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The Impact of Degradation of Islands' Land Ecosystems Due to Climate Change on Tourists' Travel Decisions

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Abstract: The degradation of terrestrial ecosystems may change the perceived value of destinations for tourists. This article analyses tourists' travel decisions when the land ecosystems of the destinations they are planning to visit are threatened by climate change impacts. More specifically, it analyses tourists' willingness to pay for their holidays at island destinations endangered by the increase in forest fires, terrestrial wildlife losses, water shortages, and damages to infrastructure and cultural heritage. With this aim in mind, a discrete choice model was designed and empirically tested with a representation of European travellers, using an alternative specific conditional logistic regression. The results show that the sharp increase in the occurrence of wildfires has had the greatest negative impact on tourists' willingness to pay for their next holiday at the affected tourist destination, followed by severe losses in terrestrial wildlife and significant damage to cultural heritage. This study highlights the importance of having accurate information on future climate change conditions impacting land attributes at the local level, not only to be more effective in the early prevention of threats to prioritise but also to confront the potential damage to the tourism economy more efficiently.

Keywords: climate change; islands; land ecosystems; economic valuation; tourism planning

Citation: Lam-González, Y.E.; León, C.J.; de León, J.; Suárez-Rojas, C. The Impact of Degradation of Islands' Land Ecosystems Due to Climate Change on Tourists' Travel Decisions. *Land* **2022**, *11*, 1644. https://doi.org/10.3390/land11101644

Academic Editor: Wojciech Zgłobicki

Received: 14 July 2022
Accepted: 19 September 2022
Published: 23 September 2022

1. Introduction

European islands are recognised as hotspots of marine and terrestrial biodiversity worldwide, as they support unique ecosystems with high levels of endemism [1–3]. They offer long coastal areas and land endowments as fascinating places for both residents and tourists [4,5].

Land ecosystems on islands, as in any other region, are under increasing pressure due to global climate change (CC) [6–10]. As pointed out in the Special Report on the Ocean and Cryosphere in a Changing Climate (IPCC SROCC report), islands are among the European lands most adversely affected by CC [2,11]. An increased risk of forest fires, more frequent and severe heat waves, drier conditions, sea-level rise, and storms and floods are among the impacts expected to have the greatest implications for both their natural and built-up ecosystems [12,13].

Moreover, the islands belonging to the European Union (EU) member states share common vulnerabilities related to their low economic diversification and high reliance on tourism [11,14–18], an activity that heavily depends on the weather conditions and the quality of the marine and land ecosystems (in terms of beauty, cleanliness, diversity, etc.), which attract tourists and support activities such as hiking, swimming, trekking, snorkelling, and wildlife observation [9,11,18,19].

In this context, there is an increasing body of literature analysing possible changes in the characteristics of environmental attributes because of CC and the subsequent implications for tourists' travelling decisions and their experiences [9,11,20–22]. For instance, previous studies confirm that tourists' willingness to revisit islands may decrease with the loss of sand and beaches as a consequence of sea-level rise and coastal flooding events [23,24].

Other studies have shown that the degradation of coral reefs is perceived by tourists as a significant downgrade in the quality of the marine environment [25]. Likewise, the reduction of the abundance of flag species, such as turtles or whales, may lead to a reduction in the economic impact of tourist activities [26,27].

In this vein, it is worth mentioning that studies on coastal and marine environments prevail [16,20,27], as if everything that happens in inland areas has less importance for island tourism. This is probably due to the fact that the tourism sector on islands has been mainly developed around "3S" tourism (sun, sea, and sand) [15]. However, 3S tourists visiting islands not only consume experiential offerings and services coming from the marine and coastal areas but also other features of the land capital, e.g., forests, infrastructure, freshwater, cultural assets, etc., which also constitute part of the tourist experience of the 3S tourists, as well as other tourist segments [27,28]. In other words, understanding the heterogeneous ways in which CC may affect island tourist destinations implies the study of tourists' decision-making in relation to a wide spectrum of impacts beyond the marine ecosystems [6,29].

In response, the research question of this study is to what extent the degradation of land ecosystems due to CC may change tourists' preferences and willingness to pay for their holidays to islands. With this aim in mind, we first selected five elements/attributes of land ecosystems to be analysed—terrestrial wildlife, forests, water, human-built infrastructure and facilities, and cultural heritage. Second, eleven island case studies were considered. Third, a discrete choice experiment (DCE) was designed by means of downscaling CC impacts on the land attributes of these islands. The findings are the result of conducting the DCE with a representation of European travellers planning to visit any of the potentially affected islands.

The application is based on the following European islands: the Canary Islands and the Balearic Islands (Spain), Madeira and the Azores (Portugal), Malta, Sardinia, and Sicily (Italy), Cyprus, Corsica, and the West Indies (France), and Crete. They are all leading European tourist destinations and are considered biodiversity hotspots globally [2,4,5,11]. Given the structural and morphological differences, they are a good representation of the wide spectrum of impacts that the EU's land ecosystems may experience this century due to CC [20].

The objective is thus to elicit the value of CC impacts on land attributes and identify those threats with the greatest potential to influence tourists' decision-making. The importance of this research lies in the fact that it provides information about how tourists may change their preferences for travelling to islands, which can indicate possible economic losses as a result of doing nothing to prevent those impacts or minimise the risk that they represent to diverse tourist activities.

The contribution of this research is twofold. First, it focuses on the implications of CC impacts on the terrestrial ecosystems of islands, a topic that has not received great attention in the literature on tourism and CC but is highly in demand by practitioners and public bodies [20,21,28]. Second, the eliciting of economic values was conducted in a multi-risk context and utilising a multi-case studies approach—scenarios that were built upon a well-documented set of CC impacts that should be prioritised at the level of EU islands.

Although the climate is somewhat beyond the control of tourism practitioners and policymakers, anticipating tourists' choices and preferences in future climate scenarios allows them to adapt their plans accordingly. This is especially important in the current climate emergency we are experiencing, where there is a need to produce a massive amount of localised information to promote fast and smart adaptation to CC [30].

2. Literature Review

2.1. Terrestrial Ecosystems, Climate Change, and Tourists' Travel Decisions

The earth's terrestrial surface—29 per cent of the total surface area—is home to a great variety of natural and built-up ecosystems [31,32]. Hence, "terrestrial ecosystems" refers to such a complex and diverse range of habitats and services that scholars very often use a simplified classification for their studies, according to social, environmental, and productive elements [33–35].

In this vein, Anderson et al. [36] classified terrestrial ecosystems into nine different categories. Borrowing his classification, which is still widely employed today [37], our research focuses on four elements: forests, water, infrastructure, and cultural heritage (built-up land). In addition, a fifth element was included: terrestrial wildlife. This was done for two main reasons. First, according to the authors, the five elements mentioned above are a good representation of all the inland provisioning, maintenance, and cultural services that the tourism industry and tourists may "utilise" at any destination, regardless of the main motivation for travelling [38–42]. Second, they partly represent the main components of the attractiveness of tourist destinations, which are: recreational values—e.g., tourists seeking interactions with wildlife in natural settings, which include observing from a distance, photographing, and approaching; natural values; cultural values; and infrastructure [42,43].

2.1.1. Forests and Terrestrial Wildlife

Forests and terrestrial wildlife bring leisure opportunities to tourists and the possibility to practice a wide range of outdoor activities in direct contact with nature [38,40,44]. At the same time, it is well-known that tourism exerts substantial pressure on terrestrial ecosystems and biodiversity due to landscape transformation for tourism urbanisation, littering, water and sewage pollution, and tourist traffic, all of which damage the vegetation and compact the ground, etc. [45]. For this reason, in recent decades, conservation has been deemed a necessary part of the tourism sector in regard to the protection of charismatic species, the creation of natural protected areas [38], and the preservation and restoration of forest ecosystems [46].

The health of forests and their biodiversity are also threatened by a changing global climate that is increasing the risk of extreme weather events, causing drier conditions, forest fire events, the extinction of flagship species, and the blooming/proliferation of alien species, among other impacts [47–49]. According to the IPCC SROC projections for this century, the probability of wildfires events and the size of fire-vulnerable areas will substantially increase on EU islands if emissions are not reduced drastically [19,50,51], particularly on those islands with large forested areas such as Cyprus and Crete [52]. In addition to the damage to forests, the increase in fire events will impact the tourism industry in terms of infrastructure damages and a decrease in tourist arrivals [51].

The literature in this field is dominated by ex-post evaluations, and there are two main positions [20]. Some authors have argued that forest fire events often lead to a decrease in tourists' willingness to return to destinations [53–57], while other studies ascertain that results differ from one location to another; not all tourists are discouraged by forest fires, especially at destinations where this impact occurs very often or on a yearly basis [13].

2.1.2. Water

Water is essential for life, and any phenomenon that will adversely affect its quality will harm human health and well-being, even potentially leading to the displacement of people [9]. In the context of islands, this natural resource is usually scarce, and its production often involves high energy consumption for desalination [41,57,58]. In addition, tourists intensify the problem of water scarcity, as they are likely to consume more water than locals [59].

Nowadays, water scarcity is being exacerbated due to the effects of CC—e.g., the higher frequency and severity of heat waves—and the consequent peaks of demand on water consumption [58,60,61]. Following the IPCC SROC projections [2], it can be stated that remarkable heatwaves suffered at the beginning of the century could become a norm in future climates [62], with a larger number of days above 35 °C. For example, some Atlantic islands will suffer an increase from 7 days per year to 75. Concerning the Mediterranean islands, despite expecting a lesser relative increase, the period with extreme temperatures will rise from 194 days per year (current situation) to 311 [63], leading to drier conditions exceeding the "extreme danger" threshold, alongside an unprecedented increase in the water consumption of residents and tourists [60].

With regard to the tourism literature, Arabadzhyan et al. [20] pointed out that up until now, studies have failed to explain how water supply shutdowns as a consequence of CC may influence tourists' travel decisions and perceived well-being—an aim of the present study.

2.1.3. Infrastructures and Cultural Heritage

Infrastructure plays an important role in providing tourism services; not only accommodation but also a wide range of amenities—e.g., restaurants, recreation, parks, etc.—that make up the offerings of tourist destinations [64–66].

Sea level rise and the increase in the magnitude and frequency of extreme weather events caused by CC, such as storm surges or coastal flooding, to name a few [67,68], not only affect beaches but also damage infrastructure and facilities—e.g., waterfronts, recreational ports, etc. [69]—with implications for the destination's image [27]. Concerning EU islands, sea level rise may range between 56 and 74 cm, being more prominent on the Atlantic Islands [2,70,71].

Similarly, studies have underlined that both air pollution (CO_2 and other greenhouse gas (GHG) emissions) generated by human activities—including tourism—and climate variability will cause chronic damage to material assets and cultural heritage [71–73]. As Forino et al. [39] underlined, "once destroyed, cultural heritage cannot be regenerated, duplicated, or reintroduced."

Research focusing on how CC-induced damages to infrastructure and cultural heritage impact tourists' decision-making has so far been neglected [20–22], with the majority of studies being focused on the risk that climatic events—e.g., coastal flooding and erosion under sea level rise scenarios—pose to heritage sites on spatial–temporal scales, aiming to identify thresholds (tipping points) that support adaptation planning and designate priority areas of attention [74].

2.2. Approaches to Terrestrial Ecosystems' Valuation in the Context of Climate Change

The tourism industry utilises a large amount of natural and environmental assets in the production of services offered to tourists [54]. From the demand side, tourists are much more attracted to places that offer a clean and non-polluted environment [43]. Hence, the quality of the environment in terms of beautiful scenery, clean air, crystalline waters, rich wildlife diversity, etc., represents a key tourist attraction, especially when outdoor recreation is the primary motivation for travelling [75,76]. Nowadays, the information available to tourists and their concerns over the natural environment, CC, and pollution is greater [77], leading to more environmentally friendly purchasing behaviour on average [78,79].

This evidence has attracted academics in an attempt to assess the economic value of non-market goods and services at tourist destinations, such as the natural resources, and the eliciting of tourists' willingness to pay for their appropriate management—decreasing congestion in natural areas, conservation programmes, etc. [80–82].

In this vein, the discrete choice experiment (DCE) method is one of the most widely employed valuation techniques in the tourism and environmental economics literature [81–83]. This method allows for the estimation of the individual utility for multiple attributes of the good or service simultaneously [80,84]. Hence, DCEs have become one of the most popular non-market valuation approaches [78,84–86].

For instance, DCEs have helped scholars to elicit tourists' preferences for decarbonisation policies in the aviation sector [87] and for adaptation programmes in skiing tourism [88]. It can be said that the literature is highly dominated by the study of CC impacts on marine wildlife and conservation [10,20]. In this group, the study of Enríquez and Bestard [89] can be mentioned, which applied a DCE to evaluate the economic impacts of CC on some of the marine and coastal features enjoyed by tourists, in particular those caused by beach retreats and jellyfish outbreaks. Other studies have focused, for example, on the degradation of coral reefs [25] and the reduction in the stocks of flagship species such as turtles or whales [26,27].

Studies assessing the value raised by land attributes for tourists have received the attention of DCE academics. For instance, Choi et al. [87] and Lacher et al. [90] studied the economic value of cultural sites, while analysing the preferences of tourists for alternative measures to better manage them. With regard to water, research efforts have been directed towards understanding the impact that water-saving practices, such as increasing water prices, premiums, installing new water systems, or building new reservoirs, may have on tourists' marginal utility [59,91–94].

In particular, [31,86,95–98] have focused on assessing tourists' preferences for terrestrial biodiversity conservation/prevention programmes, and their WTP for different land-use management options when specific tourist activities are threatened by CC [61]. Other authors have analysed the impacts on tourist satisfaction and on tourists shifting to alternative destinations [19]. These studies have concluded that tourists are sensitive to the threats that affect terrestrial wildlife, natural protected areas, and forests, and have higher preferences for maintaining and improving wildlife species' status than the other attributes [99]. Very few have attempted to provide a holistic approach by analysing the wide spectrum of elements of the land capital impacted by CC across diverse tourist destinations that are exposed with varying degrees of intensity [11], which is, in fact, the main contribution of the present research.

3. Methodology

3.1. The Model

The theoretical background in DCE relies on the random utility theory [100], which assumes that individuals have a utility-maximising behaviour when they make decisions among *j* alternatives. That is, in a choice set *t* with a finite number of alternatives, the individual *i* will choose the alternative deriving the largest utility level [81]:

$$U_{iht}\ (V_{hit}) < U_{ijt}\ (V_{jit}),\ \forall\ h \neq j \tag{1}$$

According to this, in a choice set *t*, U_{ijt} is the latent (unobservable) level of utility of an individual *i* that chooses an alternative *j*. Briefly explained, V_{ijt} is the observable utility component that the individual *i* relates with the alternative *j*, ε_{ijt} being an unobservable or random error component, where β is the coefficient vector [101,102].

$$U_{ijt}\ (X_{ijt}) = V_{ijt}\ \beta + \varepsilon_{ijt} \tag{2}$$

The marginal WTP is the monetary compensating surplus that an individual is willing to pay to maintain their current level of utility when the level of an attribute changes by one unit [81]. Thus, the marginal WTP is given by the quotient between the coefficient of the (non-monetary) attributes to be assessed (β_n) and the (negative) coefficient of the price attribute (β_c), assuming that the cost coefficient is constant [84]:

$$WTP_n = -\frac{\beta_n}{\beta_c} \tag{3}$$

In our model, the non-monetary attributes are represented by the tourist destinations under study, along with the potential CC impacts on the above-mentioned five elements of land capital—forests, terrestrial wildlife, water, infrastructure, and cultural heritage. The DCE was implemented in a structured questionnaire in which tourists were asked to choose alternative island tourist destinations with different characteristics regarding the expected CC impacts on these (5) attributes.

Eleven case studies defined by Mediterranean and North Atlantic European islands/archipelagos were considered, as shown in Table 1. These archipelagos are leading tourism destinations for non-EU residents [103]. Therefore, we looked at insularity to identify tourists' heterogeneous preferences to visit regions that are largely dependent on tourism and especially vulnerable to the effects of CC in the context of other external shocks [11,18,51].

As the islands/archipelagos analysed are quite diverse, CC impacts their land ecosystems with different levels of intensity. In this sense, the DCE design was a time-consuming exercise, as careful consideration was given to constructing CC scenarios tailored to the islands' particularities and to making the analysis of attributes by tourists simpler in the choice sets. Hence, current and future climate scenarios of impacts were analysed for each island/archipelago individually, based on recent estimations about these regions, and later translated into categories/levels of impact on the (5) attributes for all islands. The definition and categorisation of impacts were supported by experts. This qualitative stage of the study required three rounds of individual, in-depth interviews with a group of ten experts (academics and professionals, biologists, climatologists, geographers, environmentalists, etc.), and one final meeting organised in September 2020 in order to reach a consensus about the impact levels and their characterisation. Overall, three different levels of impact were considered: (i) current situation, (ii) moderate impact, and (iii) high impact, with different interpretations for each of the (5) attributes, as shown in Table 1.

At this stage, it is important to mention that this study only considered one climate impact scenario, namely RCP8.5 concentrations, which considers the evolution of the environmental goods and services without additional efforts to constrain GHG emissions from a baseline scenario. Another scenario with mitigation efforts that aims to keep global warming likely below 2 °C (specifically RCP 2.6) was initially evaluated [2]. However, the latter implies that emissions would have begun to decrease from 2020, this being far from the reality of the situation [104]. Hence, the aim is to utilise a highly likely CC scenario when eliciting tourists' preferences [104], and at the same time call for immediate, ambitious policies [2].

Table 1. Attributes and impact levels included in the DCE.

Aspect	Description	Impact Levels	
Island	Traditional EU island destinations	Canaries Malta Corsica Cyprus Balearics W. Indies	Madeira Sardinia Sicily Azores Crete
Terrestrial wildlife (T.WILD)	Biodiversity losses caused by CC impacts on sea surface temperature and properties	Current situation: favourable conservation status Moderate impact: suffering further deterioration Strong impact: completely disappeared	
Forests (FF)	Increase in the probability of wildfires occurrence, caused by drier conditions and extreme temperatures due to CC	Current situation: no increase Moderate increase: will increase by nearly 30% High increase: increase by 200%	
Water (WATER)	Increase in the probability (and duration) of water shutdowns caused by heat waves, droughts, as a consequence of CC	Current situation: no time restriction Moderate restriction: 3 h with no water supply Severe restriction: 9 h with no water supply	
Infrastructures and facilities (INFRA)	Damages to infrastructure due to sea level rise, storms surges, and floods, caused by CC	Current situation: no damage Moderate impact in the case of weak actions Strong impact on infrastructure in the case of no climate actions	
Cultural heritage (CULTURAL)	Cultural assets are damaged due to sea level rise, storm surges, and other CC-induced extreme events	Current situation: no damage Moderate impact in the case of weak climate actions Strong impact on infrastructure in the case of no climate actions	
Price	The individual daily expenditure of a tourist for a 5-day tour package in the affected island	EUR 100 EUR 150 EUR 200 EUR 300	

With regard to the "current situation" level, it is assumed that the present scenario, which includes some evidence of CC affecting land ecosystems and also some climate actions, is the most favourable in comparison to any other in the future. The "moderate impact" level refers to a scenario of high emissions (RCP 8.5) where some new adaptation/response actions are in place. Meanwhile, the "strong impact" level considers that any new adaptation initiative would slow the catastrophic consequences for island ecosystems of not drastically reducing GHG emissions. For instance, concerning the Forests (FF) attribute, the current situation means that the average number of wildfires per year would not increase. If some new early prevention measures are in place, the probability of occurrence may increase by nearly 30% (moderate increase). However, the probability would increase by 200% (high increase) if no additional mitigation programmes are implemented with respect status quo scenario. Finally, the price was defined as an attribute in the model, representing the average daily expenditure per tourist, in case she/he visits any island affected by CC.

To summarise, tourists were presented with different choice cards, each one containing three options: two alternative island destinations presenting a random combination of impacts on land attributes, plus the "neither option"—e.g., "stay at home" (see an example of a choice card in Figure 1). Tourists had to select only one option from each choice card, as if there were no other options available. To obtain the choice sets, an efficient Bayesian design was undertaken. It considered the five land attributes with three impact levels each, the 11 island destinations, and the price at four levels. This means $3^5 \times 11 \times 4$ possible combinations to choose from in the DCE exercise. By running the Ngene programme, the Bayesian design resulted in 24 choice cards. These 24 choice cards were randomly distributed into eight survey models. In other words, each respondent who arbitrarily received one of the (8) questionnaire models was only presented with three different choice cards.

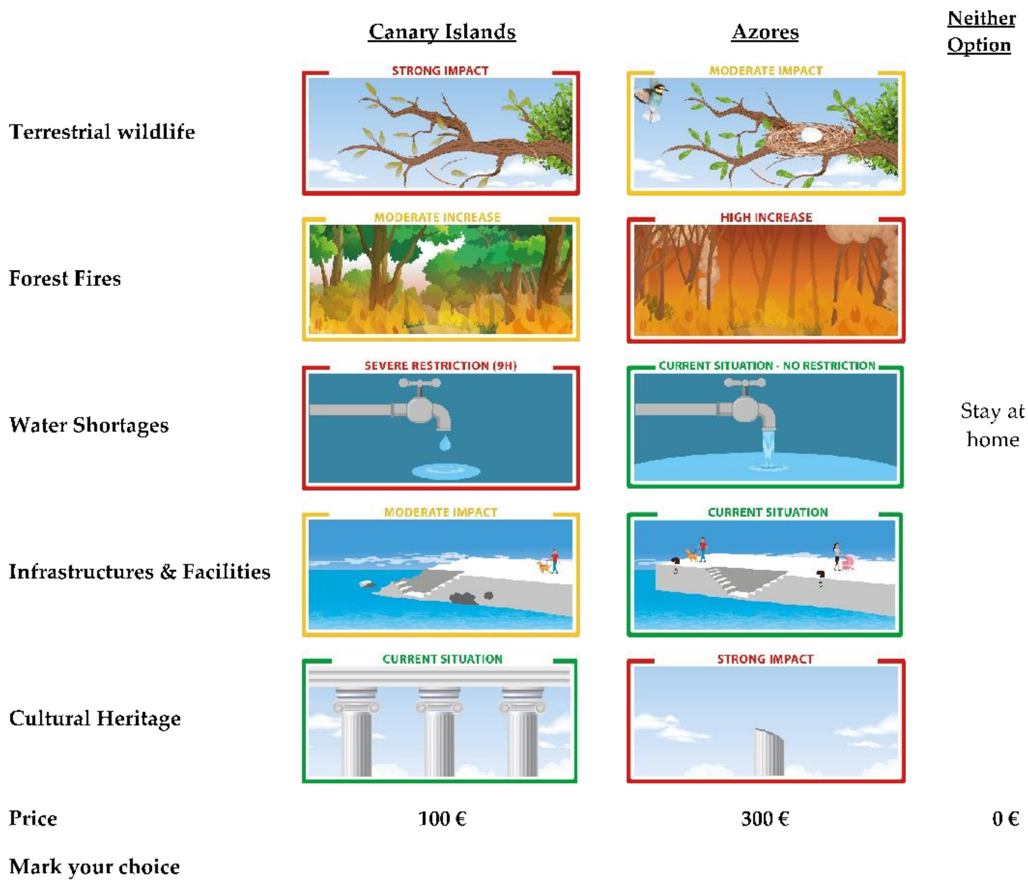

Figure 1. Example of choice card.

3.2. Fieldwork

As mentioned above, the questionnaire was utilised as the main research instrument. It had three parts, the first including questions about the travel experience of tourists and the characteristics of their last trip. The second part referred to the choice questions, which included an explanation of the destinations, the impact scenarios considered, and the attributes to be analysed. The last section was dedicated to obtaining information about the socio-demographic characteristics of the participants.

Prior to the fieldwork, focus groups were conducted in six of the regions under study (Canaries, Balearics, Malta, Sicily, Crete, and Cyprus). It was not possible to cover all 11 islands due to budget restrictions. These meetings were organised face-to-face with ten tourists on each island in order to check that the questions and the choice setting scenarios were understood. Meetings on each island were organised between October and December 2020. Furthermore, extensive pre-testing involving one hundred individuals was conducted in January 2021, online, in order to check the efficiency of the pilot questionnaire. These focus groups and the pre-testing allowed researchers to ascertain that the final questionnaire and the choice cards were going to be clearly understood by the potential respondents, as intended by the research objectives.

The final fieldwork was carried out online by a specialised firm on advanced fieldwork for consumer studies and took four continuous months between January and April 2021. By then, most EU countries had no travel restriction policies in response to the COVID-19 pandemic. The study population was defined as frequent travellers from the following countries: the United Kingdom, Sweden, France, and Germany. This is because these are the main outbound markets of tourists to European islands, according to regional statistics. Their citizens represent around 60% of the total number of tourists that visit the studied islands/archipelagos each year [11,22,103].

The quota sample passed a triple filtering process to be able to continue with the questionnaire:

(i) Frequent travellers: all individuals are used to making overseas trips at least twice a year (before the COVID pandemic).
(ii) Previous destinations: all individuals had visited at least one of the islands under study in their lives.
(iii) Travel intentions: All individuals were planning their next holiday to be on an island.

The questionnaires with missing data and protest responses were excluded from the database. Thus, from the initial 2880 individuals who opened the online questionnaire, 2538 valid cases were retained for the analysis. The nationalities—British, French, German, and Swedish—were evenly distributed in the sample. Sample representativeness by country was assessed by borrowing the finite large population formula of Israel [105], which assumes that plus or minus five per cent is a reasonable level of error [106]. According to this, the final sample was considered statistically representative of the outbound tourism numbers of the four above-mentioned countries, with a 95% level of confidence (see Table 2). It was verified using the annual data on overseas trips provided by Eurostat [103]. For instance, the numbers of trips made by French and British citizens in 2019 were 45 and 92 million, respectively, and the numbers of individuals in the study sample with these nationalities were 637 and 632.

Table 2. Sample representativeness.

Country	Population Size (Oversea Trips 2019)	Study Sample	Margin of Error
France	45 million	637	4%
Germany	93 million	632	4%
Sweden	11 million *	637	4%
United Kingdom	92 million	632	4%

Note: * Leisure overseas trips of 2018.

3.3. Data Analysis

Concerning the descriptive analysis of the data, Table 3 shows the respondents' main characteristics. As it is also common in quota samples, our study sample typified the educational and labour profiles and monthly earnings of the target population, who are, on average, employees with a monthly net salary of between EUR 1200 and 2800 and University studies [103].

Table 3. Socio-economic characteristics of tourists.

Variable	Category	Freq.
Country of origin	France	25.1
	Germany	24.9
	Sweden	25.1
	United Kingdom	24.9
Age	<35 years	33.1
	35–55 years	32.4
	>55 years	34.5
Gender	Female	52.2
Education level	Bachelor's degree or higher	42.4
Employment status	Employed for wage	57.9
Monthly income	EUR 1201–2800	45.6

On average, the respondents travelled almost three times annually. As shown in Figure 2, the top-visited islands were the Canary Islands (34.6%), closely followed by the Balearics (30.4%) and Crete (26.3%).

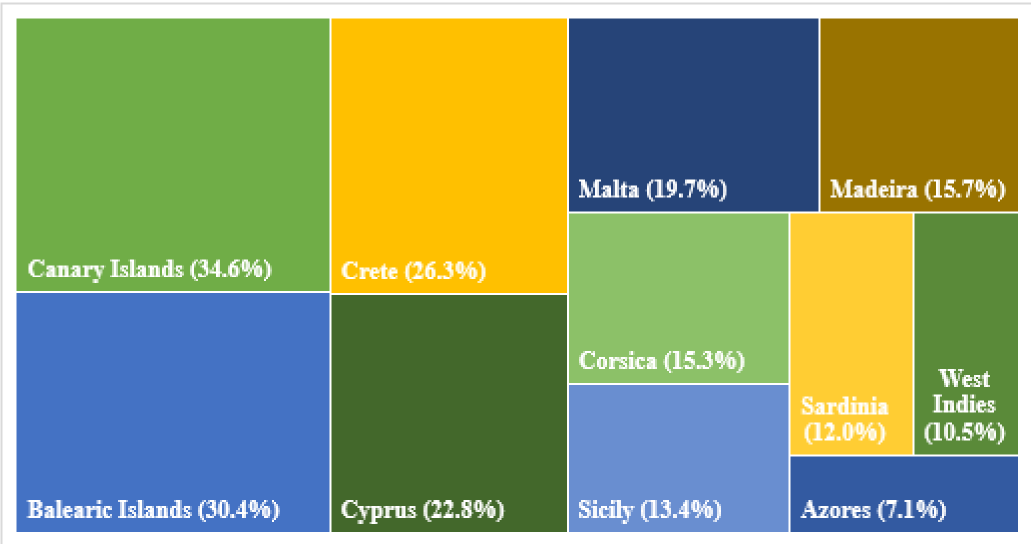

Figure 2. Percentage of previous visits to the EU islands of study.

Concerning the DCE data, the alternative specific conditional logit (Asc-logit) model was selected [100] and run using Stata14 (asclogit command). Asc-logit is commonly employed to predict individuals' choices when the alternative set is known, as is the case with this study. Other models were discarded, as they utilise variation across individuals [107]. To run the model, the 11 European island destinations and the attributes (impact levels) were transformed into dummy variables, except for "price", which was defined as a continuous variable [108]. All the attributes of the DCE were defined as alternative-specific variables, hypothesising that the respondents can see a utility in spending their holidays at EU island destinations at a lower price even when their land ecosystems are affected by CC [109].

4. Results

The results of the Asc-logistic regression are shown in Table 4. The socio-demographic characteristics of individuals were initially included in the model; however, no significant effect was found. The coefficient for the attribute "price" resulted in the expected (negative) sign, which means that individuals always choose the alternative with the lowest price. All the land attributes resulted in negative and significant regression coefficients. This tells us that the islands suffering greater losses or impacts to their terrestrial ecosystems due to CC have a lower probability of being chosen in the choice set.

The attribute with the greatest negative impact was the high increase in forest fire events, followed by severe damage to wildlife and cultural heritage. Shortages in the water supply was the attribute with the lowest negative impact on the marginal utility. Despite the fact that water is an essential resource for health security, water shortages had a lower probability of negatively affecting the selection of the islands by tourists when compared to the other attributes. Tourists may assume that a secure water provision is ensured because islands are surrounded by sea and desalination is a common practice. Citing Page et al. [59], tourists may not be aware of the problems EU islands face in providing access to drinking water. However, there is too little evidence to arrive at any conclusions in this regard.

The model also incorporates estimations for the island destinations. These should be interpreted as the contribution to the tourist's utility arising from their visit to the islands. Significant coefficients indicate that all islands have positive brand value for tourists, which may be related to the other attributes that are not explicitly considered in the choice experiment, and which contribute to the image that tourists have of the destinations.

Table 4 also shows the WTP estimates for the attributes (impacts) considered in the DCE. The values, in Euros, are all negative, indicating that tourists' willingness to pay for a visit to the island destinations would decrease if these CC impacts were present. In general, it was found that severe, strong, or high-risk levels had larger negative impacts on the WTP than moderate levels of impact.

The WTP values were also estimated for the island destinations, which can be interpreted as the image of the destination valued in monetary terms by potential visitors. The expected decrease in the WTP values due to CC impacts indicates that the image tourists have of the island will be deteriorated. For example, according to official statistics, the average tourist expenditure in Madeira was EUR 1619.04 [110] in 2021, and in the Balearics, EUR 1091.75 [111]. The WTP estimates in our model show decreases of 15 and 23%, respectively, which may be interpreted as a potential decrease in the value attached by tourists to these islands when the land ecosystems are threatened by CC.

Table 4. Asc-logistic and WTP estimation results.

Aspects	Estimation	WTP (EUR)
T.WILD Moderate impact	−0.226 ** (0.044)	−122.32
T.WILD Strong impact	−0.382 ** (0.040)	−206.40
FF Moderate impact	−0.156 ** (0.050)	−84.52
FF High increase	−0.466 ** (0.054)	−252.02
WATER Severe restriction	−0.029 ** (0.005)	−15.78
INFRA Moderate impact	−0.216 ** (0.045)	−116.73
INFRA Strong impact	−0.265 ** (0.044)	−143.18
CULTURAL Moderate impact	−0.121 ** (0.046)	−65.56
CULTURAL Strong impact	−0.268 ** (0.046)	−144.86
Price	−0.002 ** (0.000)	–
Azores	2.731 * (0.291)	976.27
Balearics	2.784 * (0.291)	1004.97
W. Indies	2.82 * (0.316)	1022.60
Madeira	2.854 * (0.289)	1042.50
Corsica	2.864 * (0.29)	1048.32
Sicily	2.864 * (0.29)	1048.02
Malta	2.887 * (0.286)	1060.39
Sardinia	2.893 * (0.288)	1063.80
Cyprus	2.922 * (0.291)	1079.52
Canaries	2.982 * (0.287)	1112.02
Crete	3.003 * (0.290)	1123.40
Cases	2538	

** $p < 0.01$, * $p < 0.05$. Errors are shown in parentheses.

5. Discussion

Since tourists value the state of the environment in their choice of alternative destinations [89], there is a need to ascertain what the expected changes in tourism demand would be following CC impacts [112,113] on terrestrial ecosystems; the literature in this area is strongly dominated by studies on the marine environment [20,27]. This research demonstrates that tourists' choices of island destinations are influenced by how CC will impact their terrestrial ecosystems, thereby supporting (and contrasting) earlier findings, but also revealing new insights.

The results support the earlier findings of Otrachshenko and Nunes [13], who pointed out that forest fires will lead to significant losses for destinations in terms of tourist arrivals and economic benefits. For instance, they projected that by 2030, the impact on the Portuguese economy related to burned areas would reach EUR 18–38 million for losses in inbound tourism, expected to increase by at least fourfold by 2050 [13]. As new quantitative evidence, this research found that the impact of forest fires may decrease tourist expenditure by up to EUR 252.02 per person in the context of the Portuguese islands, for instance.

On the other hand, this evidence contrasts with other studies concluding that tourists are indifferent to forest fires, despite the significant losses of forested areas and even human lives [114,115]. Nevertheless, the latter may not be entirely accurate in this case, mainly because these studies were conducted in Florida and Canada, where forest fires have been more frequent over the last 25 years, thus constituting a very different scenario to the EU islands.

This paper goes a step toward breaching some of the research gaps identified by Arabadzhyan et al. [20] regarding the need for further understanding of the impact of wildfires, changes to the terrestrial environment, and the degradation of cultural heritage due to CC on the travel decisions of tourists. To be precise, our study shows that the increase in the risk of forest fires, the loss of terrestrial wildlife, and damage to infrastructure and cultural heritage will lead to greater aversion on the part of tourists that travel to European islands, and a significant decrease in the perceived value and image of these destinations. In fact, the final values of the WTP for each island can also be seen as a ranking of the islands' image under worsened CC scenarios. Arabadzhyan et al. [20] also called for more studies on CC impacts from a multi-country perspective. This aspect has been partly addressed in this research since eleven European islands with different scenarios of CC impacts were considered.

It was also found that damage to natural and built-up terrestrial attributes had a stronger negative impact on tourists when compared to the possibility of suffering water supply shutdowns due to the effects of CC. On the contrary, Phan et al. [92] revealed that tourists were highly sensitive to water management in the context of islands under CC and were willing to pay large amounts to support long-term solutions—e.g., building reservoirs. However, a limitation of the cited study is the isolated analysis of water, without considering the relatively greater importance tourists seem to bestow on the other land attributes. In any case, there is room for further research to confirm the authors' suspicions concerning the image that islands may be projecting in terms of water supply guarantees, similarly to big hotels and resorts, which usually have their own water supply systems [60].

6. Conclusions

This paper delves into the relationship between terrestrial ecosystem degradation caused by CC and tourists' travel decisions to island destinations. Since CC can impact the land environment in multiple ways, this study scaled down islands into five terrestrial attributes and three levels of impact to provide a more detailed picture of tourists' behaviour in relation to the degradation and loss of natural and cultural treasures.

It can be concluded that tourists from origin countries would avoid visiting islands in the event of CC impacting their terrestrial ecosystems and are most averse to the impacts on forests, wildlife, and cultural heritage. These impacts would also significantly reduce the brand value of the European island destinations.

From the theoretical perspective, the study responds to the need to reduce the bias inherent in hypothetical settings when evaluating the environmental attributes potentially affected by CC through the design of a DCE based on well-documented scenarios of impacts and an expert-assisted process. Although it is almost impossible to control for all bias, the downscaling of CC impacts that are tailored to islands' specificities and the collective categorisation of impacts by a group of experts is always beneficial.

Moreover, although the employment of visual representations to present choice questions is a long-standing practice in DCE, utilising low-quality images and incorrect text is very common. In this sense, the study has produced accurate visualisations that are essential for preventing biased results [116]. It has created three different designs of choice cards, which were validated during the focus groups. The final version (Figure 1) was the one with the least text, which was associated with a lower level of uncertainty for respondents' choices across all sets.

From the tourism management perspective, planning islands' adaptation to CC requires working in several directions. First, this study helps to emphasise the urgent need to produce localised information regarding CC impacts, along with the threats that have the greatest potential to negatively affect the value and image of destinations for tourists. This may contribute to improving the marketing plans by giving more visibility to the progress made in the specific areas to which tourists are more averse and sensitive. This would enable tourists to make more informed purchasing decisions for their holidays on islands and lead them towards more specific tourism micro-areas. In light of this, tourism practitioners and destination policymakers are encouraged to develop mitigation and smart adaptation practices to protect their environmental, economic, and social health, while including these actions in the tourism promotion and communication strategies. This is especially important during the post-COVID recovery, as there is market potential to better position rural areas [43] and give islands the necessary tourism diversification.

Furthermore, this study underlines the importance of including the economic values when assessing the possible losses that CC may cause to tourist destinations, as most studies on CC are devoted to analysing the physiological, ecological, and genetic transformation of species that have value for tourism and wider society [117,118], but few on the potential economic implications derived from a deteriorated image caused by these losses.

Finally, this study is not exempt from limitations. Only tourists from the main outbound tourism markets for the islands were surveyed, and not all land ecosystems were considered—e.g., agricultural and barren lands [36]—leaving room for research that is going to be addressed shortly. Forthcoming modelling should also incorporate the overall image of destinations since it is an antecedent of the destination choices and spending decisions of tourists.

Author Contributions: Conceptualization, C.J.L.; methodology, C.J.L. and C.S.-R.; data curation, C.S.-R.; writing—original draft preparation, Y.E.L.-G.; writing—review and editing, Y.E.L.-G. and J.d.L.; visualisation, J.d.L.; supervision, C.J.L.; funding acquisition, all. All authors have read and agreed to the published version of the manuscript.

Funding: The authors would like to acknowledge financial support by project GOB-ESP2019-11 from Ministerio de Ciencia, Innovacion y Universidades (Spanish Government) with European Union FEDER funding, and ProID2021010048 from Agencia Canaria de Investigación, Innovación y Sociedad de la Información, Canary Islands Government with European Union FEDER funding, PO FEDER Canarias 2014–2020.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy.

Conflicts of Interest: The authors declare no conflict of interest.

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