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Tourists, Weather and Climate. Official Tourism Promotion Websites as a Source of Information

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Abstract: On the basis of the establishment and analysis of 29 indicators, this article analyses the quality of the climate and meteorological information that is provided to tourists on the websites of the bodies responsible for promoting Spanish tourist destinations at a state and regional level. Official tourism promotion websites are a prominent source of information for tourists, so it is necessary to control the quality levels of the information contained in them. The objective is to detect weaknesses that can be corrected to achieve the improvement of the public service that is offered by these websites. The results indicate that the weather information provided on the institutional websites does not meet the information needs of tourists in the different phases of the travel experience, and as a result contributes little to tactical and strategic decision-making regarding the various activities for tourists, in which the weather or climate are relevant factors. This could make it more difficult for them to interact and integrate with the destination and worsen the quality of their tourist experience.

Keywords: climate; weather; information; indicators; tourism promotion websites

1. Introduction

Climate and meteorological information plays an important role in today's society. There is very high demand for this type of scientifically processed information, which is explained in a practical way that enables the different end users to use it when taking decisions. Climate and meteorological information must be regarded as a service that should be offered to the user in the most appropriate form possible. It should not only seek to inform about, but also inform for, which, as Metzler [1] points out, means that it must be useful.

In Spain there is widespread public demand for climate and meteorological information, as revealed in a survey entitled *Perceptions of Meteorology*, conducted by the Spanish Sociological Research Centre (CIS) in 2011 [2]. In this survey 27.1% of those interviewed (N = 2958) considered that the role of climate and meteorological information in Spanish society is very important, 52.5% said it was quite important, and 11.7% important. A mere 7.3% considered it of little importance, while the "don't knows" (0.7%), and those who considered it unimportant (0.7%) were almost negligible.

This widely-held opinion as to the importance of climate and meteorological information is even more true in economic sectors or activities, such as tourism, which are more sensitive to and/or more dependent on the weather and the climate, and therefore are more vulnerable to atmospheric developments (Table 1). It is well known that the inter-relations between tourism and the climate are varied and complex [3,4], and that atmospheric factors are key aspects in the planning of tourism destinations and in the travel experience itself [5–7].

Table 1. How often do you use information about the weather for each of the following purposes?

Purposes	Always or almost Always (%)	Often (%)	Sometimes (%)	Not Often (%)	Never or almost Never (%)	Not Applicable I Never Do This Activity (%)	Don't Know (%)	No Reply (%)
To decide what clothes to wear (you or your family)	10.3	19.4	19.9	16	33.6	0.4	0.2	0.1
To plan open-air or weekend activities	18.6	32.5	20.1	10.5	16	2.1	0.1	0
To plan social events (e.g., birthday parties, celebrations)	9.6	20.3	18.5	18.8	30.3	1.7	0.3	0.4
To plan holidays or trips (destination, dates, transport)	17.8	23.8	18	13.2	23.6	3.3	0.1	0.2
To decide on the routes you take each day	7.6	16.7	16.2	19.9	37	2.1	0.1	0.4
To decide on work and work-related activities	9.1	12.3	9.2	13.2	33.9	21.6	0.3	0.2
To know what the weather will be like in general, to be informed	25.8	40.3	18.2	6.9	8.1	0.3	0.1	0.3

Source: Survey on Perceptions of Meteorology [2].

From the point of view of planning, it is important to make clear that the weather, intra- and inter-annual climate variability, extreme meteorological phenomena, and climate change are basic elements to be taken into account in regions that are tourist destinations, due to their influence on competitiveness and sustainability in both the short- and long-term. Some types of tourism are more sensitive to the weather than others, such that the weather can influence or limit the scheduling and normal performance of tourism activities [8–11]. In the same way in tourism destinations, intra- and inter-annual climatic fluctuations have a notable influence on tourism seasonality, water supply, artificial snow production, energy costs, or the need to water plants and gardens, to cite just a few examples [12–18]. Extreme meteorological phenomena (e.g., heatwaves, floods, droughts) can jeopardize to different extents the safety of the destinations, and must therefore be taken into account in early warning systems, in the communication of risks to travel agents and to the tourists themselves, and, of course, in town planning at the destination [19–21]. Weather and climate are therefore key elements for tourism, such that any change in current atmospheric conditions could have impacts of different kinds on the sector, in some cases being highly significant [22–24].

Weather and climate also play an important role in tourist/consumer decision-making and in their travel experience. The climatic and meteorological conditions both in the tourist's place of origin and in their chosen destination are important motivating elements, and are taken carefully into account in the planning of the trip [25–27]. Weather and climate also affect the tourism experience, and by extension, visitor satisfaction [28]. All of these factors have led climate to become an important aspect of the image of the destination due to the enormous power of attraction that it has over the tourist/consumer [29,30].

The importance of weather and climate in the tourist's planning and choice of destinations and in their holiday experience highlights the importance of climate and meteorological information for the normal pursuit of this activity [31–33]. Providing information that meets the needs of different users (e.g., tourists, tour operators, tourism planners, hoteliers) at different spatial and temporal scales could be a key factor for an adequate decision-making that guarantees the success and maintenance of the tourist destinations (Table 2). This is why, as Rutty and Andrey [34] make clear, the studies that deal specifically with the importance of weather information for the normal pursuit of leisure and recreation activities are becoming increasingly important in scientific literature (Table 3). In this context, this article analyses the characteristics and shortcomings of the climate and meteorological information provided to tourists on the institutional websites for promoting tourist destinations in Spain. We aim to find out the strengths and weaknesses of this information and so help improve the management of tourist destinations and the quality of the tourist experience.

2. The Tourist as a User of Climate and Meteorological Information

Although there are clearly a wide variety of users of climate and meteorological information, in this paper we will be focusing on tourists. As Scott and Lemieux [18] point out, the climate and meteorological information that is provided to the tourist deserves particular attention given the fundamental role it plays in the different phases of the holiday experience (Table 4).

Table 2. Utility of climate and meteorological information for different tourism stakeholders.

Type of Information		Tourism Stakeholders		
		Public/Private Stakeholders at the Destination	**Tour Operators**	**Tourists**
Past: Information about climate history		Decisions on where to locate a tourist resort; Investment decisions; Assessment and management of climate risk; Contract insurance that provides protection for investments(e.g., productive, infrastructure, accommodation, transport) in the face of the occurrence of extreme climate events; Marketing-promotion; Design of tourism installations and infrastructure; Tourism policy development; Territorial planning development.	Investment decisions; Assessment and management of climate risk; Hiring climate insurance as financial instruments for risk transfer; Marketing-promotion.	Choice of destination; planning of trip; Insurance contracting by tourist based on climate indexes and risk analysis.
Present: Observation of weather and short-term weather forecasts (hours-days)		Decision-making (open/close/ restrict access to tourist attraction; modify opening/ closing times); energy management of buildings/tourism facilities; disaster risk management.	Decision-making (modify the schedules of flight to guarantee the "back to back" operations); Scheduling of activities; Disaster risk management.	Decision-making (to choose outdoor/indoor activities); Scheduling of activities.
Future	Medium- and long-term weather forecasts (weeks/seasonal forecast)	Occupation forecast; Income forecast; Forward planning of recruitment; Investment decisions; Contract insurance that provides protection for investments against unfavourable seasonal predictions; Planning of activities.	Occupation forecast; Income forecast; forward planning of recruitment; investment decisions; Taking out of insurance; Planning of activities	Planning of activities; decision-making (advance/delay the holiday period).
	Climate change projections	Decisions on where to locate a tourist resort (e.g., ski resorts/altitudinal limits); Design of tourism facilities and infrastructures; Investment decisions; Development of adaptation/mitigation strategies; Development of tourism policy; Development of territorial planning; Assessment and management of climate risk; Sustainability of destinations.	Investment decisions; Product design; Development of adaptation/mitigation strategies; Assessment and management of climate risk; Sustainability of destinations.	Development of adaptation/mitigation strategies; Sustainability of destinations.

Source: Adapted from Scott et al. [35].

Table 3. Main subjects discussed in research on weather information/tourism activities.

Subject	Bibliographical Reference
Theoretical and conceptual reflection: Weather information and tourism.	Perry (1993) [36] Altalo and Hale (2002) [31] De Freitas (2003) [32] Matzarakis (2006) [37] Scott and Lemieux (2010) [18] Scott et al. (2011) [35]
Proposal for a "leaflet" with climate information for tourists.	Zaninovic and Matzarakis (2009) [33]
Analysis of the role of climate information in tourist decision-making (choice of destination).	Hamilton and Lau (2005) [6] Gossling et al. (2006) [38]
Assessment of the weather information required for decision-making by tourists and different stakeholders in the tourism sector.	Gamble & Leonard (2005) [39]
Comprehension of how meteorological information is obtained by tourists, how it is perceived, and how it is used for planning and carrying out leisure and recreation activities.	Lim et al. (2010) [40] Rutty & Andrey (2014) [34]
Study of the use of forecast and weather-related information by different tourism entrepreneurs and stakeholders.	Ayscue et al. (2015) [41]
Analysis of the characteristics and shortcomings of the climate and meteorological information provided to tourists on the websites of the main public and/or private climate and meteorological information services and other instruments used to promote these destinations.	Gómez-Martín (1999) [42] Wilson and Becken (2011) [43] Gómez-Martín et al. (2014) [44]

Table 4. Influence of climate and meteorological information on tourists'decisions.

	Pre-holiday period		**Holiday period**	**Post-holiday period**
	Planning of the trip		**Trip**	**Overall assessment of the trip**
Decisions taken by the tourist / Perceptions	Motivation trip Destination choice Possible dates Takes out insurance	Destination choice in "last-minute" bookings Planning activities Itinerary/Routes	Planning of activities Enjoyment Safety Comfort Tourist spending Satisfaction	Memories Satisfaction Loyalty Recommendation
Weather/Climate	Climate in home region Weather in home region Climate at destination Weather at destination		Weather at destination	Climate in home region Weather in home region Weather/Climate at destination
	Month **Week** **Day**		**Day** **Week**	**Months** **Years**

Source: Adapted and modified from Scott and Lemieux [18].

The tourist, therefore, plans his or her holiday in advance during the pre-holiday period [6]. Climate and weather are normally important motivators in that the weather conditions at home form the setting in which the decisions are taken [25,27,30,37]. In this phase potential tourists choose the destination and the dates they will be travelling, and to this end try to find out above all about the climate in the possible destinations that they are considering [6,18]. This information can be

acquired from different sources—own knowledge, travel guides, information leaflets, promotional websites, social networks, web 2.0—and will enable them in the months leading up to their trip to choose the destination and book their holiday [37]. As the date of the trip approaches (two or three weeks beforehand), the tourists begin to think about the weather at their chosen destination and soon become tireless followers of the weather forecasts that are offered by the media and by specialized public and private bodies that offer this kind of service [4]. On the basis of this weather information, they then plan possible excursions or activities, choose routes or itineraries, and decide what to pack. This information is also used by tourists who make last-minute bookings, a market segment that has grown spectacularly over the last decade [18].

The time comes for the trip and once the tourists arrive at their destination, they continue to be interested in the weather conditions that they are now experiencing in situ [6,37]. These weather conditions and the forecasts for the coming days help them to organize their activities, influence their behavior, level of spending, safety, enjoyment, and comfort [4,18]. If by the end of the holiday, all has gone as expected, the experience gives the tourist an initial impression of satisfaction.

Once the trip has finished and the tourists have returned home, they gather their memories together, and compare the weather that they experienced in situ with their prior expectations [4,6,18]. This comparison, which is made within the weather context of their place of origin, determines to some extent their level of satisfaction, their future loyalty to the destination, and their potential as a promoter thereof [6,18].

It is clear then that the tourist/consumer requires climate and meteorological information during all the different phases of the tourism experience. In order for this experience to be satisfactory, they not only require their climate and weather expectations to be fulfilled, but also need certain information requirements to be met. There are four main requirements, using the terminology used by the World Meteorological Organization (WMO), but are applicable to any sector [45,46]:

1. *Availability:* tourists must receive the information they need when they need it. In order for the climate and meteorological information that is offered to them to fulfil the criterion of *availability*, the activities that tourists can do or take part in at the destination must be known. This knowledge is very important in that it can even affect the infrastructure of the weather services (for example the choice of a suitable site for an observation system so that it can provide useful data for the activity; the format in which the forecast is issued such that in certain cases the traditional text-based format is replaced or complemented with forecasts in digital, graphic, or grid formats).
2. *Reliability:* tourists must receive the information on time, regularly, and without omissions. They must receive the information on demand and its effective dissemination and correct reception must therefore be guaranteed.
3. *Credibility:* tourists will use the information they are given if they believe that it is accurate. The source therefore plays a fundamental role. Boosting confidence in the quality of the information and admitting its limitations (sometimes forecasts do not come true) are important aspects of this requirement.
4. *Usefulness:* tourists need information that is tailored to their level and their needs. What are the most relevant atmospheric parameters to provide for each tourist activity and destination? What is the best way to present the information so that the tourists can take maximum advantage of it? What type of additional information do users or tourists need so that in certain weather conditions their comfort, safety, and enjoyment needs are satisfied? These are all important questions that must be answered.

The sources, the information providers, and ICT (Information and Communications Technologies) all play a fundamental role in ensuring that these requirements are met. In the last two decades, the sources and the providers of climate and weather information have diversified greatly as have the ways of reaching final users (in our case the tourist/consumer). Almost all countries have one or various public agencies that are responsible for supplying climate and meteorological information

services and/or products to a variety of final users. As a result, for example, Spain today has a nationwide agency (AEMET) and three regional agencies (Servei Meteorològic de Catalunya, MeteoGalicia, and Euskalmet in Catalonia, Galicia, and the Basque Country, respectively). In addition to these public bodies there are also a number of private organizations that have proliferated due to the high commercial added value of these kinds of services. Sources of primary information also include a variety of research or tourism-related bodies (ski resorts, sailing resorts), which produce useful data specifically related to their particular interests.

This primary information is then disseminated by a range of providers. Often, the agencies and institutions that generate the information also disseminate it to final users. In other cases, however, there are intermediaries who do this job. In this sense, it is important to highlight the role that is played by some of the promotional and information vehicles that are used by the destinations themselves (e.g., institutional websites for the promotion and marketing of the destination, tourist leaflets, information panels at the destination) or certain tourist associations.

As regards the ways of reaching users/tourists, in addition to the traditional means of personal communication, we now have the mass media, in which the Internet plays the undeniable starring role. The WMO stated "without underestimating the importance of the benefits arising from scientific progress and the capacity of computerized calculation over the last decade, the most useful advance for the provision of climate and meteorological services from the point of view of the users has been the world wide web" [45]. The Internet has facilitated our access to knowledge and information at any time and anywhere so enabling the user to get involved in decision-making processes designed specifically for him. In the tourism sector, too, there are various researchers who argue that the Internet has become the main container or purveyor of tourist information and the main means of transmission and dissemination [47–49].

ICT has therefore enabled the development of new ways of compiling, transmitting, and using information in real time. This is important for the provider of services and also for the user/receiver, in our case, the tourist. The boom in mobile communication brought about by the appearance and development of the mobile phone and the possibilities of interaction offered by the Internet—social networks, web 2.0 [50,51]—help explain why the Internet has become the second most used source of information for decision-making by Spanish travellers after recommendations from friends and family members [52], and the most used source of information for decision-making of foreign tourists who come to Spain [52].

However, the influence of the Internet, mobile technology, and the web 2.0 goes much further than the search for information to aid decision-making in the pre-holiday period (Table 5). It also has an essential role in the holiday period itself and beyond [40,53]. Examples of this include the fact that the number and the variety of holiday-related activities conducted via the mobile phone in the holiday destination increase year by year (around 61% of Spanish travelers own Smartphones [54]).The activities that are most frequently performed by Spanish travellers include searches involving maps and addresses, information about the destination (including for example weather information: In Spain, applications about weather information services are amongst the most frequently downloaded by users (29%), together with others relating to social networks (44%), GPS (33%), news (30%), and music (30%) [54]), updating of social networks, searching for travel products, and downloading of applications (apps) about the destination, according to a report by Lookinside.travel [55].

Table 5. Main means of acquisition/transmission of climate and meteorological information.

	Pre-Holiday Period Planning of the Trip		**Holiday Period the Trip**	**Post-Holiday Period Assessment of the Trip**
Tourist	Demand for information Climate	Weather	Demand for information Weather	Provides information Climate/Weather
Main means of acquisition/transmission of climate and weather information	Travel guidesLeaflets Previous knowledgeInternetTour OperatorsTravel AgenciesWeb 2.0	InternetPressTvRadio	Information in situ InternetAppsPressTVRadio	Web 2.0.:BlogsSocial networksNews aggregators, Images (Flickr, Instagram, etc.)
	Months Week Day		**Day Week**	**Months Years**

In the post-trip phase, tourists also tend to use the Internet, this time to provide information for example about the weather or climate to other tourists, exchanging experiences, offering opinions and recommendations, and uploading photographs that may be useful to other visitors (Table 5). Comments that are made by previous visitors to a destination influence the decision-making of other tourists due above all to the fact that they are based on real experience and can be highly motivating. As Prahalad and Ramaswamy point out "users are no longer prepared to accept experiences manufactured by companies. Increasingly, they want to change or shape their own experiences by themselves, either individually or through the experiences of other consumers" [56].

Technological progress has also increased the possibilities of user access to information anywhere and at any time. In the case of tourists, improved access to high-quality climate and weather information could enhance the interaction and integration of the user in the destination, which would help increase the quality of the tourist experience, a key reference in the drive towards "New Intelligent Tourist Destinations".

3. Objective and Study Area

Tourism is therefore an industry with intense and continuous flows of information [57,58]. The quantity and complexity of the information that is handled by this sector means that the possibility of accessing this information quickly and easily can become a decisive element in the process of creation of the knowledge that is required for decision-making. The Internet has increased and enhanced the consumption of tourist information: users enter the virtual world in search of everything they need to organize and carry out their trip with total satisfaction. Tourist destinations have appreciated the importance of having their own official website, which allows them to present their own image of the resort online [59]. As a result, institutional tourism websites have become powerful communication tools that offer a great deal of information. Public bodies make use of the wide variety of functions and applications of these websites "to find and meet their target audience better and, in this way, achieve the informative, communicative, economic and image goals established in their promotion strategies" [60].

As mentioned earlier, institutional or official tourism websites are normally important providers of climate and meteorological information and often appear amongst the sites most frequently consulted by tourists when taking decisions during the pre-holiday phase. Tourists also consult them at the destination for the weather information they require during the holiday itself. Afterwards, in the post-holiday phase, they also use these websites to provide information to other tourists using the Web 2.0. The result is that the weather information displayed on these websites must draw a careful line between the demands for accurate information and the need to present a certain image for promotional purposes. It must therefore strike a balance between principled information interests and the marketing requirements of the information providers themselves. The hypothesis on which our research is based therefore sustains that the weather and climate information that is offered by institutional websites is insufficient and does not meet the information needs of the tourist/consumer. In order to test this hypothesis, we have evaluated for the Spanish case the quality of the climate and meteorological information that is provided to tourists on the websites of the bodies responsible for the tourist promotion of the destinations at national and regional level. *Official tourism promotion websites are not only addressed to international tourists, but are also widely consulted by national tourists who move within the*

territory. Our objective is to identify the strengths and weaknesses of this information to help improve the management of destinations and the quality of the tourist experience from the point of view of enjoyment, comfort, and safety.

This objective is of special interest for the geographical area (Spain) we are studying, in which tourism is one of the most important business sectors, contributing 10.9% of GDP [61]. Spain is one of the world's leading tourist destinations, ranking third in the world in 2016 in terms of number of arrivals and second in terms of the income generated [62]. An estimated 115 million foreign visitors crossed the Spanish frontiers, of whom 75 million could strictly speaking be classified as tourists (the rest are hikers without overnight stay) (Table 6). This figure for foreign visitors is of course incremented by internal tourism by Spaniards. In 2016, Spanish citizens made 182 million trips, most of which (170 million) took place within Spain itself [63] (Table 6). Spain's popularity as a tourist destination has traditionally been based on a model specializing above all in sun and beach tourism, which has centred on the Mediterranean coast and the Balearic and Canary Islands. The country's rich heritage has also ensured that in recent years there has been a substantial increase in tourism to historic cities, and rural and inland tourism has also taken off. These changes have helped contribute to the territorial re-equilibrium of the tourism sector.

Table 6. Distribution of tourists by region of destination.

Autonomous Community/Autonomous Cities	Internal Tourism % Vertical	International Tourism % Vertical	Tourism GDP %
Andalucía	18.2	13.1	12.5
Aragón	4.5	0.5	7.7
Asturias	2.9	0.3	10
Baleares	1.7	17.5	44.8
Canarias	3.5	17.6	31.4
Cantabria	2.5	0.5	10.9
Castilla La Mancha	7.2	0.3	12
Castilla y León	11.6	1.5	10.2
Cataluña	15	25.9	12
Ceuta	0.2	0	-
Comunidad de Madrid	6.2	7.0	6.3
Comunidad Valenciana	10	9.6	12.6
Extremadura	3.1	0.3	5
Galicia	5.6	1.6	10.6
La Rioja	1.4	0	9.8
Melilla	0.2	0	-
Murcia	2.4	1.5	9.8
Navarra	1.6	0.4	6
País Vasco	2.3	2.4	5.8

4. Methodology

To this end, we began by the selecting the most suitable indicators (Table 7) for measuring the quality of the climate and the meteorological information that is provided to tourists on institutional websites that promote destinations at both a national and regional level (Autonomous Communities and Autonomous Cities). In Spain, the model of State established in the Constitution of 1978 made the planning and promotion of tourism the responsibility of the Autonomous Communities and Cities and of local government entities (e.g., provinces, town councils, associations of town councils). Within this context, and given the almost impossible task of assessing the thousands of local government entities that are spread across the country, we decided to focus this research on the Autonomous Communities (17 in total) and Autonomous Cities (2). As these organizations have the responsibility and the necessary powers to promote tourism in their respective areas, they implement various strategies to promote their region as a holiday destination. The most typical strategy is to create official websites: each Autonomous Community and each Autonomous City has an official website for promoting tourism, to which we should also add the two "official support websites"

run by the Spanish Central Government. In this paper, we analyzed all 21 of these websites in their Spanish language version (although almost all of them also have literal translations in other languages). The indicators we used (Table 7) cover, first and foremost, the technical (information architecture), communicative (presentation of information), and relational (devices, links) aspects, normally considered in assessments of the quality of tourism promotion websites [47,48]. The indicators also cover the recommendations established by the WMO [45], in particular those relating to the *Credibility* (Source) and *Usefulness* of the meteorological and climate information in the different phases of the tourist experience (type of information, type of variable, type of value, drawing up and processing of statistics, description of climate for tourism purposes, additional information, warnings, and complementary information). In this case, if we consider the tourism climatology framework within which this proposal falls, the indicators have taken into account the three facets of climate conceptualized by Perry and De Freitas [32,36], which themselves are closely linked with the three demands of the tourist conceptualized by Besancenot [64]: the thermal facet, which is linked to a demand for thermal comfort (including variables such as air temperature, wind speed, solar irradiance, humidity, and comfort indices), the physical facet of climate related to the tourist's need for safety (including variables such as wind speed, amount and duration of precipitation, and the ultraviolet index) and the aesthetic facet, which is related with the tourist's demand for enjoyment (including variables such as the number of hours of sunshine, cloud cover, visibility, mist and fog, and the length of the day).

Table 7. Indicators that assess the quality of climate and meteorological information.

Information Architecture	a. Presence of a recognizable link	0 No			1 Yes
	b. Visualization level	0 Nil	1 Low	2 Average	3 High
	c. Presence of meaningful descriptive labels	0 No			1 Yes
Type of information	d. Past: Historical climate information	0 Nil	1 Low	2 Average	3 High
	e. Present: Observation of weather and short-term weather forecasts (hours and days)	0 Nil	1 Low	2 Average	3 High
	f. Future: Weather predictions in the medium- and long-term (weeks/seasonal forecast)	0 Nil	1 Low	2 Average	3 High
Type of variable	g. Enjoyment: Hours of sunshine, state of the sky, duration and amount of rain	0 Nil	1 Low	2 Average	3 High
	h. Comfort: Felt air temperature, maximum temperature, minimum temperature, relative humidity, wind speed and direction	0 Nil	1 Low	2 Average	3 High
	i. Safety: Wind speed, intensity of rainfall, UV index	0 Nil	1 Low	2 Average	3 High
Type of value	j. Normal	0 No			1 Yes
	k. Extreme	0 No			1 Yes
Preparation and processing of statistics	l. Average values and centrality values	0 No			1 Yes
	ll. Probabilities	0 No			1 Yes
Climate Description aimed at tourists	m. Suitability indices	0 No			1 Yes
	n. Types of weather	0 No			1 Yes
Additional information	ñ. Water temperature, state of the sea, air quality and similar, phenology	0 Nil	1 Low	2 Average	3 High
Warnings	o. Warning, alert alarm	0 Nil	1 Low	2 Average	3 High
	p. Emergency procedure	0 Nil	1 Low	2 Average	3 High
Complementary information	q. Recommendations	0 Nil	1 Low	2 Average	3 High
Presentation of information	r. Written text	0 Nil	1 Low	2 Average	3 High
	s. Numerical	0 Nil	1 Low	2 Average	3 High
	t. Graphics	0 Nil	1 Low	2 Average	3 High
	u. Maps	0 Nil	1 Low	2 Average	3 High
	v. Languages	0 Nil	1 Low	2 Average	3 High
Source	w. Citing the sources used	0 No			1 Yes
	x. Webcams	0 No			1 Yes
Devices	y. Apps , widgets	0 No			1 Yes
	z. Web 2.0	0 No			1 Yes
Links	aa. Interesting links	0 Nil	1 Low	2 Average	3 High

Following the methodological recommendations that are proposed in research by Fernández et al. [47] and Law et al. [48], we designed a template for the analysis of websites, in which we included the corresponding indicators and scales for evaluation. Each indicator has been calculated using scales that measure its absence (0) or presence (1) in the website analysed, or scales that express a broader qualitative valuation of the item being considered (no presence whatsoever 0; acceptable or low presence 1; good or average presence 2; very good or high presence 3). Some indicators show a clearly dichotomous response (0–1). However, others present nuances related to the level of information. For these, we have introduced a scale between 0–3: no presence whatsoever 0; acceptable or low presence 1 (offer information about 1 or 2 parameters for each type of information or type of variable, include 1 or 2 sections warnings, 1 or 2 section advice, maps, graphs, etc.); good or average presence 2 (offer information about 3 parameters for each type of information or type of variable, section advice, etc.); very good or high presence 3 (offer information about more than 3 parameters for each type of information or type of variable, section warnings, tips, etc.). Our analysis consisted of: (a) quantifying each indicator individually across all 21 promotional websites, and (b) adding up the total score for all of the indicators for each of the websites to calculate a Quality Index for each one based on the percentage they achieved of the maximum possible score (100%). The websites were analysed between December 2014 and December 2015 by the authors. A description of the indicators we used is set out in Table 7:

1. Information architecture. This refers to the structuring, organization, and labelling of the elements that make up the information areas within the website to facilitate the location of (or access to) the climate and meteorological information it contains and so improve its usefulness and use by tourists and other users. Of the various possible aspects to evaluate in this section, we considered those related to structure and navigation (the presence of a recognizable link and the level of visualization) and labelling (presence of meaningful descriptive labels). The websites must present easily recognizable links on the homepage with a clearly descriptive label, for example "Climate and Meteorological Information".
2. Type of information. These websites must clearly distinguish between information about the weather and information about the climate. The information they provide about the weather should distinguish between observation and prediction, the latter in the short-term (hours and days), medium-term (weeks), and long-term (seasonal prediction).
3. Type of variable. The websites must provide information about variables that affect the conditions for tourists' enjoyment (e.g., sunlight, state of the sky, and duration and amount of rainfall), comfort (e.g., felt air temperature, maximum temperature, minimum temperature, relative humidity, wind speed and direction), and safety (e.g., wind-speed, intensity of the rain, UV index), which brings us on to the type of value.
4. Type of value. The climate and weather information provided to the tourist not only refers to "normal" values but also to "extreme" values and phenomena.
5. Drawing up and processing of statistics. Depending on the type of information, the websites should be able to provide not only average values and centrality values, but also probabilities.
6. Description of climate for tourism purposes. In addition to the conventional information resulting from the measurement of the different atmospheric parameters, the websites should prepare information and provide indices as to the suitability of the climate for particular tourist activities (covering at least the main kinds of tourism that take place in the geographical sphere of reference).
7. Additional information. There are other kinds of environmental information that may be extremely useful for tourists depending on the particular kind of tourist activity and the geographical environment in which they intend to do it. The following information may therefore be of great interest for the tourist: information about water temperature, wave levels, air quality (e.g., levels of atmospheric pollutants and pollen), and the thickness and quality of the snow.

8. Warnings. In the climate and weather information sections, these institutional websites must provide warning alert or alarm information in the event of extreme weather phenomena and emergency procedures that meet the needs of the tourism sector and of potential users-tourists (in this last case, see complementary information). The establishment of different sections is highly recommended (section on meteorological warnings, section on hydrometeorological alerts, section on wave alerts, alerts about episodes of pollution, etc.).
9. Complementary information. The websites should advise potential users as to what to do in the event of certain meteorological phenomena or atmospheric situations (e.g., heatwaves, intense rainfall, floods, high levels of UV radiation). The establishment of different sections is highly recommended (section on advice on action against weather alerts, section on advice on hydrometeorological warnings, section on advice on wave alerts, section on advice on air pollution alerts, etc.).
10. Presentation of information. The weather information sections should consider the possibility of offering information in different formats (written text, numerical, graphics, and maps) and languages.
11. Source. The websites should cite the sources of their information.
12. Devices. New interactive technologies should be made available to the tourist to make them feel more involved in their chosen destination, so enhancing the quality of their holiday experience. In this sense offering free apps specific to the destination with weather and environmental information contents. Widgets, webcams that offer real-time images about some point of interest (e.g., the beach or a ski slope), and social network sites may be both interesting and useful for the user.
13. Links. Finally, the websites must provide users with interesting links that enable them to broaden the scope of their weather and environmental information.

5. Results

Our analysis of the tourism promotion websites run by the Spanish Central Government and Regional Governments (Autonomous Community and Autonomous Cities), according to the indicators set out in the methodology section shows that, with few exceptions, they all have some form of climate and/or meteorological information about their destinations (Table 8). Having said this, in some of these websites the tab or link to the weather information is not easily visible or recognizable, and often users have to click through two or three pages to reach the weather section.

When comparing the information, they provide about the climate with that about the weather, we found that climate information generally had a lower profile than weather information (Table 8), to the extent that 13 of the 21 profiles that we analysed had no systematized information of any kind about the climate, although they did have some indirect references in the form of photographs, logos, or in the main body of general information about the destination. By contrast, only six of the webs we consulted had no information about the weather on their websites. In both cases, only 10 of the websites cite the source of the information, an omission that reduces the credibility of the information. All of the websites that were analyzed offer climate and meteorological information in various languages in addition to the official language.

Table 8. Detailed overall score for the indicators we used us to assess the quality of the climate and meteorological information offered by Spanish tourism promotion websites.

	Information Architecture			Type of Information			Type of Variable			Type of Value		Preparation and Processing of Statistics		Climate Description Aimed at Tourists		Additional Information	Warnings		Complementary Information	Presentation of Information					Source		Devices			Links
	a	b	c	d	e	f	g	h	i	j	k	l	ll	m	n	ñ	o	p	q	r	s	t	u	v	w	x	y	z	aa
Spain info	3	3	3	3	1	1	1	1	0	3	0	3	3	0	0	1	0	0	0	1	1	0	1	3	0	0	3	3	0
I Need Spain	3	3	3	3	1	1	1	1	0	3	0	3	3	0	0	1	0	0	0	1	1	0	1	3	0	0	3	3	0
Andalucía	3	2	3	3	1	1	1	1	0	3	0	3	0	0	0	0	0	0	0	1	1	1	1	3	3	0	0	3	0
Aragón	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1
Asturias	3	1	3	0	1	1	1	1	0	3	0	3	0	0	0	0	0	0	0	0	1	1	0	3	3	0	3	3	1
Baleares	3	2	3	0	2	2	1	1	1	3	3	3	3	0	0	1	1	0	0	1	1	0	1	3	3	0	3	3	1
Canarias	3	3	3	3	2	2	2	2	1	3	0	3	3	3	0	1	0	0	2	2	2	2	2	3	0	0	3	3	2
Cantabria	3	2	3	3	1	0	1	1	0	3	0	3	0	0	0	1	0	0	0	1	0	0	2	3	0	0	3	3	0
Castilla La Mancha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Castilla y León	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Cataluña	3	3	3	0	1	1	1	1	0	3	0	3	3	0	0	1	0	0	0	0	1	0	1	3	3	0	0	3	1
Com. Valenciana	3	1	3	0	3	1	2	2	1	3	0	3	3	0	0	1	0	0	0	0	2	0	0	3	3	3	3	3	0
Extremadura	3	3	3	0	1	1	1	1	0	3	0	3	0	0	0	0	0	0	0	0	1	0	0	3	3	0	0	3	0
Galicia	3	2	3	0	3	1	3	2	3	3	3	3	3	3	0	3	3	3	3	2	2	2	2	3	3	0	3	3	1

Table 8. *Cont.*

	Information Architecture			Type of Information			Type of Variable			Type of Value		Preparation and Processing of Statistics		Climate Description Aimed at Tourists		Additional Information	Warnings		Complementary Information	Presentation of Information				Source		Devices		Links
	a	b	c	d	e	f	g	h	i	j	k	l	ll	m	n	ñ	o	p	q	r	s	t	u	v	w	x	y	z	aa
Madrid	3	1	3	3	2	2	1	1	1	3	3	3	3	0	0	1	1	0	0	1	1	0	1	3	3	0	3	3	1
Murcia	3	3	3	3	1	1	1	1	0	3	0	3	3	0	0	0	0	0	0	1	1	0	0	3	0	0	0	3	0
Navarra	3	2	3	3	1	1	1	1	0	3	0	3	3	0	0	0	1	0	0	1	1	0	1	3	3	0	3	3	1
País Vasco	3	1	3	0	1	1	1	1	1	3	3	3	3	3	0	1	1	0	1	1	1	1	1	3	3	3	3	3	1
La Rioja	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1
Ceuta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Melilla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0

0 Nil / No **1 Low** **2 Average** **3 High / Yes**

The sites containing climate information generally offer a written description and only four of them use graphics and monthly numerical values. The parameters that appear most frequently are temperatures (average maximum and average minimum), rainfall, and hours of sunshine, although some offer data on sea temperature, wind speed, relative humidity, and/or atmospheric pressure. There are almost no references to extreme values and events. It is curious that in the promotional websites that present the information in descriptive text format, a lot of the information is overly "generalized", "vague", and/or "wrong". Some websites, for example, confuse average monthly temperatures and average maximum temperatures, while the figure for hours of sunshine on the Spain.info website: "3000 h of sunshine a year in Spain" refers in fact to the south-east and conceals the enormous differences between the 1600 h of sunshine on Spain's north coast and the 3400 h in the Canary Islands.

Although it is true that the climate information and parameters provided on the different websites that we consulted may be of information for the tourist, it is not clear whether they will be very useful to them. In other words, there are few websites that offer climate information that is adapted to the specific needs of the traveller. None of the websites provide for example calendars with probabilities of types of weather or calendars showing the times of the year in which the climate is suitable for the different kinds of tourist activities. The exception is the Canary Islands tourism website, which in its section *elmejorclimadelmundo.com* (which could be translated as "the best climate in the world.com") offers information that is adapted to the needs of the user, with comparative tools, advice to help you make the most of their benevolent climate, and expert opinions, for example.

As regards the meteorological information, we noted that on most websites it is very brief and with a few exceptions only provides the figures for maximum temperature, minimum temperature, probability of rain, state of the sky and a forecast with these basic parameters for 1–3 days (Table 8). Few websites offer additional information about the UV index, felt air sensation, wind speed and direction, water temperature, and wave levels, in numerical, graphic and/or cartographic form. Some websites, including the ones about Galicia, the Balearic Islands, and the Basque Country, include a direct link to the source of the information, which allows the tourist to access more detailed information that may be of more use to them (index showing the suitability of the weather conditions for a particular type of tourism, weather warnings and recommendations, and medium-term forecasts, for example). As regards webcams and apps with weather information that is adapted to the needs of the tourist, note that they do not have a widespread implementation and sometimes their character is not free. By contrast, the different Web 2.0 tools are already much more prevalent on these websites (although in this analysis we did not evaluate their weather and climate information). Last of all, various websites offer external links that enable users to obtain more detailed atmospheric and/or environmental information (e.g., links to ski and sailing resorts).

The quality of the climate and meteorological information varies notably between the different websites (Table 9). Nonetheless, the Quality Index that was calculated for each website reveals the generalized shortcomings in the fulfilment of the requirements listed above, given that even those in the top positions achieve scores of around 60–76% (Table 9). The websites for Galicia and the Canary Islands achieved the highest scores, while those for the inland regions, with the exception of Madrid and Extremadura, achieved the lowest. The high scores obtained by the Canary Islands and Galicia could be the result of different approaches. In the Canary Islands, tourism represents over 31% of GDP. A large part of the marketing strategy for its tourism-based economy focuses on the benevolence of its climate. As the climate is its main resource and tourist attraction factor, it is also the dominant feature of the Canary Islands website. The same cannot be said for Galicia, which from a weather point of view could be described as a "rainy destination". The huge variability in the weather conditions, which could create uncertainty in tourists and perhaps discourage them from choosing it as a destination, is counteracted with detailed information. Another important factor is that this region's most important tourism product, the Camino de Santiago (a long pilgrimage/hike to the

region's capital), takes place in the open air, which means that climate and meteorological information is a fundamental aspect of the services provided to those making the trek to Santiago.

Table 9. Quality Index (%).

Autonomous Community/Autonomous Cities	Quality Index (%)
Andalucía	31.7
Aragón	3.1
Asturias	28.6
Baleares	42.8
Canarias	61.9
Cantabria	30.1
Castilla La Mancha	1.6
Castilla y León	1.6
Cataluña	33.3
Ceuta	1.5
Comunidad de Madrid	42.8
Comunidad Valenciana	39.7
Extremadura	27
Galicia	76.2
La Rioja	3.1
Melilla	1.5
Murcia	30.1
Navarra	36.5
País Vasco	44.4

6. Conclusions

The climate and meteorological information that is provided to tourists on the websites of the institutions responsible for promoting tourism in destinations in Spain at a national and regional level shows obvious limitations in that it does not always contribute to improved decision-making, both tactical and strategic, in all of those activities available to visitors in which the weather or the climate play an important role [5,6,18]. The meteorological information provided by these websites does not take tourists' requirements (enjoyment, comfort and safety) sufficiently into account and is based above all on the marketing interests of the information providers [27,31,32,36]. This is because the tourist's perception of the weather and/or climate in the various holiday destinations is particularly important in decision-making during the pre-holiday phase, making the weather that they actually experience during their holiday (and the information they receive about it) of less importance for those that are marketing the destination.

We also assessed various criteria that measure the quality of the climate and meteorological information in terms of the fulfilment of the requirements that are established by the WMO [45]. Our qualitative analysis highlighted that most of the climate and meteorological information provided by the bodies responsible for promoting tourism in the different Spanish holiday destinations is not tailored to the needs of the tourist [6,31–33]. The information that they provide tends to be overly brief and generalized, and does not always cover all the stages of the tourist experience satisfactorily. It is rarely adapted to the type of tourism, in which the visitor is likely to be involved (e.g., nautical sports, beach holidays, skiing, trekking) or the type of environment in which this kind of activity normally takes place (e.g., coast, mountains, cities). Another drawback is that the websites do not display integrated climate information or probability values (calendars with the probabilities of particular types of weather or calendars setting out the most suitable times in terms of weather for the different kinds of tourist activities), and little advice is given to enable visitors to make the most of the benefits of the climate or weather and prevent or mitigate some of their negative effects (weather warnings, emergency procedures, and recommendations appear on very few websites). It is also important to stress that although all these websites cover the information requirements for different hours of the

day and for several days in advance, they rarely offer weather forecasts based on climate suitability indices, which would allow for people to assess the suitability of a particular day for different tourist activities and sub-sectors on a scale of 0 to 10.

The climate and meteorological information provided by the bodies that are responsible for promoting tourism in the different Spanish holiday destinations often appears in a descriptive text format, in which generalisations and inaccuracies abound, something that destroys the credibility and indeed the usefulness of the information that they are conveying.

The temperature, rainfall levels, the state of the sky, and the hours of sunshine are some of the main parameters that are presented in the climate and meteorological information provided by the bodies responsible for promoting tourism in the different Spanish holiday destinations. However, other parameters that could be of interest to tourists (e.g., felt air sensation, UV index, water temperature, wave levels) are not always included. We also found that the information that is provided by these websites can improve tourist decision-making regarding their enjoyment of their holiday, but helps to a lesser extent with decisions relating to their comfort and rarely enhances their safety [32,36,64].

Although ICT has been incorporated into the tourism and environmental services sectors on a huge scale and now plays a vital role in the promotion of destinations and in the transmission of information, various weaknesses can be observed, at least in relation to the subject that we are dealing with here. In spite of the increase in the number of applications relating to tourism or to the weather and climate, there are still relatively few that are totally or partially focused on climate/tourism aspects and are accessible from the promotional websites or the providers of meteorological/climate services (some of the Apps with climate/tourist contents have been developed by public bodies, in spite of which it is impossible to access them directly from institutional websites related to tourism. This highlights not only the poor level of communication between different public or semipublic bodies but also the shortcomings in terms of the design of the most suitable channels for the distribution and dissemination of projects of this kind). These kinds of applications could be very useful when it comes to preparing a trip, enabling tourists to interact with and feel involved in their destination, and could therefore be essential tools in improving visitor experience. The same is true for webcams. The tools that are associated with the Web 2.0 are by contrast included in most of the websites, so enabling tourists themselves, the people who participate directly in the tourist experience, to pass on useful information. This information can greatly influence other tourists' decision-making, as it provides a more objective description of the destinations in comparison with the promotional information offered by the official websites.

In the tourism context, providing climate and weather information means disseminating processed accurate data that is adapted to the different potential users. On this question, although there is a wide range of environmental information available, its usefulness is often seriously limited by the forms in which it is presented [18,65]. Tourists require different forms of information during the different phases of the tourist experience, information that matches their needs and is provided with sufficient accuracy and detail to let them know what the weather will be like at a certain place at a certain time.

Highlighting the weaknesses of atmospheric information that is provided to tourists should serve to improve the quality of climate services. These must be able to satisfy the needs of users so that they can make climate-smart decisions. Improving the level of weather/climate information provided for tourism purposes remains a great challenge, which will require the collaboration of those researching the relationship between climate and tourism, the national and regional meteorological services, the tourism authorities, and the tourist industry itself. At this point, it is necessary to continue researching in the role of climate information in tourist decision-making (choice of destination) [6,38]; in the comprehension of how meteorological information is obtained by tourists, how it is perceived, and how it is used for planning and carrying out leisure and recreation activities [34,39–41]; and, to continue researching into climatic needs of different profiles of tourists. Improving the dissemination of weather information for tourists is another great challenge that will require constant updating and

incorporation of new ICT. This will make it easy for tourists to prepare their trip, to interact, and get involved with the destination and so improve the tourism experience, all key aspects of what the Spanish government refers to as *new intelligent tourist destinations*.

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