and water scarcity problems and solutions. Special consideration should be given to the needs of small and medium-sized, largely family-run, hotels that cannot afford to invest in water-saving measures, and particularly more costly and sophisticated systems, such as gray water reuse and rainwater harvesting systems.

On another note, possession of environmental certification attests to a hotel's commitment to saving water and upholding certain quality standards. None of the hotels in our study had environmental certification, but pursuing that route would logically result in better water-saving practices. Government incentives are needed to improve uptake in this area.

Although cost was perceived as the main barrier to implementing water-saving measures, many hotels owners and managers were unaware that money invested in relatively simple measures, such as low-flow devices and staff and guest education, can be recouped within a relatively short time. There is thus a clear need for more information in the sector. Hotel associations could take the lead by prioritizing activities such as information days and knowledge-sharing sessions to help hoteliers get up to speed on the possibilities available.

In addition, hotels that invest in water-saving measures should qualify for some form of tax relief or other incentives that recognize their efforts.

Another practical implication to emerge from our findings is related to the need to inform and educate hotel staff and guests about the importance of saving water and to encourage them to collaborate. Staff training and engagement is essential, particularly in small and medium-sized hotels, where formal training activities are largely absent. Guests also need to be engaged, as the effectiveness of many water-saving measures largely depends on their cooperation. In this respect, signs informing guests about water shortage problems and educating them about how they can make a positive impact during their stay can go a long way. Providing guests with information on room water usage might also help to encourage better practices and hotels with individual monitoring systems could also award good behavior by offering discounts on stays or other services. Finally, hotels should also inform guests and potential guests about water-saving measures in place by providing information both on site and through the hotel's website and other booking channels.

In conclusion, by holding in-depth interviews with managers and owners from different types of hotels in the study area, we were able to gain important insights into perceptions of incentives and barriers to good water-saving practices in this sector that should help to guide initiatives in this area.

Further research: Our findings show that hotel owners and managers in the Muga river basin need to take a more proactive approach to water use and management. Hotel guests and staff, however, also have a crucial role in ensuring the effectiveness of many measures, and their water-saving habits and attitudes should be a topic of future studies.

It would also be interesting to conduct a similar study in other types of accommodation establishments, such as campsites, which have burgeoned in the Muga river basin and other tourist destinations along the Mediterranean coastline in recent decades.

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