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Research article

COVID-19 effects on travel choices under climate risks☆

Carmelo J. León [1], Matías M. González Hernández [2], Yen Lam-González *,[3]

Institute for Tourism and Sustainable Economic Development, University of Las Palmas de Gran Canaria, Campus de Tafira, 35017, Spain

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A B S T R A C T

This article analyses the impact of COVID-19 on travel behaviour by measuring changes in the utility of visiting destinations threatened by climate change. A choice experiment was conducted before and after the outbreak. The model was empirically investigated with 6900 individuals interviewed at origin countries as potential travellers to 11 destinations with different levels of damage. Data from the two waves of surveys show a shift in preferences toward travelling at lower prices, greater sensitivity to new infectious disease episodes and forest fires, and a downward effect on the value of other environmental features that may be more affected after the pandemic. The results support the 'finite-pool-of-worry' hypothesis over the alternative 'affect-generalisation' hypothesis. The implications of the shift in travellers' environmental sensitivities are discussed.

Introduction

Climate change is impacting tourism in multiple ways, not least because tourists take the characteristics and quality of the environment into consideration when making travel decisions (Atzori et al., 2018; Škare et al., 2021). It is as yet uncertain how travel-related preferences may be modified under future climates, the understanding of which is necessary for preventing possible damage to tourist demand (Scott & Gössling, 2022).

The outbreak of the COVID-19 pandemic caused substantial disruption to the travel industry, the ramifications of which are still being felt. In 2020, we witnessed a 74 % decline in tourist flows worldwide, from 1461 billion international tourists the previous year to 381 million (World Tourism Organization, 2021). In 2022, >900 million tourists travelled internationally, doubling the number recorded in 2021. However, the global tourism figures had not yet recovered to pre-pandemic levels and were still down 63 % (World Tourism Organization, 2022).

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* Corresponding author.
E-mail address: yen.lam@ulpgc.es (Y. Lam-González).
[1] Full Professor at the University of Las Palmas de Gran Canaria (ULPGC), Spain.
[2] Professor at the University of Las Palmas de Gran Canaria (ULPGC), Spain.
[3] Post-doc researcher at the University of Las Palmas de Gran Canaria (ULPGC), Spain.

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This pandemic caused a significant disruption to human life, leading to changes in society's processes and behaviours that have affected environmental assets (Chakraborty & Maity, 2020; Fotiadis et al., 2021). For instance, one interesting side effect of the lockdowns manifested in higher levels of environmental quality as human mobility and consumption were reduced (Butcher, 2021; Shakil et al., 2020).

At the same time, COVID-19 has modified the way individuals plan their holidays, choose destinations and evaluate their experiences (Braje et al., 2021). New patterns in travel have been identified, including preferences for more open spaces and less crowding (Jiricka-Pürrer et al., 2020; Seraphin & Dosquet, 2020), which has led to discussions on the value of rural and protected areas, natural parks, and the limits of tourism growth (Kim et al., 2022; Yang et al., 2021).

Regarding how individuals may have modified their environmental preferences and attitudes as a result of COVID-19, the findings are somewhat contradictory (Qiu et al., 2020). Based on theories from social psychology, researchers suggest that the more significant worry over health risks due to the pandemic has reduced concern about climate change. As people have a limited 'budget' when it comes to worry (Botzen et al., 2021; Sisco et al., 2023), the 'finite-pool-of-worry' hypothesis is confirmed (Linville & Fischer, 1991; Weber, 2010).

On the other hand, there is preliminary evidence in favour of the 'alternative affect-generalisation' hypothesis (Johnson & Tversky, 1983), which suggests that worrying more about one threat makes people worry more in general (Sweeny & Dooley, 2017). In the context of COVID-19 and climate change, recent studies show that higher levels of concern about health risks have been transferred to environmental threats, favouring pro-environmental responses. These studies evidence greater aversion to crowding, greater support for climate policies and a greater desire to stay at green hotels since COVID-19 (Ekinci & Van Lange, 2023). This behaviour can be explained by theories proving that 'worry' underlies moral norms and the sense of responsibility, and both determine the sense of obligation to take action (Lindenberg & Steg, 2007; Weber, 2010).

This paper aims to draw on the mixed findings by empirically testing these two competing theoretical hypotheses. To this end, a carefully conducted experiment has been designed to compare the potential effects of climate change impacts on individuals' travel choices before and after the COVID-19 outbreak. The fieldwork was carried out in two moments: one *before* the outbreak and one *after* the pandemic had already passed through the first wave of infections and several European countries were no longer imposing travel restrictions. The results from the two large samples of tourists are compared to assess the influence of COVID-19 on the *travel intentions* of tourists toward destinations that might be threatened by climate-related risks.

The methodology utilises a discrete choice experiment approach that evaluates tourists' preferences and their intention to visit alternative destinations. The focus is on estimating parameters that affect the utility or satisfaction of individuals arising from the visit to destinations under worsened conditions due to climate change. In turn, these parameters represent the utility sensitivity of tourists or *environmental sensitivity*.

In our study, the affect-generalisation hypothesis would be supported if all climate change damages have a more (negative) influence on travel preferences after the health crisis, whereas the finite-pool-of-worry hypothesis would imply that only some impacts - i.e., those related to the health crisis - would affect travelling intentions to a greater extent in the wake of COVID-19.

The main contribution of this paper is based on the evaluation of possible shifts in the *environmental sensitivity* of travellers due to the COVID-19 outbreak, while the situation regarding the pandemic continues to improve and destinations try to recover tourism demand as rapidly as possible. The evidence shows what sort of trade-offs individuals are willing to make between healthy travelling conditions and the quality of environmental attributes when choosing holiday destinations. Furthermore, these trade-offs are traced to the social psychology theory (Linville & Fischer, 1991), from which useful insights for managing climate change impacts and communication at tourist destinations in 'the new normal' can be drawn.

Literature review

With expectations that climate change will be more economically and socially disruptive than the COVID-19 pandemic, as well as largely irreversible (Gössling & Schweiggart, 2022), the health emergency has led to growing reflection on the dissimilarities between these two crises and other pandemics (Botzen et al., 2021; Marazziti et al., 2021) with the intention of gaining insights into the management of climate change.

Although climate change and the COVID-19 crises differ in many ways, including the speed at which they develop (Gössling & Schweiggart, 2022), evidence on how COVID-19 might psychologically impact people - i.e., stress, anxiety, risk perception and life satisfaction (Ekinci & Van Lange, 2023) - and affect *perceptions of risk* and *environmental attitudes* (Braje et al., 2021; Qiu et al., 2020) is providing an opportunity for reflection on climate change and tourist behaviour (Prideaux et al., 2020).

Beyond a descriptive discussion of the health and climate change crises, this section revises significant findings related to climate change impacts on the *travel behaviour* and *environmental attitudes* of tourists, along with the new perspectives on this topic during and throughout the COVID-19 crisis.

Climate change and travel behaviour

The typical drivers of tourism demand are economic growth, changes in demographic and technology, political circumstances, and social and cultural trends. The implications of demographic and social changes are highly complex and should be analysed in relation to other important factors, such as environmental change (Reintinger et al., 2016).

A large body of evidence shows that individuals consider the characteristics of the environment when browsing between alternative destinations. Tourists are also recognised as having a great *adaptive capacity* to climate variability due to their flexibility in regards to rescheduling and changing destinations/types of holiday (Michailidou et al., 2016). Consequently, popular holiday destinations are projected to lose their appeal due to the extreme temperatures and environmental degradation likely to occur this century. In contrast, those destinations - at higher latitudes - are expected to become more attractive (Gössling & Schweiggart, 2022). Thus, future climate scenarios might cause important changes in the geography and stationarity of tourism at a global level (Reintinger et al., 2016).

Studies have also demonstrated that climate change impacts are not synchronous since they show different intensity levels across regions and localities (Vrontisi et al., 2022). Similarly, expectations and opinions about climatic conditions and climate-related risks differ among tourists according to their demographics, travel experience, the climatic conditions of their place of residence, the projected and perceived image of destinations (Bekk et al., 2016), and the type of activities in which they participate (Seekamp et al., 2019).

For instance, when it comes to coastal destinations, tourists have great expectations about how they should look, which is partly based on the projected image and advertising efforts (Bekk et al., 2016). Hence, these tourists might be more averse to physical changes (e.g., beach width), leading to more intense 'recreation substitution behaviours' caused by climate change impacts. At the same time, they can present stronger intentions to return if effective recovery strategies are implemented (Seekamp et al., 2019). The same happens with other types of marine and mountain tourism that are also recognised as highly sensitive to climatic conditions since they are also dependent on the quality of environmental services - e.g., water transparency and abundant biodiversity (Lam-González & de Leon, 2019).

Other impacts of climate change with direct effects on tourism demand include *extreme weather events* and *heat waves* (Vrontisi et al., 2022). Climate change is also expected to have pronounced indirect effects via its contribution to disease spreading (Manzanedo & Manning, 2020) that pose greater health risks to tourists and damage the image of destinations (Vrontisi et al., 2022). Hence, climate change represents an enormous challenge to tourist destinations in managing their environmental features and other attributes. These challenges need to be anticipated in order to ameliorate their potential impacts on tourism demand since they affect tourists' intentions and the level of satisfaction - or 'utility' - they feel (Reintinger et al., 2016).

COVID-19 impacts on travel preferences

Since the outbreak, "travellers have not abandoned the desire to travel, but have reoriented their choices" (Corbisiero & Monaco, 2021, p.411). According to the World Travel and Tourism Council, tourist behaviour in general has shifted toward a stronger preference for domestic and short-haul destinations. Other studies show a greater desire for less crowded, quieter destinations (Kim et al., 2022; Sigala, 2021) and travelling in smaller groups (Nazneen et al., 2020). According to the theory of 'environmentally significant behaviour', these new beliefs represent an opportunity to study possible behavioural changes (Gössling & Dolnicar, 2023) about the growing value placed on more private (Kusumaningrum & Wachyuni, 2020) and local tourism (Kourgiantakis et al., 2021).

At the same time, evidence suggests that the intention to avoid unnecessary travel has become greater in the aftermath of the lockdown, especially to destinations that are perceived as having a high level of health insecurity (Neuburger & Egger, 2021). This finding is consistent with research about previous infectious disease outbreaks (Qiu et al., 2020). Some authors have argued that even when the pandemic conditions improve considerably, uncertainty and the perception of greater health risk are projected to remain for a long time to come while the seeking of variety in travel choices and activities will increase as 'compensatory consumption' (Kim et al., 2022).

Qiu et al. (2020) attempted to classify tourists' possible long-term, post-pandemic behavioural patterns. The authors concluded that future travel behaviours would be well differentiated, ranging from a more rational and bounded travel behaviour, dominated by tourists who will maintain a preference for less-crowded destinations and domestic trips, to the so-called 'quest for meaning behaviour', characterised by those who will engage in more ephemeral and authentic activities to achieve a greater sense of self-esteem when travelling (Mkono et al., 2022).

Finite-pool-of-worry versus affect-generalisation theory

When it comes to the pandemic's effects on the individuals' environmental and climate-related mindsets, there are at least three academic perspectives. First, studies have shown that widespread public concerns about climate change and other environmental issues have not been affected by the outbreak (Hynes et al., 2021). According to Botzen et al. (2021), this can be explained because there is a greater psychological distance from climate change impacts than from the COVID-19 threats. They also argue that individuals will only rank environmental problems as having equal importance to COVID-19 when it is too late to prevent the most severe impacts (Botzen et al., 2021). In this respect, Hynes et al. (2021) also indicate that environmental concerns follow the conventional economic theory that suggests that consumer preferences are stable over time.

Second, other authors suggest that COVID-19 has confirmed the 'finite-pool-of-worry' hypothesis in the context of climate change (Gregersen et al., 2022; Jiricka-Pürrer et al., 2020). This theory states that humans have limited cognitive and emotional resources to designate what issues they worry about (Linville & Fischer, 1991). The original theory was adapted to 'climate worry' (Weber, 2010), which states that worrying more about one threat may exhaust cognitive resources and cause one to be proportionately less worried about other threats.

In this vein, Gregersen et al. (2022) found that as worry over health risks has increased with the latest pandemic, the existing capacity to worry about climate change and its environmental consequences has been reduced. Assessing the decrease in climate awareness is crucial, as it argues against moral norms and ruled-based social responsibility (Weber, 2010). In this context, organisations taking action to counter climate change would have a reason to slow their efforts until citizens are willing to support them (Sisco et al., 2023).

A lower level of awareness of climate-related issues also affects trust and the credibility of scientific evidence, which further constrains moral norms (Gregersen et al., 2022).

On the contrary, high levels of concern about environmental degradation are proven to be drivers of relevant mitigative actions (Sisco et al., 2023). Combatting long-term climate risks with measures that carry immediate personal costs requires a compromise with mitigation (Marx & Weber, 2012). Nonetheless, the latter researchers conclude that there is still limited evidence for a finite-pool-of-worry, as recent research has argued that, in reality, there has been a decreasing amount of attention paid to the climate change topic - 'finite pool of attention' - or other crises (e.g., refugees), and general levels of worry have not been affected (Ekinci & Van Lange, 2023).

Third, a hypothesis that competes with the 'finite-pool-of-worry' is 'affect-generalisation' (Johnson & Tversky, 1983). It proposes that worry about one threat might spill over to other issues, increasing general levels of worry via associative networks (Sweeny & Dooley, 2017). In the context of climate change, studies have found that higher levels of worry over health risks caused by COVID-19 have led to greater worry and intentions to protect the environment (Ekinci & Van Lange, 2023), manifested as a greater aversion to crowding and a disposition to stay at 'green hotels', or support climate policies (Jian et al., 2020; Sisco et al., 2023). These authors indicate that further research is still needed to infer causality to climate change worry and subsequent action or decision-making.

While conclusions are still imprecise, the present paper aims to address the mixed findings in the literature by shedding light on the influence of COVID-19 on tourists' sense of utility or satisfaction regarding some of the environmental assets of destinations that are likely to be modified or damaged by climate change. The focus of the present study is thus on destination choice, which is an individual decision resulting from the interplay between tourists' future travel plans and the expected characteristics of destinations (Reintinger et al., 2016). It is also concerned with measuring changes in the perceived utility of visiting sites endangered by climate change before and after COVID-19.

In light of the finite-pool-of-worry hypothesis, it can be expected that the experience of COVID-19 has reduced the relative perceived importance of the majority of *environmental attractors* while enhancing others related to the health crisis. Those risks likely to play a significant role after the health crisis are those that are psychologically closer to COVID-19 from the perspective of individuals (i.e., spreading of diseases such as ¨dengue¨ caused by climate variability). Based on the affect-generalisation hypothesis, there should be a greater sensitivity to most climate change impacts after COVID-19. This means that any potential risk will have more (negative) influence on destination choice and travel intentions.

Material and methods

Modelling

This study assesses changes in tourists' utility (or satisfaction) from visiting destinations exposed to climate change impacts before and after the COVID-19 pandemic. With this aim, a discrete choice experiment methodological approach was utilised (Lindenberg & Steg, 2007). The discrete choice experiment was repeated after COVID-19 for the comparison of the results with those obtained before the pandemic. In turn, we assessed the changes in the environmental sensitivity of individuals.

Discrete choice experiments are based on the random *utility model*, which assumes that individuals choose the destination that drives the largest utility or individual satisfaction (Kamakura & Russell, 1989). That is, the tourist is assumed to have a utility function that relates the characteristics of a destination with their level of satisfaction.

Tourists choose between alternative destinations based on their perceived utility under alternative environmental conditions of these destinations. This allows researchers to estimate the parameters of the utility function that represent the utility sensitivity of the tourists concerning the different environmental characteristics susceptible to be affected by climate change. The destinations are desirable but, at the same time, may be suffering diverse environmental impacts due to climate change (Yuriev et al., 2020). The study relies upon 'the theory of planned behaviour' (Hensher, 2010), where individuals' intentions and stated preferences are assumed to be the best direct predictors of that behaviour.

Authors have utilised discrete choice experiments to represent tourists' behavioural processes in deciding upon alternative destinations based on their features (Eymann & Ronning, 1997; Huybers, 2003), natural ecosystems and their conservation and management alternatives (Enríquez & Bestard, 2020; Kemperman, 2021).

As there are different models for assessing individuals' preferences (Hoyos, 2010), a comparative assessment of alternative approaches was undertaken in this study. This allows us to define which one better fits the choice data. These models were the Generalised Multinomial Logit Model (Fiebig et al., 2010), the Multinomial Logit (McFadden, 1974), the Mixed Logit Model (Ben-Akiva et al., 1997), the Latent Class (Kamakura & Russell, 1989), and the Mixture of Normals Multinomial Logit Model (Keane & Wasi, 2013). Three indicators were used to select the most suitable model: the Log Likelihood, the Bayes Information Criteria, and the Akaike Information Criteria. The supplementary material presents the alternative models/approaches in more detail.

The questionnaire

The discrete choice experiment method was conducted using a questionnaire where tourists were presented with a situation in which they had to choose between holiday destinations. Eleven destinations were chosen for the analysis, all represented by

European islands or archipelagos. They were included as labels for the travel choice options (Azores, Balearic Islands, Canary Islands, Corsica, Crete, Cyprus, Madeira, Malta, Sardinia, Sicily, Martinique/Guadeloupe).

These islands were chosen for three main reasons. First, they are among Europe's most important tourism destinations (Eurostat, 2019). Second, their economies heavily rely on tourism, which contributes >20 % to their regional GDPs (Vrontisi et al., 2022). In addition, they feature low economic diversification because of their distance from markets and less chance to enjoy the scale advantages arising from economic agglomeration. This contributed to a critical economic situation due to the COVID19 outbreak and the subsequent efforts dedicated to tourism recovery. Third, they share common vulnerabilities to the impacts of climate change, as they have relatively large coastal zones and feature valuable ecosystems while being subjected to more challenging adaptation processes due to their remoteness (Mariano et al., 2021).

The questionnaire was structured into three sections. The first part was concerned with two questions. One of them was about the importance individuals give to the environmental attributes of destinations. The second question was about their travel intentions in the context of climate-related risks affecting their favourite destinations. The second part concerned the choice questions central to applying the discrete choice experiment method. The last part requested information on the socio-demographic profile of respondents.

The environmental attributes

In applying the discrete choice experiment, it was crucial to define the characteristics that differentiate alternative destination options. Thus, to specify the discrete choice questions, the destinations were characterised according to nine environmental attributes with different levels of *impact/risk* potentially caused by climate change. The selection of impacts was made by consulting the available literature, the latest climatic projections and recent research on the destinations under study. The definition of *damage level* or *risk* due to climate change was fine-tuned through consultation with experts.

Eleven experts were engaged in the different phases of (i) defining and validating the attribute levels and the choice scenarios and (ii) validating the final questionnaire. The experts were not necessarily based at the destinations but were selected because of their expertise in climate models, marine and terrestrial habitats, forest fires, climate change, and tourism systems surrounding European waters. In turn, climatic projections and expert participation served to draw a more realistic picture of the climate-related damages to which these islands are exposed.

According to the experts' views and opinions, and considering a high emissions scenario of GHG compatible with RCP8.5 (IPCC AR6 WGII report), the future of tourism for the islands under study will mainly be affected by sea level rise and erosion, prolonged droughts and heat waves, with subsequent effects on beaches, infrastructure, cultural heritage, probability of forests fires, water availability, and infectious disease episodes (Nguyen-Trung et al., 2020). Although these are common climate risks for all European islands, they are not synchronous, as their intensity, form, and exposure may vary from region to region (Vrontisi et al., 2022). This justifies the consideration of different levels of damage, later handled as categorical variables in modelling the individual responses.

Three levels - *current situation, moderate damage* and *strong damage* – were considered for the different impacts of climate change at the island tourism destinations. Table 1 presents the description of the attributes under study alongside the main sources from which the climate change impacts were extracted.

At the beginning of the questionnaire, individuals rated the importance of environmental attributes at destinations. Ten statements were utilised (e.g., *Comfortable air temperature; Water availability*). These statements had a relationship with the attributes of Table 1.

After, they were presented with a generic conceptualisation of climate change and possible impacts (without any reference to a specific destination). In this sense, the study produced accurate visualisations. Respondents received bits of information with images and a simple description of damage levels and how they can affect a 5-days holiday. For example, Fig. 1 shows the information provided about two attributes/impacts: *heat waves* and *infectious diseases*.

After describing climate change impacts and risk levels, the individuals were posed with the following: “Consider now that some of these climate change risks are present in the destination chosen for your next holiday. How likely is it that you would either cancel the trip or stay at home?” At this point, individuals continued filling in the questionnaire before passing onto the second question about the likelihood of either changing their travel plans or staying at home in the face of severe climate risks (e.g., *temperature is extremely hot; infectious disease widespread*). Here, individuals were revealing their intended travel behaviour if faced with severe impacts or risks due to climate change. Nevertheless, all the statements had a relationship with the attributes of Table 1.

Then, the individuals moved to the second part of the questionnaire (the choice experiment). Before starting, they were presented with the island destinations under study, followed by an explanation of the accelerated changes to the climate that are currently affecting them. A particular focus was given to clarifying the meaning of ‘current situation’. The ‘current situation’ (reference scenario) is the observed data utilised in climate models to estimate future damage to the islands. This is also considered the ‘least damage’ scenario in a projected future of increasing GHG emissions.

However, the current situation does not always represent a ‘no-hit scenario’, as some islands are seeing significant changes (Vrontisi et al., 2022). For instance, with the present climate, Sardinia and Sicily have high habitat suitability index values for *insect vectors* (Mariano et al., 2021), while the *fire danger* in Crete is among the highest in the Mediterranean (Bacciu et al., 2021). For its part, Cyprus can be considered the most-affected island in Europe concerning *climate discomfort*, as they currently have more than three months per year with air temperature above 35 °C (Zittis et al., 2021).

Table 1
Attributes and levels considered in the choice model.

Attribute	Description	Risk levels	References
Heat Waves	Heat waves are periods of several hours or days of excessive hot temperatures (Humidity >35 °C, leading to danger for outdoor activities). According to estimates, these periods could increase during this century by >100 % above the current situation on the islands. The number of days with Humidity >35 °C in the reference period range from 30 to 90 (three months per year), depending on the island.	Current situation (3 h) Heat increase (4 consecutive days) Extreme heat (5 consecutive days)	Mariano et al., 2021
Infectious diseases	Climate change can influence the transmission of vector-borne diseases by altering the habitat suitability of insect vectors that cause chikungunya, dengue fever, yellow fever and various encephalitis (i.e., *Aedes Albopictus* – also known as Asian Tiger Mosquito). The vector Suitability Index ranges from 1 to 100, mainly controlled by increases in air temperature and changes in the hydrological cycle. Some islands have high habitat suitability index values for the present climate, while, for others, the suitability is expected to decrease under the new climatic conditions.	Current situation Moderate risk Severe risk	Davis et al., 2021; Zittis et al., 2021
Beaches	The scenarios of beach reduction considered in this study come from the latest climatic projections available at island level, where the probability of losing comfortable beach space depends on sea level rise and flooding, either permanent or during episodes, and the beach bathymetry. This is a big issue in the context of islands where a significant reduction in the usable area of many beaches is expected.	Current situation (no reduction) Moderate reduction Strong reduction	Lionello et al., 2019
Water	Climate change is reducing water availability. Available water is commonly analysed through the SPEI - Standardised precipitation-evapotranspiration - Index. It is a representative indicator of increases in water demand for residents, tourists and agriculture. At the same time, it indicates the available water stored in dams or underground resources. A much drier future is the likely scenario for most islands.	No restriction Moderate restriction (3 h) Severe restriction (9 h)	Zittis et al., 2021
Forest fires	The Fire Weather Index (FWI) system provides numerical, non-dimensional ratings of relative fire potential for a generalised fuel type (mature pine stands) based on weather observations. The scale ranges from 0 – low increase to 1 – high increase. Estimates vary greatly among subareas (NUT3), but the best-positioned islands are projected to keep their same current situation.	Current situation Moderate increase High increase	Bacciu et al., 2021
Marine ecosystems	Climate change induces seawater heating and acidification, which are chief contributors to the disappearance of seagrass meadows and coral reefs, flag species and the increase of water turbidity, among other aspects that affect water quality (cleanliness, transparency) and marine ecosystems (abundance). Islands will be mainly affected by the disappearance of the main seagrass species that are foundational, altering ecosystem properties that are a tourist attraction.	Current situation Moderate degradation Strong degradation	Jorda et al., 2020
Land ecosystems	The rising temperatures, sea levels and flooding lead to a possible deterioration in the conservation status of the terrestrial ecosystems and their biodiversity in the visited island (flag species, rivers, vegetation, landscapes)	Current situation Moderate degradation Strong degradation	Vrontisi et al., 2022
Infrastructure	Climate change induces damage to tourist infrastructure on islands due to more intense and frequent storms, higher waves, rising sea levels and floods.	Current situation Moderate damage Strong damage	
Cultural heritage	Changes in weather patterns and extreme events can affect cultural heritage by degrading traditionally built cultural assets. Sea level rise and storms will particularly affect cultural heritage sites in coastal regions.	Current situation Moderate damage Strong damage	
Price	The total expenditure per day per person to be paid for a 5-day trip, including the displacement to the destination and the total stay in hotel accommodation	0€ 100 € 150 € 200 € 300 €	

Using an alternative current situation scenario (or status quo) as an attribute level in the choice experiment is proven to support the derivation of robust estimates that have a closer link to the real behaviour of individuals (Lindenberg & Steg, 2007). The computer-aided and internet-based personal survey instrument allowed us to automatically individualise the description of the current situation for each attribute.

Before starting with the choice question (part 2 of the questionnaire), individuals could select any island on the screen to see the description of the current situation for all the attributes, or any attribute to compare islands. During the choice task, some values and indices that helped bring the current situation to mind were incorporated into each attribute/island. Hence, *moderate* or *severe* risk levels always imply a situation that is worse than the *status quo* or *current situation* of each island.

Focus groups and pre-testing

The design of the final questionnaire was preceded by extensive work with focus groups and pre-testing phases that were organised to check the suitability of the pilot questionnaire. Both the focus groups and pretesting phases also served to check whether the individuals understood the meaning of each attribute, allowing the research team to improve the final questionnaire.

Eight focus groups were organised in a 'face-to-face' format with seventy tourists visiting the islands. The budget restriction was the main reason all eleven islands under study could not be covered. Only one Italian, one Portuguese and one French island

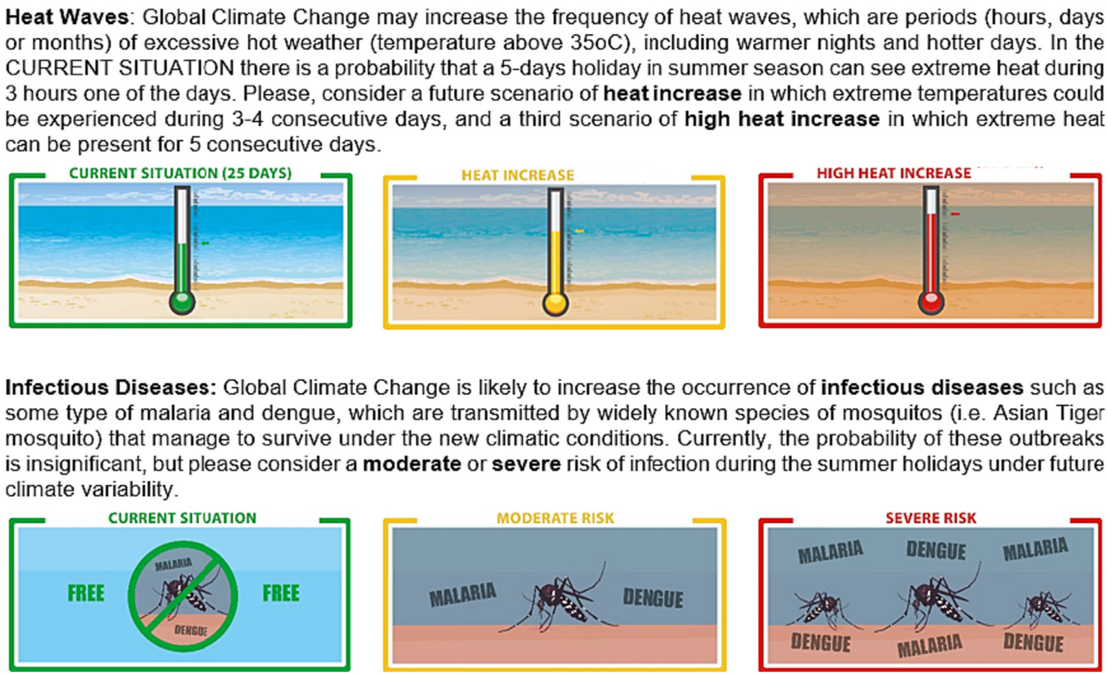


Fig. 1. Climate change impact levels for *heat waves* and *infectious diseases*.

were included. The meetings and work sessions were successively held across all islands with visiting tourists (February 2019). There was an incentive consisting of a dinner at the non-buffet restaurant inside the facility.

In the focus groups, it was possible to discuss the payment vehicle that was easier to understand and raised fewer protest responses or rejections of the choice scenario. As a result, the price attribute was defined as the per-day cost of staying at a destination for five days, including accommodation and hotel costs. Therefore, the five-day stay was incorporated into the choice option to give more realism to the choice situation. The price offered in the choice alternatives had to be calculated times five (x5) to obtain the total cost of the stay.

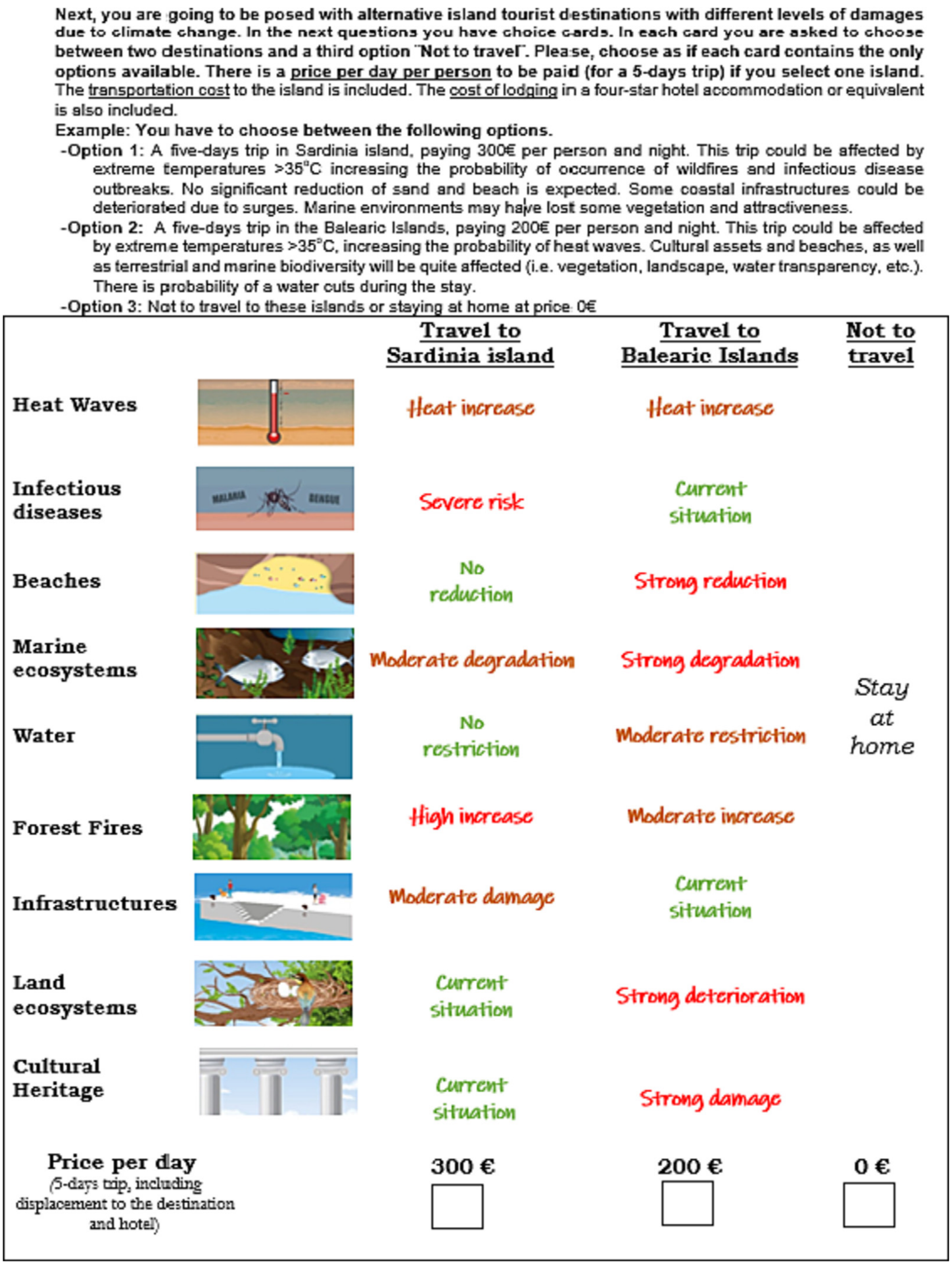
Focus groups allowed us to improve the way the information about climate change impacts was presented so as to be easily understood by respondents. Climate change risks are assumed not to be caused by tourism, but by global climate change with local consequences at the destination to be visited. Here, individuals were asked open questions about what the impacts of climate change at their favourite tourism destinations would be, and to rank those impacts in terms of importance. The answers to these questions were cross-checked for consistency with the environmental attributes to be defined in the choice experiment. Each of the climate change impact attributes were openly discussed with the group of tourists and checked for being fully understandable based on the descriptions finally utilised in the questionnaire.

Next, a pre-testing phase involving four hundred tourists was conducted to analyse the statistical significance and the relevance of the attributes and questions posed in the questionnaire. This was in an online format (June 2019) and participants were not incentivised to join the survey. The analysis of the pre-test data showed that tourists ranked the various impacts posed in the choice experiment differently and that the results were consistent with qualitative responses.

Discrete choice questions

Once individuals were placed in the context of the risk levels and the islands under analysis, they were presented with the discrete choice questions (part 2 of the questionnaire). The choice questions showed two alternative destinations involving different levels of climate change impacts for all the attributes, plus the price to pay for a holiday at those destinations. That is, tourists were posed with two alternative choice scenarios involving different combinations of climate impacts at the alternative destinations. A third option of not travelling was added to these two alternatives. Fig. 2 shows an example of one of the choice questions utilised. Based on market realism and to simplify the decision task, tourists were presented with decisions related to destination choice as though the climate-related damages coincided with their current, rather than future, decision-making process.

In order to define the set of choice alternatives of destinations, a Bayesian efficient design was utilised to obtain the combinations of destinations and impact levels to be offered. A set of 24 combinations of impact levels and destinations was obtained. Following results from the focus groups and pre-testing phase, the number of choice cards in each questionnaire was set to three - from the five initially considered - to make the choice tasks manageable. In this way, each individual had to answer three successive cards. Thus, eight different questionnaires were randomly distributed across the sample.



Next, you are going to be posed with alternative island tourist destinations with different levels of damages due to climate change. In the next questions you have choice cards. In each card you are asked to choose between two destinations and a third option "Not to travel". Please, choose as if each card contains the only options available. There is a price per day per person to be paid (for a 5-days trip) if you select one island. The transportation cost to the island is included. The cost of lodging in a four-star hotel accommodation or equivalent is also included.

Example: You have to choose between the following options.

-Option 1: A five-days trip in Sardinia island, paying 300€ per person and night. This trip could be affected by extreme temperatures >35°C increasing the probability of occurrence of wildfires and infectious disease outbreaks. No significant reduction of sand and beach is expected. Some coastal infrastructures could be deteriorated due to surges. Marine environments may have lost some vegetation and attractiveness.

-Option 2: A five-days trip in the Balearic Islands, paying 200€ per person and night. This trip could be affected by extreme temperatures >35°C, increasing the probability of heat waves. Cultural assets and beaches, as well as terrestrial and marine biodiversity will be quite affected (i.e. vegetation, landscape, water transparency, etc.). There is probability of a water cuts during the stay.

-Option 3: Not to travel to these islands or staying at home at price 0€

	Travel to Sardinia island	Travel to Balearic Islands	Not to travel
Heat Waves	Heat increase	Heat increase	Stay at home
Infectious diseases	Severe risk	Current situation	
Beaches	No reduction	Strong reduction	
Marine ecosystems	Moderate degradation	Strong degradation	
Water	No restriction	Moderate restriction	
Forest Fires	High increase	Moderate increase	
Infrastructures	Moderate damage	Current situation	
Land ecosystems	Current situation	Strong deterioration	
Cultural Heritage	Current situation	Strong damage	
Price per day (5-days trip, including displacement to the destination and hotel)	300 € ☐	200 € ☐	0 € ☐

Fig. 2. Example of choice set.

Hence, respondents were asked to select one of two alternatives, labelled options (destinations), plus the option of *no choice*, i.e., to stay at home/not travel (Fig. 2). The choice of one destination was associated with a given price per day (the cost of the trip), and the option *stay at home/not travel* had a price equal to 0€. Each choice set compared alternatives for each climate change impact, involving either the status quo/currently observed situation or the levels of the attributes expected to be observed in future times.

Internet experiment

The study population was adult - defined as 18 or older - citizens of four countries (England, France, Sweden and Germany). All individuals had past experiences or plans to travel overseas to a European island. The selected countries represent Europe's

Table 2
Characteristics of samples.

Variable	*Pre*-COVID19	*Post*-COVID19	F-test
Gender (%)			
Male	47.8	48.3	0.002
Female	52.2	52.7	0.001
Age (%)			
<30 years	17.0	17.2	0.001
30–60 years	58.3	58.9	0.001
> 60 years	24.7	24.9	0.001
Nationality (%)			
French	24.9	24.9	0.002
German	25.0	25.0	0.001
Swedish	25.0	25.0	0.002
English	25.0	25.0	0.001
Education level (%)			
High school or less	29.0	29.3	0.001
Vocational training	28.7	29.0	0.001
Bachelor's degree or higher	42.4	42.8	0.001
Monthly Income level (%)			
1201–2000 €	22.2	22.4	0.001
2001–2800 €	23.4	23.6	0.001
2801–3500 €	19.8	20.0	0.001
>3500 €	19.0	19.2	0.001
N	4838	2062	

main outbound markets for coastal tourism (Eurostat, 2022). A total sample of 6900 individuals were interviewed online. The sample was split into two subsamples: one before the outbreak in November 2019, and the other in May 2021. The interviews were carried out a professional survey company and samples were taken randomly from the populations of origin countries.

The sample was randomly distributed according to quotas of nationality, age ranges and gender groups. In order to focus only on the market segment of the island destinations in the E.U., potential respondents were screened for whether they had visited a Mediterranean or North Atlantic island in Europe in the previous five years or whether they planned to do so in the following year.

Participants did not receive any incentive to participate. Protest and invalid responses represented 13.2 % of the total. Those cases where the participant responded in less than ten minutes were excluded from the study. Equally, the analysis did not include individuals who selected only the third option - *stay at home* - for all discrete choice questions. This because all respondents were screened for having intentions, past or present, to travel to a European island, and all these regions are far from exempt from environmental damage. It was assumed that these individuals were avoiding elements that reminded them of conflicts - *non-trade-off* (Marx & Weber, 2012).

The post-pandemic questionnaire and sampling plan followed the same design specifications as the fieldwork conducted before COVID-19. That is, the questionnaire was the same and the sample was randomly taken from the same source countries. Table 2 presents the socioeconomic characteristics of the subsamples of respondents *before* and *after* the COVID-19 pandemic regarding *gender*, *age*, *level of education, nationality* and *personal income level.*

There are no significant differences between the subsamples. The most well-represented age category is 30–60 years old, at 58 %. Regarding *level of education*, the largest proportions are found for those holding Bachelor degrees or other higher education certifications, at 42 %. Concerning *personal monthly income,* about 40 % of the sample had an income above 2800 €/month.

Results

Fig. 3 shows the descriptive statistics of the importance given by individuals to a set of environmental attributes at tourist destinations *before* and *after* COVID-19. This information was obtained through the first question in the survey. On average, individuals consider all the items to be of great importance, as the mean values are consistently higher than 4.5 within the seven points Likert scale utilised. Standard deviation (SD) values also show a low variance ranging from 0.5 to 0.9.

The pre-pandemic results show that respondents rank *lack of infectious diseases* first (mean = 5.80; SD = 0.50), followed by *comfortable air temperature* (mean = 5.25; SD = 0.69). The *post*-COVID-19 results indicate significant differences between periods in the mean values for almost all attributes except *lack of extreme events*, as indicated by the *t*-test ($p < 0.05$). The differences are in opposite directions. Post-COVID-19 tourists attach greater importance to *lack of infectious disease* (from 5.80 to 6.50; $p < 0.01$), *water availability* (from 5.00 to 5.40; $p < 0.01$) and *lack of wildfires* (from 4.91 to 5.05; $p < 0.01$). According to the responses, the rest of the items became less important after COVID-19.

Concerning the disposition to *change travel plans* or *stay at home* if their preferred destination was experiencing 'severe climate risk' due to climate change, nine statements were utilised and an ordinal scale ranging from 1 = Not at all (*I do not want to change travel plan or stay at home if the climate risk is present*) to 5 = For sure (*I would like to change travel plan or stay at home if the climate risk is present*). Data was obtained from the responses to the second question of the questionnaire (Fig. 4).

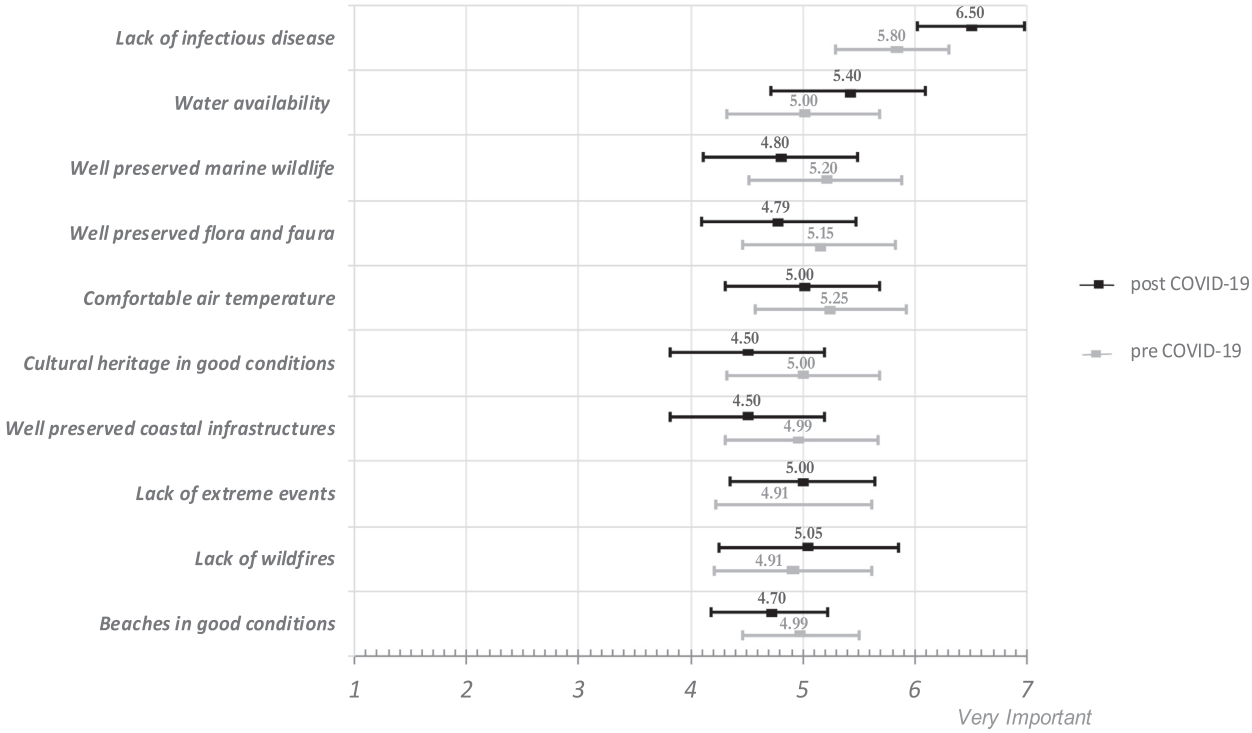


Fig. 3. Importance of environmental attributes.

According to the responses, all the impacts were potential deterrents for tourists before the pandemic and remain so after. >55 % of respondents expressed their disposition to cancel their travel plans with some degree of certainty in both periods, indicating a high aversion to travelling under a climate risk scenario. Furthermore, no significant differences were found between the dispositions to either *change travel plans* or *stay at home*.

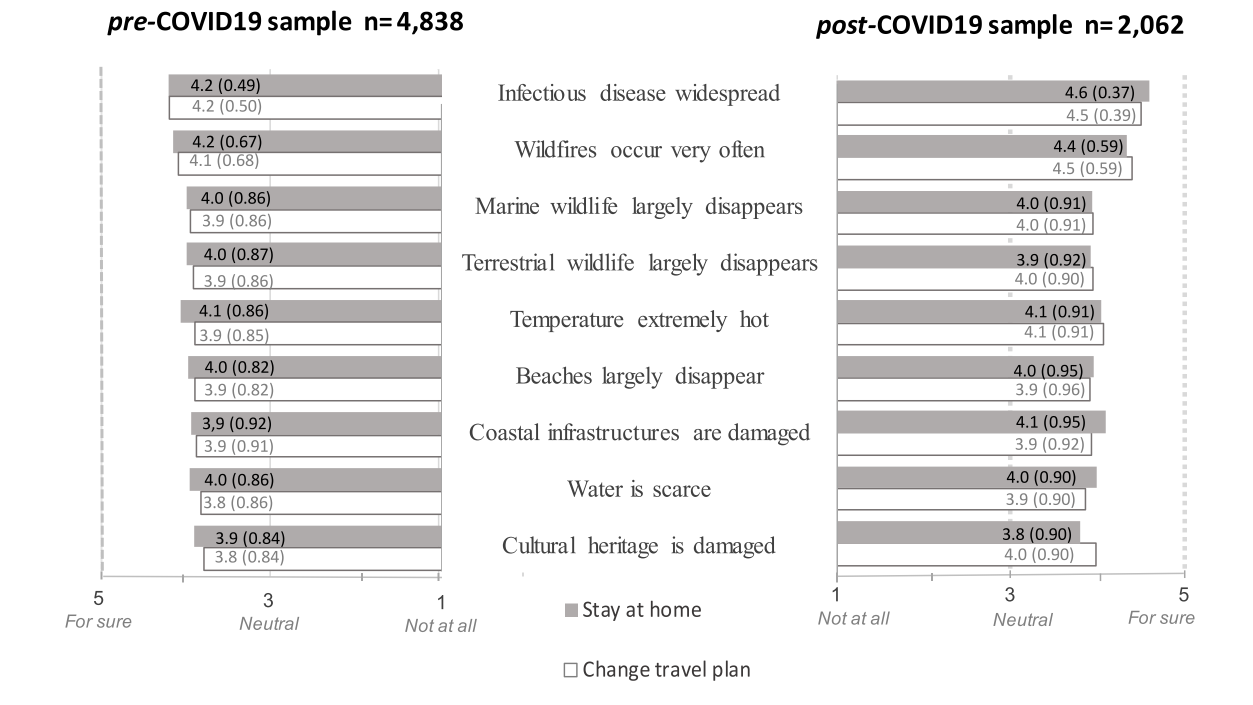


Fig. 4. Disposition to change travel plans or stay at home under climate risks.
Note: Bars show the mean values; SD values in parentheses. On the left results of the first period (*pre*-COVID19); on the right are the results with the *post*-COVID19 sample.

Table 3
Results of the model selection criteria in the *Pre*-COVID-19 sample.

	Log Likelihood	*Akaike's Information Criteria*	*Bayes' Information Criteria*	*Consistent Akaike's Information Criteria*
Multinomial Logit	−6.13	12.71	12.41	12.42
Mixed Logit	−5.50	13.09	11.89	11.49
Generalised Multinomial Logit	−5.35	12.38	11.24	10.91
Latent Class	−5.92	13.04	12.03	12.04
Mixture of normals Multinomial Logit	−5.45	13.50	12.76	11.62

On average, the spread of infectious diseases and the higher frequency of wildfire events were somewhat highly ranked by both groups in terms of the likelihood of them influencing a decision to either stay at home or change their travel plans, pre *and* post COVID-19 (mean values 4.2 and 4.5/4.6 respectively).

The *post*-COVID-19 results show changes in tourists' intentions only for *Infectious disease widespread* and *Wildfires occur very often.* Since the pandemic, there is a greater disposition to stay at home if infectious diseases are widespread (from 4.2 to 4.6). Similarly, the likelihood of changing travel plans if wildfires occur more often is greater within the *post*-COVID19 group of tourists (from 4.1 to 4.5).

Model selection

Tables 3 and 4 present the statistics for the comparison of the choice models for both *pre* and *post* COVID-19 samples. The model comparison was undertaken utilising a two-stage process, also known as S-L test (Swait & Louviere, 1993). In this exercise, the first stage estimates the log likelihood function values and parameter vectors for each database separately. In the second stage, the *pre* and *post* COVID-19 datasets were merged. In this step, the scale parameter of the first dataset was fixed to one, while the second parameter took hypothetical values. Then, a grid search simulation was run for the joint model, utilising the parameter of the second dataset that maximised the Log Likelihood.

The Log Likelihood ratio was utilised to measure the equivalence between the two subsamples: Log Likelihood Ratio $= -2[L_p - (L_{b+}L_a)]$, where L_p is the value of the ensemble dataset and L_b, L_a are the values of the separate datasets. The Chi^2 statistics of the S-L test was 66.15 - higher than the critical value of the distribution, indicating a significant difference in some of the parameters of the subsamples *before* and *after* COVID-19. The best-performing model was the Generalised Multinomial Logit model, with a Log Likelihood of −5.35 for the first-period sample, and −3.21 for the second.

The remaining models show a lower performance in explaining heterogeneity across individual preferences. Mixed logit was modelled with different specifications of the random parameters, but none of them outperformed the best-fitting GML model. Furthermore, the latent class model was also specified with two alternative classes that led to the best-fitting specification among the different classes.

Valuation of climate risks before COVID-19

This section presents the results of the choice experiment utilising the best model selected in the previous section. Here, the results are presented only for the *pre*-COVID-19 subsample (the results are not subject to the turbulence of the health crisis). The results for the *post*-COVID-19 subsample and their comparison with *pre*-COVID-19 outcomes are presented in the next section.

Table 5 presents the results of the best-performing Generalised Multinomial Logit model. Since the number of survey respondents was 4838 and each individual answered three choice questions, the total number of observations for the model estimation is 14,514. The explanatory variables are defined for the corresponding upper levels of the scale, leaving the lowest level as the baseline for comparison.

Parameter τ is the standard deviation of the distribution of the scale parameter affecting the random coefficients, which reflects the heterogeneity of the sample respondents. Parameter γ determines how the standard deviation of the random coefficients is scaled. If $\gamma = 1$, the model approaches the Mixed Logit model. In addition, heterogeneity due to sample's socioeconomic characteristics (income, education, gender) was modelled by including covariates that interacted with the alternative specific constant of choosing some travelling option, and were significant at the level of 0.001. The probability of travelling was higher for those subjects with education level (bachelor) and in the highest income bracket, while it was lower for those with higher age.

Table 4
Results of the model selection criteria in the *Post*-COVID-19 sample.

	Log Likelihood	*Akaike's Information Criteria*	*Bayes' Information Criteria*	*Consistent Akaike's Information Criteria*
Multinomial Logit	−3.30	7.85	7.13	6.89
Mixed Logit	−3.55	7.82	7.21	7.27
Generalised Multinomial Logit	−3.21	7.43	6.74	6.55
Latent Class	−3.27	8.01	7.66	6.97
Mixture of normals Multinomial Logit	−3.30	7.85	7.13	6.89

Table 5
Pre-COVID-19 estimation results of discrete choice utility parameter values.

Covariate	Estimation	Stand. err.
Price	−0.0019***	(0.0002)
Climate change impacts		
Heat waves	−0.009***	(0.001)
Infectious diseases (*Moderate*)	−0.281***	(0.039)
Infectious diseases (*Severe*)	−0.606***	(0.042)
Beaches	−0.003***	(0.001)
Water	−0.028***	(0.006)
Forest Fires (*Moderate*)	−0.151***	(0.063)
Forest Fires (*High*)	−0.316***	(0.092)
Land ecosystems (*Moderate*)	−0.219***	(0.054)
Land ecosystems (*Strong*)	−0.370***	(0.061)
Marine ecosystems (*Moderate*)	−0.092***	(0.052)
Marine ecosystems (*Strong*)	−0.276***	(0.056)
Infrastructure (*Moderate*)	−0.209***	(0.068)
Infrastructure (*Strong*)	−0.257***	(0.104)
Cultural heritage (*Moderate*)	−0.119***	(0.069)
Cultural heritage (*Strong*)	−0.269***	(0.044)
Destination brands		
Martinique/Guadeloupe	2.732***	(0.392)
Azores	2.649***	(0.361)
Balearic Islands	2.706***	(0.187)
Canary Islands	2.893***	(0.356)
Corsica	2.778***	(0.274)
Crete	2.913***	(0.254)
Cyprus	2.834***	(0.233)
Madeira	2.768***	(0.301)
Malta	2.800***	(0.253)
Sardinia	2.806***	(0.336)
Sicily	2.778***	(0.132)
Socioeconomics		
Education (1 = Bachelor, 0 = otherwise)	0.272***	(0.130)
Age (1 ≥ 60 years; 0 = otherwise)	−0.134***	(0.028)
Monthly income (1≥ 3500 €; 0 = otherwise)	0.235***	(0.073)
τ	0.502	(0.087)
γ	0.083***	(0.031)
No. individuals	4838	
No. observations	14,514	

Note: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$ Standard errors are in parentheses.

All the attributes are significant ($p = 0.01$) in explaining changes in tourists' utility and decision-making regarding destinations. As expected, they all have negative signs, indicating that the presence of any damage will reduce the individual's sense of utility from visiting the affected destination and will induce a 'substitution effect' to avoid the risk. The highest negative impacts are found for the attributes of *infectious diseases* (severe risk), *forest fires* (high increase) and *land ecosystems* (strong degradation). The lowest negative impacts are found for the potential *beach reduction* and the risk of *extreme heat waves*.

In general, higher levels of damage have greater negative effects on utility than moderate levels. These results support theoretical consistency with the individual decision-making process observed in the constructed market experiment in terms of the sensitivity to the scope of the impacts to be valued (Enríquez & Bestard, 2020). The results also complement the qualitative assessments presented in the aforementioned Figs. 3 and 4. Although *water availability* was found to be somewhat highly ranked in terms of importance for travellers, the discrete choice results show that its impact on utility can be traded for the presence of other potentially harmful attributes perceived by individuals.

Table 5 also incorporates the results into the destination labels. They represent the utility arising out of visiting the destinations, or their implicit brand value. 'Brand value' covers all the attributes that were not explicitly considered in the choice experiment but contribute toward forming the overall image tourists have of the destinations.

As can be seen in Table 5, all destination labels are positive and significant, with small differences in their contribution to *tourist utility* across destinations. Thus, a visit to any of the destinations under study, irrespective of the climate risks, do positively contribute to *tourist utility*, which can be explained because of the interplay between all other attributes offered by these destinations, e.g., accommodation and restaurant services.

Within these small differences observed across destination labels, the greatest influence on utility is found for Crete, the Canary Islands, Cyprus, Sardinia and Malta. In contrast, the smallest are found in the Azores and the Balearic Islands. In summary, a reasonably homogeneous image exists for all the islands considered. However, these images change in the face of climate risks, thereby reducing the destinations' brand contribution to tourists' sense of satisfaction or 'utility'.

The effects of COVID-19

This section explores the changes in travel preferences after the pandemic outbreak in the context of the same expected impacts across destinations. Table 6 presents the results of the *post*-COVID-19 subsample and the differences with those obtained in the *pre*-COVID-19 subsample, while Fig. 5 integrates the utility parameters of both periods. Standard errors for the utility parameter differences were calculated utilising the Delta method (Hole, 2007).

The data shows that the climate change impacts maintain a significant, negative influence on utility ($p = 0.01$) for all the parameters, similar to the model estimated with the *pre*-COVID-19 subsample. The strongest effect was found for the higher levels of the risks of *Infectious diseases* (*Severe*), *Forest Fires* (*High*) and *Land ecosystems degradation* (*Strong*).

The parameters of the *destination brands*, as given by the *destination dummies*, are also highly significant in all cases. The destination brands with the highest utility parameter values are Martinique/Guadeloupe, Sicily, the Canary Islands, Corsica, and Sardinia, while those with the lowest are the Azores, Madeira and Malta. Thus, the destination image is also significant *after* COVID-19, similar to the climate change attribute parameters.

All parameters of the destination brands have increased their value in absolute terms by an average of 19.25 %. The destinations with the highest increments in utility sensitivity are the French islands, Martinique and Guadeloupe (+33 %), and the Balearic Islands and Sicily (+31 % and +30 % respectively). The pandemic has reduced the influence of most climate change impacts on *destination choice* in favour of *destination brands*, reflecting the other tourism characteristics and services provided at destinations. This implies that tourists have become more reluctant to cancel travel plans after COVID-19, in the face of several climate change risks that may impact these destinations.

The comparison of the results indicates changes in the parameter estimates of the utility function that explain tourists' selection of alternative destinations in the face of climate change impacts. The price parameter has risen by 16.49 % in absolute terms,

Table 6
Discrete choice utility parameters estimation results after COVID-19, and comparative utility parameters difference (DIFF) with *pre*-COVID-19 sample results.

Covariate	Estimation	Stand. err.	DIFF	Stand. err. of DIFF	% DIFF
Price	−0.0022***	(0.000)	−0.000	(0.000)	16.49
Climate change impacts					
Heat waves	−0.009***	(0.003)	0.000	(0.003)	−2.21
Infectious diseases (*Moderate*)	−0.344***	(0.051)	−0.063	(0.054)	22.39
Infectious diseases (*Severe*)	−0.735***	(0.046)	−0.129	(0.052)	21.27
Beaches	−0.003***	(0.006)	0.000	(0.004)	−6.01
Water	−0.028***	(0.011)	0.000	(0.008)	−1.41
Forest Fires (*Moderate*)	−0.207***	(0.084)	−0.055	(0.097)	36.54
Forest Fires (*High*)	−0.452***	(0.103)	−0.136	(0.106)	43.15
Land ecosystems (*Moderate*)	−0.105***	(0.073)	0.114	(0.080)	−52.06
Land ecosystems (*Strong*)	−0.288***	(0.077)	0.082	(0.076)	−22.15
Marine ecosystems (*Moderate*)	−0.068***	(0.027)	0.024	(0.046)	−25.86
Marine ecosystems (*Strong*)	−0.236***	(0.067)	0.039	(0.074)	−14.37
Infrastructure (*Moderate*)	−0.095***	(0.113)	0.114	(0.111)	−54.55
Infrastructure (*Strong*)	−0.209***	(0.109)	0.047	(0.102)	−18.36
Cultural heritage (*Moderate*)	−0.117***	(0.092)	0.001	(0.094)	−1.01
Cultural heritage (*Strong*)	−0.259***	(0.101)	0.009	(0.101)	−3.45
Average of Climate Change Impacts			0.001	(0.072)	−3.84
Destination brands					
Martinique/Guadeloupe	3.654***	(0.622)	0.9215	(0.622)	33.73
Azores	3.411***	(0.596)	0.7616	(0.577)	28.75
Balearic Islands	3.549***	(0.770)	0.848	(0.684)	31.43
Canary Islands	3.632***	(0.875)	0.739	(0.838)	25.56
Corsica	3.603***	(0.729)	0.825	(0.561)	29.70
Crete	3.580***	(0.519)	0.666	(0.458)	22.89
Cyprus	3.531***	(0.782)	0.696	(0.716)	24.58
Madeira	3.497***	(0.610)	0.729	(0.580)	26.36
Malta	3.529***	(0.821)	0.729	(0.759)	26.05
Sardinia	3.597***	(0.745)	0.791	(0.613)	28.19
Sicily	3.633***	(0.410)	0.855	(0.390)	30.78
Average of destination brands			0.535	(0.312)	19.25
Socioeconomics					
Education (1 = Bachelor, 0 = otherwise)	0.163***	(0.041)			
Age (1 ≥ 60 years; 0 = otherwise)	−0.130***	(0.011)			
Monthly income (1≥ 3500 €; 0 = otherwise)	0.218***	(0.097)			
τ	0.481***	(0.071)			
γ	0.075***	(0.021)			
N individuals	2062				
Observations	6186				

Note: *p < 0.1; **p < 0.05; ***p < 0.01 Standard errors are in parentheses.

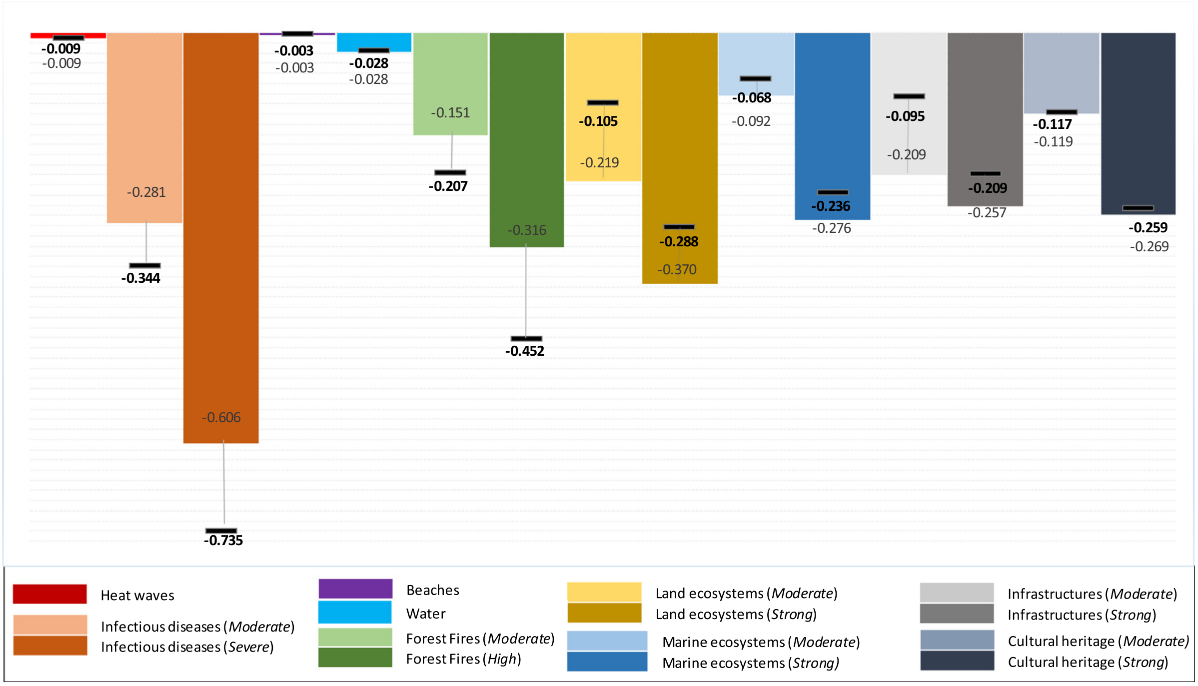


Fig. 5. Utility parameters with *pre*-COVID-19 and *post*-COVID-19 sample results
Note: *pre*-COVID-19 values (bars) and *post*-COVID-19 values (lines and bold font).

from −0.0019 to −0.0022, indicating that the demand has become more sensitive to price. In addition, there have been changes in the parameters of the environmental attributes (Fig. 5).

Most types of damage have become reduced in terms of *utility sensitivity* - that is, they have become less significant in absolute terms. However, other risks provoke a greater degree of sensitivity. This is the case for (*Severe*) infectious diseases, for which the parameter changes from −0.606 to −0.735, representing a 21.27 % increase in absolute terms. There is a similar situation with the *Moderate* level, with an increase of 22.39 %. Other attributes that have also slightly increased in utility sensitivity include forest fires: *high level* of impact from −0.316 to −0.452; *moderate level* from −0.151 to −0.207.

Discussion and evaluation of hypotheses

Climate change is expected to affect the environmental attributes of tourist destinations that have value for tourists (Enríquez & Bestard, 2020; Gössling et al., 2012). There is a need to ascertain what changes in tourism demand can be expected following climate change impacts, and how these changes will affect the sense of utility and satisfaction provided by the 'environmental goods' utilised in travel and tourism (Atzori et al., 2018).

Societies' preferences for market and *non-market* goods have always changed in the wake of pandemics and other major social or economic crises (Chakraborty & Maity, 2020; Marazziti et al., 2021). Due to the associated health risks, the emergence of the health crisis caused by COVID-19 deprived individuals of their travel plans (Kim et al., 2022). People have experienced sustained periods of quarantine and social distancing (Fotiadis et al., 2021); this has modified the way they travel (Kim et al., 2022) and altered preferences for destinations and their features (Qiu et al., 2020).

In a nutshell, this paper employs a multi-attribute, decision-making approach and two waves of surveys to analyse the effect of COVID-19 on the relative perceived importance given to various climate risks that explain shifts in individuals' travel behaviour. It allows us to ascertain that there is more willingness to travel to destinations *despite* the environmental impacts since the pandemic. That is, tourists show a greater inclination to consume services that were suspended during the pandemic, regardless of worsening climate conditions. Consequently, they have become *less sensitive* and *less averse* to most climate-induced risks (i.e., marine biodiversity degradation, damage to infrastructure, beach reduction, destruction of cultural heritage, Etc.).

Preferences have also changed toward a more negative perception of *infectious diseases* and *forest fires* caused by climate change. Since COVID-19, these risks have led to stronger negative impacts on the perceived utility of travelling to endangered destinations. Since most climate risks have become less important in travel decisions, the 'finite-pool-of-worry' hypothesis is supported against the alternative 'affect-generalisation' hypothesis regarding the impact of COVID-19. These results highlight the advantages of explaining travel decision-making in light of contextual and psychological factors that impact tourists' preferences, such as those caused by the emergence of a global health crisis (Mkono et al., 2022).

The present research has noteworthy theoretical implications. The results contradict the findings of Ekinci and Van Lange (2023) and Jian et al. (2020) that support the affect-generalisation hypothesis as an explanation of individuals' more environmentally-conscious behaviour after the pandemic. By confirming the finite-pool-of-worry, this study supports the hypothesis of Kim et al. (2022) and Jiricka-Pürrer et al. (2020). These authors affirm that the COVID-19 crisis has increased tourists' concerns over health risks.

According to our study, tourists are more averse to new waves of *infectious disease* that may originate from climate variability since the outbreak, perhaps caused by the psychological closeness of this attribute to the recent health crisis. Also, *infectious diseases* and *forest fires* are popularly understood as disruptive events and rapid forms of climate disaster and danger, which reinforce their closeness to the COVID-19 outbreak from the perspective of individuals, which is in line with the findings of Nguyen-Trung et al. (2020).

Although the current climate change crisis differs in many fundamental ways from the one caused by COVID-19 (Botzen et al., 2021), this study supports previous research suggesting that the pandemic has appeared to confirm that travel decisions are subjected to the way individuals frame health and risks at the personal level (Manzanedo & Manning, 2020). This calls for a need to find more effective ways to make tourists aware of the other impacts of climate change that will not be synchronous across large regions and nations, as was the case with COVID-19. Instead, some impacts are expected to be slow and vary in frequency, intensity, scale and timing worldwide, but with devastating health and socioeconomic consequences nonetheless (Prideaux et al., 2020).

Conclusion

This paper has evaluated the influence of the COVID-19 pandemic on travel choices and the relative importance of climate risks for travellers when deciding upon alternative destinations that are threatened by climate change. In general, it can be concluded that tourists are likely to switch destinations because of the emergence of climate risks and that any possible environmental damage would significantly reduce their preferences for holidaying at affected destinations.

Concerning the COVID-19 effect, the results show that there are significant changes in tourists' preferences and intentions in the wake of the pandemic. It has confirmed that COVID-19 has diminished worries about most climate threats while enhancing the role of other threats that are more related to risks to human health, thereby raising support for the 'finite-pool-of-worry' hypothesis against the alternative 'affect-generalisation'.

An element of novelty in this study is the more complex definition of the hypothetical settings in the choice experiment, which has come about by incorporating fine-tuned 'damage scenarios' that have a high probability of occurring at the eleven destinations under study. This is richer than traditional choice situations with forced (and artificially constructed) alternatives. It has been proven that when individuals know that the choice alternatives represent a very probable market setting (as was the case with this study), the alternative is more reasonably chosen and the utility outcome maximised (Hensher, 2010).

From a 'demand-side' perspective, this study shows that the occurrence of *infectious diseases* and *forest fire events* have a stronger negative impact on the utility arising from visiting endangered destinations after the pandemic. This result confirms that tourists have become less interested in travelling if these risks exist. It helps to identify policies tailored to the new travel profiles emerging from the pandemic experience. Those tourist destinations lacking the capacity to prevent and minimise new vector-borne diseases or fire exposure will see larger shifts in tourism demand, with the subsequent implications for profitability, employment and other components of 'quality of life' (Fotiadis et al., 2021).

In order to mitigate the increased level of worry of tourists regarding health security in the *post*-COVID19 era, more significant progression toward the reduction of GHG emissions, more effective early warning systems, and better communication that highlights the progress made in more transparent ways is required (Mariano et al., 2021).

However, since the pandemic, most impacts at destinations (e.g., heat waves, beach reduction, water restrictions) have become less prominent in influencing travel intentions. This poses a great challenge for compelling climate change communication, capable of making people understand the complex impact chains arising from global warming (Braje et al., 2021). The effectiveness of climate change communication is thus conditioned by the managers' capacity to convey how much health security depends on these other environmental attributes.

In this vein, the present paper highlights the importance of breaking down the climate change problem into specific categories of damage in order to crystallise the contribution of each impact to travel decision-making. Organisations taking action against climate change can now better identify to which impacts tourists are more sensitive after the pandemic. This is also an indication about which policies could result in more public engagement through, for instance, crowdfunding or direct taxation (e.g., forest fires prevention, early warning and health crisis response systems, etc.).

It may be expected that COVID-19 effects are transitory or will tail off as tourist destinations recover their pre-pandemic health and sanitary conditions (Botzen et al., 2021). However, the results of this paper confirm that the pandemic has changed tourists' perceptions and values with respect to climate risks and associated health conditions. This demonstrates the increased uncertainty regarding tourists' travel preferences and environmental sensitivity in the face of any other possible climate, natural or social situations. Further research should assess a more lasting effect and how far the encountered effects will recover once normality in the global tourism market is re-established.

This study has some limitations that highlight the need for further research efforts. First, since the results are based on simulated discrete choice experiments, there is possibility that they do not match what would be obtained in a real market setting. This can be addressed by comparing the current results with those observed in real market situations that will evolve as climate change impacts are fully materialised over the next decades. Second, the results support the 'finite-pool-of-worry' hypothesis, but more evidence is needed, leaving room for research with alternative evaluation techniques on which the authors are currently focused.

Finally, the fact that the extent of the market situation is limited to island destinations across the European region calls for further generalisation of the results to other geographical contexts, and involving other types of tourism niches and market segments, for instance, in the Asia-Pacific region.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.annals.2023.103663.

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