SOCLIMPACT

Downscaling climate impacts and decarbonisation pathways in EU islands, and enhancing socioeconomic and non-market evaluation of Climate Change for Europe, for 2050 and beyond

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Work Package 5:

Measuring market and non-market costs of Climate Change and benefits of climate actions for Europe

Deliverable 5.5. Report on market and non-market economic values for environmental services of marine and coastal ecosystems related to the activities of the blue economy.

Coordinated by ULPGC with the participation of WP5 participants and IFP partners. A previous version of this document has been reviewed by X () and X (), according to the quality review internal process.

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	Tourism

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Revision History

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V10	19/08/21	Yen Lam Matías González	Incorporation of Executive Summary, Discussion section and Post-COVID19 comparison section.

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Executive Summary

This Deliverable presents the results of the economic valuation of climate change impacts utilizing the non-market valuation method of Discrete Choice Experiments. The focus is on the priority nine impact chains for the tourism sector that have been assessed and reported in previous stages of SOCLIMPACT (WP3 and WP4). The economic impact values obtained in this phase are incorporated into the Work Package 6 for the macroeconomic assessment of the impacts of climate change in the island economies, and successively into Work Package 7 for the Island Reports and the information base for setting up the policy design process through participatory social workshops. For assessing direct economic impacts of the other Blue Economy sectors (energy, maritime transportation and aquaculture), other methods have been employed, which also were incorporated into the macroeconomic models of WP6.

The Discrete Choice Experiment surveys were conducted both at island destinations and at the source countries of the tourists. For the surveys at the island destinations, 2,528 tourists in ten different islands were on-site investigated in 2019 by means of in-person interviews following a structured questionnaire that presented a set of policy proposals for counteracting the expected climate change impacts. The preferences of respondents as elicited with these questionnaires showed that tourists have significant positive values for the policies for climate change action at island destinations, with the most valued policies being those concerned with guaranteeing the availability of water resources, the restoration of marine habitats and the containment of the risks of infectious diseases.

For the Discrete Choice Experiment surveys conducted at the source countries, 6,900 tourists who had travelled or were interested to travel to European Islands were interviewed on-line. The sample was divided between 4,838 subjects interviewed before the COVID-19, and 2,062 after the outbreak became widespread. The results show that the risks of climate change impacts will have significant effects on the destination choices of potential tourists to European island destinations, with the most sensitive effects for those related with the higher risks of infectious diseases, the damage to marine habitats and the forest fires.

The emergence of the COVID-19 pandemic had a downward effect on the value that tourists attach to the problem of climate change on island destinations, although some of the impacts such as the risk of infection disease and forest fires did increase after the pandemic. Thus, the global disease outbreak had made tourists less sensitive to the expected impacts of climate change on island destinations, thereby experiencing a higher demand for tourist services that have been repressed over the pandemic. It can be expected that these effects are temporary and will tail out in the long run once the health crisis is overcome by a tourist market situation similar to the one before the pandemic.

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1. Introduction

Changes in the multiplicity of variables that constitute the climate of the islands are the consequence of the global warming, in turn powered by human-induced emissions of GHG. Those changes happen in each island depending of the complex interactions between air masses speed, temperature, and humidity; circulation, temperature and acidity of the oceans; and the location, topography and bathymetry, vegetal covered and types of soil characterizing the islands.

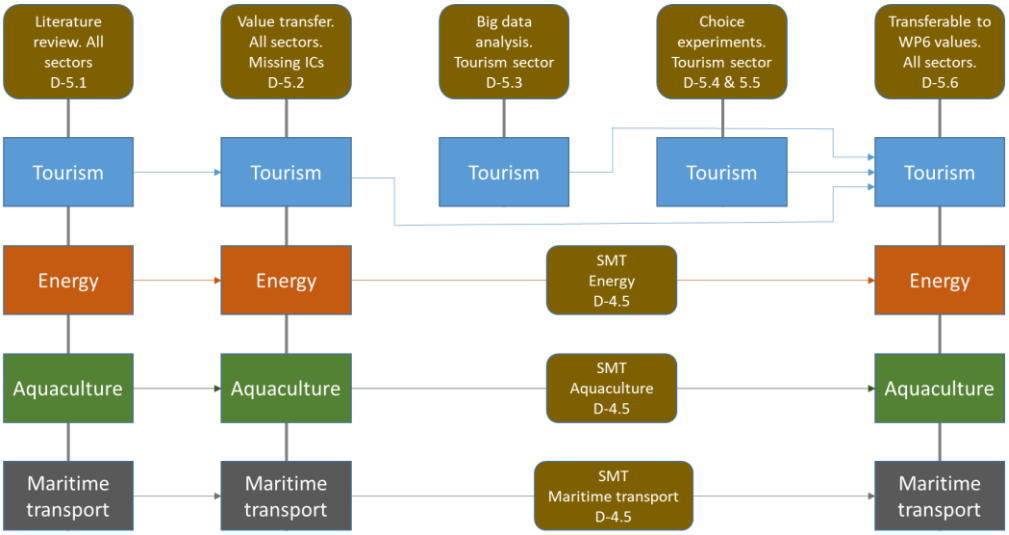
The concept of Ecosystem Services has arisen since the 1990s to assess goods and services provided to people by nature (Daily, 1997; Haynes-Young and Potschin, 2013)[1]. Since then, research based on it has allowed to develop theoretical refining and structuring procedures to refer different categories of ecosystem services, as well as to develop indicators to quantify them (Costanza et al., 1997; Worm et al., 2006; Burkhard et al., 2010; Costanza et al., 2011; Maes et al., 2016). As a result, the construct and the conceptual architecture developed around it, provide a useful framework to describe and study the complex linkages and dependencies between natural and human systems (Costanza and Farber, 2002).

For example, in a particular piece of marine area near to the shoreline, the sea provides the characteristics of swell, temperature, acidity, charge of nutrients and other conditions that make it available to properly support aquaculture, that is to say, offers services that support that human economic activity. The atmosphere provides the air temperature, humidity and average speed (wind) and the ocean provides the swell that transports and sets the sediments that allow for the stable formation of beaches, thanks to which coastal tourism may be properly developed. Climate change thus modifies the referred environmental conditions by harming most of the time (sometimes benefiting) the economic activities, thereby affecting their production costs and/or their market demand.

In SOCLIMPACT, WP5 is in charge of the economic valuation of changes in the ecosystem services that support the four blue economy sectors under study (Tourism, Aquaculture, Maritime Transport and Energy). Then, it joins the values for all sectors collected from literature after a discussion on their transferability (Deliverable 5.2). In addition to the value transfer method, SOCLIMPACT utilises the climatic projections of WP4 as inputs to big data analysis (D5.3) and a series of Discrete Choice Experiments (DCE) to assess how CC impacts on tourists' expenditure and arrivals to the islands (D5.5). Finally, a Deliverable 5.6 presents a compilation a refinement of relevant results in previous stages to feed the macroeconomic modelling (WP6) (see Figure 1).

[1] Daily (1997) defines ecosystem services as the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfil human life. Haynes-Young and Potschin (2013) define ecosystems goods and services as the contributions that ecosystems make to human well-being, and arise from the interaction of biotic and abiotic processes. There are many other definitions but all are quite close each other.

Figure 1. The flow chart of the economic valuation.



This document corresponds to Deliverable 5.5, which focuses on the economic valuation of climate change impacts for tourism, utilizing the non-market valuation method of Discrete Choice Experiments. It only refers to the nine priority risks under study in SOCLIMPACT:

1. Loss of tourist experience value in the destination due to changes in environmental attributes.
   1.1. Loss of attractiveness of marine environments due to loss of species, increase of exotic invasive species or degradation of landscape.
   1.2. Loss of attractiveness and comfort due to beach availability reduction.
   1.3. Loss of attractiveness due to increased danger of forest fires in tourism areas.
   1.4. Loss of attractiveness of land environments due to loss of species, increase of exotic invasive species or degradation of landscape.
2. Loss of tourist experience value in the destination due to changes in human being comfort (or health).
   2.1. Loss of comfort due to increase of thermal stress and heat waves.
   2.2. Increase of health issues due to emergent diseases.
3. Loss of tourist experience value in the destination due to the change in the quality of infrastructure
and facilities.
   3.1. Increase of damages to infrastructures and facilities (accommodation, promenades, water treatment system, etc.).
   3.2. Decrease of available domestic water for the tourism industry.
   3.3. Loss of attractiveness due to loss of cultural heritage (monuments, gastronomy, etc.).

The report is structured as follows. Next section provides a holistic approach to the concept of ecosystem services to the extent it is needed to properly frame the economic valuation of climate change impacts of SOCLIMPACT within the CICES framework and wider socio-economic systems. Section 3 presents the methodology and section 4 the results of the discrete choice experiments. Finally, Section 5 and 6 discusses and concludes, highlighting the theoretical and practical implications of the results, and presenting the main limitations and future innovation needs.

2. Ecosystem Services and the Economic Valuation of Climate Change

The concept of Ecosystem Services performs in the interface between the ecological and socioeconomic sciences from a systemic perspective. It helps to the understanding of the dynamical and adaptive behaviour of different human-environmental systems, and their complex structures and functions (Costanza and Farber, 2002). Economic growth strongly supported on the use of ecosystem services transforms the ecosystems' structure and functioning, in turn conditioning the further availability of ecosystem services for humans. Additionally, changes in ecosystem functions come from the interaction of different sources of impact that can either strengthen or neutralise each other. Those factors make the complex relationships between human and environmental systems to be hardly captured by static and linear approaches, requesting dynamic and non-linear ones.

Due to its explanative potential, it has been used as a reference framework for relevant research initiatives, such as the Millennium Ecosystem Assessment (2001-2005), which involved more than 1360 experts worldwide. It delivered a first categorisation of ecosystems services as shown here on (MA, 2005):

- *Provisioning Services* which cover material or energetic outputs from ecosystems, including food, water and other resources;
- *Regulating Services* which cover factors that affect the ambient biotic and abiotic environment, such as flood and disease control;
- *Cultural Services* which cover non-material (intellectual/cognitive/symbolic) uses, such as spiritual, recreational, and cultural benefits; and,
- *Supporting Services*, such as nutrient cycling and primary productivity, which maintain the conditions for life on Earth.

Later on, The Economics of Ecosystems and Biodiversity (TEEB) initiative was aimed *"to achieve this goal by following a structured approach to valuation that helps decision-makers recognize the wide range of benefits provided by ecosystems and biodiversity, demonstrate their values in economic terms and, where appropriate, suggest how to capture those values in decision-making"*[2]. It provided a classification strongly oriented to facilitate the economic valuation of ecosystem services in order to make them more visible and mainstreaming in policy making. The practical results do not differ very much from those delivered by MA (2005). Table 1 shows TEEB' ecosystem services classification.

Table 1. Main service-type according to TEEB initiative.

	PROVISIONING SERVICES
1	Food (e.g. fish, fruit)
2	Water (e.g. for drinking, irrigation, cooling)
3	Raw Materials (e.g. fibre, timber, fuel wood, fodder, fertilizer)
4	Genetic resources (e.g. for crop-improvement and medicinal purposes)
5	Medicinal resources (e.g. biochemical products, models & test-organisms)
6	Ornamental resources (e.g. artisan work, decorative plants, pet animals, fashion)

[2] TEEB- http://www.teebweb.org/about/the-initiative/27/11/2019

	REGULATING SERVICES
7	Air quality regulation (e.g. capturing (fine)dust, chemicals, etc.)
8	Climate regulation (incl. C-sequestration, influence of veg. on rainfall, etc.)
9	Moderation of extreme events (e.g. storm protection and flood prevention)
10	Regulation of water flows (e.g. natural drainage, irrigation and drought prevention)
11	Waste treatment (esp. water purification)
12	Erosion prevention
13	Maintenance of soil fertility (including soil formation)
14	Pollination
15	Biological control (e.g. seed dispersal, pest and disease control)
	HABITAT SERVICES
16	Maintenance of life cycles of migratory species (including nursery service)
17	Maintenance of genetic diversity (esp. gene pool protection)
	CULTURAL SERVICES
18	Aesthetic information
19	Opportunities for recreation & tourism
20	Inspiration for culture, art and design
21	Spiritual experience
22	Information for cognitive development

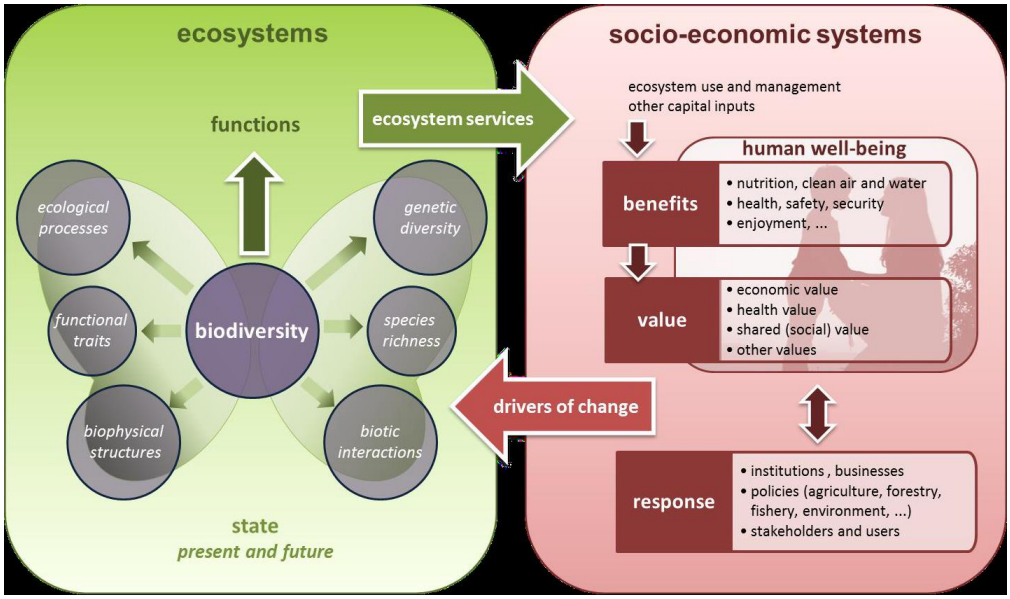
Source: De Groot et al. (2010)

The concept of ecosystem services is widely employed as a practical tool to properly orientate decision-making. It also supports the creation of the *Common International Classification of Ecosystem Services* (CICES), recently updated to the 5.1 version (CICES, 2018). In the revised version, the definition of each service identifies both the purposes or uses that people have for the different kinds of ecosystem service *and* the particular ecosystem attributes or behaviours that support them.

The CICES classification was aimed to integrate contributions from most of related scientific literature with previous efforts of sorting ecosystem services as those carried out by the Millennium Ecosystem Assessment and The Economic of Ecosystems and Biodiversity; and also make it compatible with the design of Integrated Environmental and Economic Accounting methods being considered in the revision of SEEA 2003. This compatibility with SEEA 2003 should also allow to facilitate the integration of the economic valuation of changes in ecosystem services in the macroeconomic modelling.

The European Union has adopted the CICES framework for the development of a coherent analytical framework for environmental accounting purposes (European Commission, 2013). This work was intended to help to the creation of a governance structure to underpin the effective delivery of the EU Biodiversity Strategy to 2020. Figure 2 shows the chart flow delivered by the Working Group on MAES to guide ecosystems assessment.

Figure 2. Conceptual framework for EU wide ecosystem assessments.



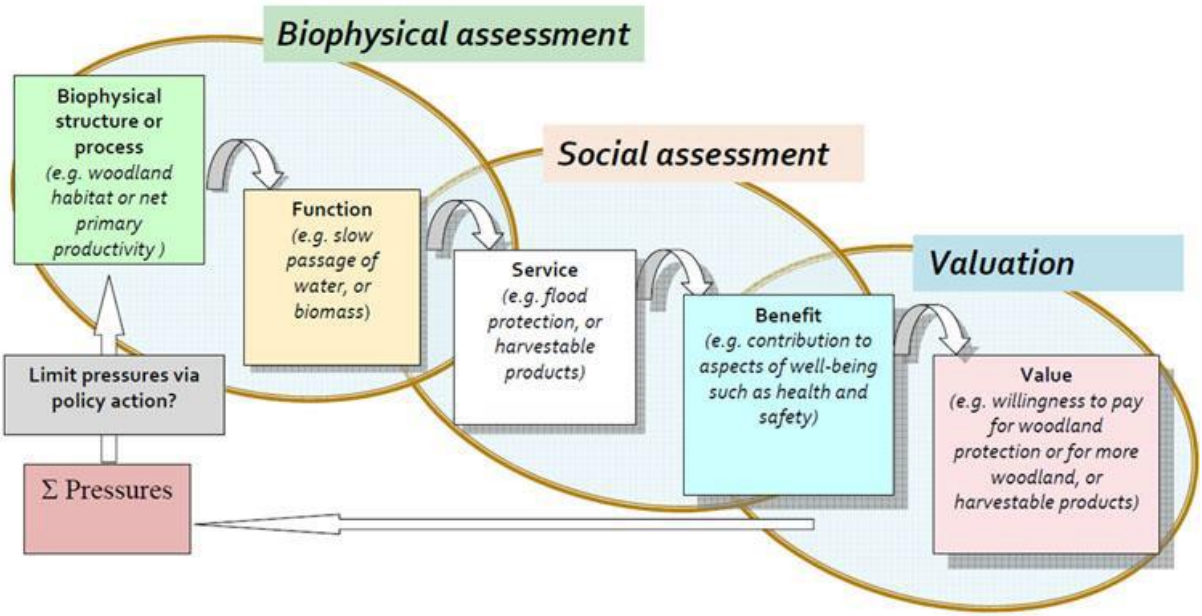
Source: European Commission, 2013, Mapping and Assessment Ecosystems and their Services

2.1. Climate Change Impacts on Ecosystem Services that support Blue Economy Sectors

For the purpose of framing the economic valuation of climate change impacts on the ecosystem services that give support to the blue economy sectors of the European islands, we will follow the last available version of CICES, 5.1, as presented in Haines-Young and Potschin (2018), partially founded by the European Union through the Esmeralda and OpenNESS Projects. In Section 3.5 of this work it can be read: *"To emphasise the 'purposeful' nature of CICES, the definition of each service is made up of two parts, namely a clause describing the biophysical output (i.e. the 'ecological clause' noting what the ecosystem does) and a clause describing the contribution it makes to an eventual use or benefit ('use clause')"*. This is the way in which we will present onward in this section the complex relationships tracking how climate change ultimately affects the blue economy sectors in the European islands. We also will have as reference the application of the conceptual framework provided by Haines-Young and Potschin (2018) to the specific context of marine environments as done in Chaniotis el al. (2015) and Culhane et al. (2014).

The rationale under the economic valuation conducted in SOCLIMPACT is represented in Figure 3 as an example of flowchart from the modification of the biophysical structures and processes to the economic valuation of changes in the aspects of human well-being affected by the former ones.

Figure 3. The relationship between biodiversity, ecosystem function and human well-being.



Source: From Haines-Young and Potschin 2018.

Considering the above mentioned sources of information, Table 2 shows the relational flow of the analysis for the Tourism sector, starting from the risks and hazards considered in the nine impact chains studies in SOCLIMPACT. The analysis only considers the last version of CICES, which distinguishes amongst Provisioning, Regulation, Maintenance and Cultural services and also holds an abiotic extension that will be relevant for the purpose of classifying the ecosystem services that support other blue economy sectors that are affected by climate change.

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Table 2. relational flow from the hazards to the economic valuation of the changes in the ecosystem services damaged by climate change.

Impact Chain Risk	Climate hazards	Biophysical impact	Ecosystem Service		
			CICES Section	Class	Code
Tourism					
Loss of attractiveness due to beach surface diminishing	SLR and higher waves and swells	Coastal erosion and inundation of sedimentary coasts	Regulation and Maintenance; Biotic	Buffering and attenuation of mass movement	2.2.1.2
Loss of attractiveness due to presence of vectors transmitting contagious diseases	Increase in average of medium and maximum temperatures	Vectors find better climate conditions to settle at the destinations	Regulation and Maintenance; Biotic	Disease control	2.2.3.2
Loss of attractiveness due to Infrastructures and facilities breakage	More frequent and intense storms	Breakage of coastal tourist infrastructures and facilities	Regulation and Maintenance; Biotic	Storm protection	2.2.1.4
Loss of attractiveness due to forest fires	Higher maximum and average temperatures	Increase of forest surface burnt	Regulation and Maintenance;	Fire protection	2.2.1.5
Loss of attractiveness due to thermal discomfort	Heat waves; tropical nights	Increase of thermal stress for visitors	Regulation and maintenance	Regulation of temperature and humidity, including ventilation and transpiration	2.2.6.2
Loss of attractiveness due to marine habitat degradation	Seawater heating; seawater temperature variability; seawater acidification	Worsening of survival conditions for marine species and ecosystems	Cultural (biotic)	Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through active and passive interactions, aesthetic and entertainment experiences, have and existence or bequest value	3.1.1.1 3.1.1.2 3.1.2.4 3.2.1.3 3.2.2.1 3.2.2.2
Loss of attractiveness due to land habitat degradation	Higher air temperatures; temperature variability; droughts;	Worsening of survival conditions for land species and ecosystems	Cultural (biotic)	Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through active and passive interactions, aesthetic and entertainment experiences, have and existence or bequest value	3.1.1.1 3.1.1.2 3.1.2.4 3.2.1.3 3.2.2.1 3.2.2.2
Loss of attractiveness due to water shortages	Droughts; water distribution breakage	Restrictions of water supply to tourists	Provisioning (abiotic)	Surface and ground water for drinking	4.2.1.1 4.2.2.1
Loss of attractiveness due to damages to cultural heritage	Storms; Droughts	Degradation of heritage-based and living systems components of cultural patrimony	Cultural (biotic) Regulation and Maintenance	Characteristic of living systems that are resonant in terms culture or heritage, have sacred or symbolic meaning. Storm protection	3.1.2.3 3.2.1.1 3.2.1.2 2.2.1.4

3. Methodology

In order to assess the economic values of climate change impacts and policies, two different field works were conducted based on respective survey instruments carefully designed in focus groups and pre-testing work, as explained in Deliverable 5.4. The first survey was conducted at origin countries (United Kingdom, Germany, France and Sweden). In these source countries tourists were asked how climate change impacts could affect their travelling decisions and their destination choice. In the second survey, conducted at 10 islands destinations of the project, tourists were asked how they would choose between alternative adaptation policies that could be implemented at the destinations they were visiting.

Designing a discrete choice survey requires to consider different aspects until a reliable questionnaire instrument is obtained. The selection of attributes and the policies included in the different questions asked to tourists has been obtained from a combination of existing studies in the literature and the expertise of the researchers working on the project. In addition, the focus groups (FG) meetings conducted at 6 different islands of the project constituted a crucial step of WP5 (D5.4) and were essential for the design and pre-testing of the questionnaire, leading to an assessment of its effectiveness according to the research needs. Therefore, FG allowed the research team to carefully assess that the questionnaire was going to be clearly understood by the respondents as intended by researchers. The following steps involved running pre-test samplings of improved versions of the questionnaires until a final set of instruments was fully validated. In this case, a larger group of participants was required to be surveyed in a second pre-testing step. Participants in pre-tests were asked to fill in the surveys as if they were the final versions, in order for researchers to double-check whether the questionnaires were well designed or whether they needed further modifications.

An example of the final surveys carried out at the destinations can be found in **Annex** 1, and for the surveys at origin countries they can be found in **Annex 2**. In these surveys tourists are asked how they would choose between adaptation policies at destinations, or change their choice of destinations facing climate change impacts, as well as about their perceptions of the image of destinations, socio-economic characteristics, and some other information about the tourist trip. The main parts of the surveys, in both cases, are concerned with eliciting the economic values and tourists' preferences regarding climate change impacts and adaptation policies at islands' tourist destinations.

3.1. Discrete Choice Experiments (DCEs)

In order to evaluate tourists' preferences and decision making facing climate change options, we utilize the technique of Discrete Choice Experiments (DCEs) (e.g., León et at., 2015). This technique has been widely applied to the evaluation of tourists' preferences both in natural areas and other tourism contexts (e.g., Morley, 1994; Eymann & Ronning, 1997; Huybers, 2003). The growing body of literature on this field emphasizes the increasing role that DCEs are playing in environmental decision making in the last decades. The first known application of DCEs in the context of environmental resources assessment was reported by Adamowicz et al. (1994). DCEs consists of asking tourists to choose between alternative profiles defined by different sets of attributes levels of tourist destinations or policy measures about climate change. The principal advantage of this method is that it allows researchers to simultaneously investigate tourists' preferences for various attributes of a tourist product, thereby framing the choice context in a setting somewhat closely linked to a market situation.

Typically, a DCE experiment involves several choice sets, each containing a group of mutually exclusive alternatives for which respondents are asked to choose their preferred one (Hoyos, 2010; Araña & León,

2012, 2013a, 2013b). Alternatives are defined by a set of attributes, each attribute taking one or more levels. Individuals' choices imply implicit trade-offs between the levels of the attributes in the different alternatives included in a choice set. In particular, the subject will pick up the one providing the highest utility, which depends on the attribute levels of the alternatives. Socio-economic characteristics of the individuals may influence this decision. The resulting choices are finally analysed to estimate the contribution that each attribute and level add to the overall utility of individuals. Moreover, when the cost or the price of the joint items contained in the alternative profile is included as an attribute, marginal utility estimates can be easily converted into willingness-to-pay (WTP) estimates for changes in the attribute levels and, by considering different attribute changes, welfare measures may be obtained.

Several econometric approaches can be utilized to estimate the discrete choice valuation models, using the Stata (StataCorp. 2014) software. These models fit the theoretical McFadden's consumer random utility choice model, assuming different error structures for the random part of utility (McFadden 1974) or different specifications of the utility functions. In the analysis of the data, we utilized three alternative modelling strategies: i) Conditional Logistic, ii) Multinomial Logit and iii) Mixed Logit.

The Conditional Logistic (CL) discrete choice model is commonly utilized to analyse situations involving the choice of individuals among sets of J alternatives. This model focuses on the set of alternatives for each individual and the explanatory variables are characteristics of those different alternatives proposed to the individuals.

The Multinomial Logit model (MNL) is a specific case of the more general conditional logistic regression model (McFadden 1974). It requires multiple observations for each case (individual or decision), where each observation represents an alternative that may be chosen. This model allows for two types of independent variables: alternative-specific variables and case-specific variables. Alternative-specific variables vary across both cases and alternatives, while case-specific variables vary only across cases.

The Mixed Logit (MXL) model was also adopted as a more flexible approach to model the random error of the utility function. Mixed Logit is a highly flexible model that can approximate any random utility model (McFadden and Train, 2000). It obviates the three limitations of standard logit by allowing for random taste variation, unrestricted substitution patterns, and correlation of unobserved factors over time (Train, 2003). Thus, this model allows for heterogeneity in the structural preferences parameters of the utility function, being one of the main differences with respect to the MNL model (where all attributes are assumed to be fixed, instead of random).

3.2. Application of DCEs

In SOCLIMPACT, two alternative surveys were conducted at the source or home countries of potential tourists (survey at origin countries) and at the islands destinations (survey at the destinations). The first survey was designed with the aim of obtaining *the value of climate change impacts at destinations* by evaluating the tradeoffs that potential tourists could make whenever facing climate change impacts in their choice decision making processes. The second survey was aimed at eliciting the *value of the climate change policies at island destinations* that could be able to counteract the impacts of climate change in the specific environmental services susceptible to be affected.

In both surveys at origins and destinations there were introduced introductory questions, previously to the discrete choice questions, which were about socio-demographic characteristics of the participants, the characterization of the trip to the destination, the perceived image of the destination, and the importance of climate change impacts for the choice decision to travel to their most preferred tourist destination. As explained in Deliverable 5.4, these questions were necessary both for the construction of

a reliable survey instrument and for explaining the economic values of climate change impacts at island destinations. Thus, in the next two subsections, the results of these questions are presented previously to the results of the analysis of the questions involving the discrete choice experiments.

3.2.1. Study at origin or home countries

In order to assess the effects of climate change impacts on destination choice, potential EU travellers were surveyed at their home or origin countries, thereby posed with situations in which different climate change impacts could occur with different intensity levels at a set of EU islands destinations. A total of 6,900 EU citizens (frequent travellers) were interviewed on-line at their country of origin (United Kingdom, Germany, France and Sweden). These countries were selected because together they constitute the main outbound markets for tourism to the European islands, representing more than 60% of the tourists' arrivals in most of the islands or archipelagos of the project.

The sample was taken randomly from the adult population of EU frequent travellers subject to the quotas of gender and age groups. In order to ensure population representativeness of the tourist niche market, potential participants in the survey were filtered by asking them if they had visited any Mediterranean islands or North Atlantic islands (Canary Islands, Madeira, Azores or Antilles) in the last five years, or whether they had planned to do so in the next year. If the answer was "no" to both questions, then the survey was finalized and the subject invited to abandon the study.

Each individual randomly received a questionnaire that contained the specifically designed discrete choice questions involving the alternative destinations with different levels of climate change impacts. That is, respondents were posed with a scenario in which two EU islands had several climate change impacts and they were asked to choose between visiting either of these two islands at a specified price or "staying at home" (at price 0 €). Each of the attributes included in the alternative profiles describing the climate chain impacts presented one of three potential levels: no impact (current situation), moderate impact or strong impact. The definitions of the attributes and their levels are presented in Table 3. By applying a Bayesian efficient design, a set of 24 combinations was obtained and implemented into choice cards. Each individual randomly answered 8 different choice questions involving three alternatives, where one of the alternatives was defined as no travel to the alternative destination

The field work was carried out from the second semester of 2019 to first quarter of 2021. Since the emergence of COVID-19 health crisis in the second quarter of 2019 may have had some impacts on tourists' preferences regarding the climate change impacts on island destinations, the sample was split in two subsamples, one before COVID-19, considering 4,838 surveys, and one after the COVID-19 with 2062 citizens who were interviewed in the last quarter of 2020 and first quarter of 2021. Although there can be some significant differences between both subsamples, it may be expected that the impact of COVID-19 is transitory and will tail out in medium and long terms as the situation in the international tourism market becomes similar to the one before the pandemic.

Table 3. Descriptions of attributes considered in the Choice Experiments (Origin countries).

Attribute	Short Description	Levels	Model
Island destination	Island destination	Canary Islands Malta Corsica Cyprus Madeira Sardinia Sicily Azores Balearic Islands Crete Martinique/Guadeloupe	Categorical variable (dummy for each island)
Price	Price per day per person, for a 5-days trip, including transportation cost and cost of four stars hotel accommodation	0€ if stay at home 100 € 150 € 200 € 300 €	Continuous variable
Heat Waves	# of days per year of extreme heat	Current situation (25 days) Heat increase (50 days) High heat increase (75 days)	Continuous variable (days of heat)
Infectious diseases	Probability of getting infected	Current situation Moderate risk Severe risk	Categorical variable (moderate; severe)
Beaches availability	% of beach surface reduction	Current situation (no reduction) Moderate reduction (35%) Strong reduction (70%)	Continuous variable (% of beach loss)
Water restriction	Hours of water restrictions suffered by tourist (between 8am-12pm)	Current situation (no restriction) Moderate restriction (3h) Severe restriction (9h)	Continuous variable (hours of water restriction)
Forest Fires	Increase in burnt areas	Current situation Moderate increase High increase	Categorical variable (moderate; high)
Marine Habitats	Deterioration of their conservation status	Current situation Moderate impact Strong impact	Categorical variable (moderate; strong)
Land Habitats	Deterioration of their conservation status	Current situation Moderate impact Strong impact	Categorical variable (moderate; strong)
Damages to Infrastructures & Facilities	Damages to infrastructures due to storms, higher waves & floods	Current situation Moderate impact Strong impact	Categorical variable (moderate; strong)
Damages to Cultural Heritage	Damages to cultural heritage due to sea level rise & storms	Current situation Moderate impact Strong impact	Categorical variable (moderate; strong)

3.2.2. Study at destinations

In the survey at destinations, the discrete choice questions should allow to estimate how much tourists do value (WTP) the potential adaptation policies that could be implemented in the islands case studies. Therefore, tourists visiting the islands in the project were posed with choice settings in which adaptation policies were implemented at the destinations, in order to overcome the impacts of climate change. This subsection presents the definition of attributes and their levels considered in each survey.

In 2019, a total of 2,528 tourists were on-site interviewed at 10 different islands destinations: Azores, Balearic Islands, Canary Islands, Crete, Cyprus, Fehmarn Island, Madeira, Malta, Martinique & Guadeloupe (Antilles) and Sicily. Tourists were randomly chosen, but they were screened to be adults (18 years old or more), should had stayed at least one night at the island, and should have completed at least half of their stay. The survey work took place at both weekdays and weekends days to capture all groups of tourists.

Respondents were posed with choice scenarios in which two alternative sets of adaptation policies to climate change impacts were presented, and they were asked to choose between one of the options for which they had to pay an extra price per day during their stay, or the alternative of "no policy option" (at price 0 €). Each policy proposal was designed to address one of the climate change impacts identified in WP3 for the tourism sector in EU islands. These policies were described with the aid of words and images, and were said that they were to be implemented at the destinations with the aim to ameliorate climate change impacts. The descriptions of the adaptation policies and their levels are presented in Table 4. By applying a Bayesian efficient design, a set of 12 combinations was obtained and incorporated into choice cards. Each individual randomly answered 6 different choice sets of policy alternatives.

Table 4. Descriptions of attributes considered in the Choice Experiments (Destinations).

Attribute	Description	Levels	Model
Price	Price per day per person. Extra payment above current expenses.	0€ if no policy 1 € 3 € 5 € 7 €	Defined as a continous variable in the regression
Heat Waves Amelioration	This policy consists of early warning, proper information for vulnerable groups, air conditioning in public indoor and outdoor places, increasing green and watered areas and provision of proper medical care for heat-related diseases.	No Policy Policy	Defined as a continous variable in the regression
Infectious diseases Prevention	This policy consists of proper information and advisement to face outbreaks, fumigation of mosquitoes' prone areas, and emergency medical care plans.	No Policy Policy	Defined as a categorical variable in the regression
Beaches Protection	This involves building seawalls and breakwaters, nourishment of sandy beaches when needed and building compensatory artificial beaches across coastal areas.	No Policy Policy	Defined as a categorical variable in the regression
Water Supply	This includes desalination plants and water facilities reinforcement to guarantee fresh water supply.	No Policy Policy	Defined as a categorical variable in the regression
Forest Fires Prevention	This policy consists of improving forest management to reduce combustibility, increasing firefighting technical and human resources, and investing more in post-fires landscape and habitats restoration.	No Policy Policy	Defined as a categorical variable in the regression
Marine Habitats Restoration	This involves removing death seagrass from the beaches sand, offering marine biodiversity-based facilities and providing accurate information on best places for each marine activity.	No Policy Policy	Defined as a categorical variable in the regression
Land Habitats Restoration	This involves reforestation and landscape restoration, enhancing protected areas	No Policy Policy	Defined as a categorical variable in the regression

	network and encouraging botanic gardens and wildlife show places.		
Coastal Infrastructures Protection	This policy will provide proper information on prevention, and emergency facilities against disasters; reinforce coastal structures; and facilitate access to alternative safe places and attractions.	No Policy Policy	Defined as a categorical variable in the regression
Cultural Heritage Protection	This policy consists of reinforcing protection of exposed heritage and moving the endangered cultural assets to alternative safe locations.	No Policy Policy	Defined as a categorical variable in the regression

4. Economic Value Assessments in the Tourism Sector

4.1. The Value of Climate Change Impacts at Destinations

4.1.1. Socio-demographic Characteristics of the Participants

Table 5 presents the descriptive statistics of the socioeconomic characteristics of the home countries survey respondents regarding gender, age, education level and personal income level. While each gender representation is almost 50%, there are some differences across countries. The most represented age category is 30-60 years old.

Regarding the level of education, the largest proportions of bachelor degrees or higher levels of education are found for the French and British subsamples (48.5% and 49.3% respectively), while the largest proportions of lower education level (high school or less) is found for the Swedish subsample (47.1%). With respect to personal monthly income level, about 40% of the sample has an income level above 2,800 €/month.

Table 5. Characteristics of the participants.

Items	(FR)	(GER)	(SWE)	(UK)	Total
Gender (%)					
Male	50.9	52.4	45.5	42.5	**47.8**
Female	49.1	47.6	54.5	57.5	**52.2**
Age (%)					
<30 years	19.5	17.7	18.8	11.8	**17.0**
30 – 60 years	60.7	59.5	52.8	60.5	**58.3**
> 60 years	19.8	22.8	28.4	27.7	**24.7**
Education level (%)					
High school or less	27.2	17.1	47.1	24.5	**29.0**
Technical/vocational training	24.3	49.0	15.2	26.2	**28.7**
Bachelor degree or higher	48.5	33.9	37.7	49.3	**42.4**
Monthly Income level (%)					
1201 – 2000 €	24.5	20.3	20.2	23.6	**22.2**
2001 – 2800 €	23.0	22.3	25.9	22.2	**23.4**
2801 – 3500 €	22.2	22.3	18.8	15.6	**19.8**
>3500 €	18.8	22.8	15.4	18.7	**19.0**

4.1.2. Visits to the Islands

Table 6 shows the descriptive statistics related to the previous visits to the different islands destinations. Survey respondents make on average 2.9 trips per year. Around 77% of the participants had visited Mediterranean islands or North Atlantic islands in the previous five years, and 85.6% of the sample expected to visit some of these islands in the following year. With respect to the destinations of interest (the islands or archipelagos under study in the project), those which have been most visited across the sample of respondents are the Canary Islands (34.6%), the Balearic Islands (30.4%) and Crete (26.3%).

Table 6. Previous visits to the islands destinations.

Variable	Total
# Overnight trips per year	2.9
Visited Mediterranean islands or North Atlantic islands in the last 5 years (% Yes)	77.5
Expect to visit Mediterranean islands or North Atlantic islands in the next year (% Yes)	85.6
Visited before these islands (%):	
Azores	7.1
Balearic Islands	30.4
Canary Islands	34.6
Corsica	15.3
Crete	26.3
Cyprus	22.8
Madeira	15.7
Malta	19.7
Sardinia	12.0
Sicily	13.4
Martinique/Guadeloupe	10.5
Fehmarn (Germany)	4.3

4.1.3. Image and Perceptions of the Destinations

Individuals were asked to assess their perceptions of the images of the different islands, on a scale from 1 (very negative image) to 7 (very positive image). Results of the ANOVA tests are presented in Table 7. These tests identify whether there are differences in destinations images across origin countries (a p-value lower than 0.1 concludes that there are differences across home countries); those images of islands or archipelagos that are significantly different for some of the home countries are highlighted in bold. In general, tourists have a very positive perception of the images of the islands, since all scores are between 4 and 5. However, there are differences in perceptions across origin markets in the case of Balearic Islands, Corsica, Malta, Sardinia, Sicily and Antilles.

4.1.4. Importance of Climate Change Impacts for Travelling Decisions

In order to understand the behavioural processes involved in tourism decision making as a results of climate change impacts at tourist destinations, survey respondents were asked how their traveling plans would change if potential climate change impacts occur at their chosen destinations. The answers to these questions allow researchers to figure out how prone are tourists to modify their behavioural processes in the face of climate change with potential impacts on the economy of tourist destinations, leading to an essential input for the modelling of the socioeconomic impact in the tourism sector conducted in WP6. The answers to the question of whether the subjects would stay at home whenever facing each of the

climate change impacts identified in the project, were recorded in a Likert scale from 1 to 7, where 1=will not stay at all; 2=very unlikely; 3=unlikely; 4=neutral; 5=likely; 6=very likely; 7=will stay at home for sure. For the purpose of simplification, answers 6 and 7 have been grouped into a single category. The results are presented in Figure 4 and Figure 5.

Table 7. Destination image by country of origin. Test ANOVA.

Destination	France	Germany	Sweden	UK	F	p-value
Azores	5.18 (1.19)	5.18 (1.40)	4.89 (1.38)	4.94 (1.42)	1.50	0.213
Balearic Islands	5.20 (1.29)	5.06 (1.48)	**4.98** (1.40)	**5.42** (1.31)	2.32	**0.075**
Canary Islands	5.39 (1.10)	5.23 (1.29)	5.14 (1.40)	5.46 (1.39)	1.47	0.221
Corsica	**5.51** (1.31)	5.00 (1.34)	**4.91** (1.37)	5.26 (1.45)	4.55	**0.004**
Crete	5.33 (1.17)	5.10 (1.37)	5.09 (1.31)	5.23 (1.35)	0.86	0.460
Cyprus	5.14 (1.17)	**4.79** (1.39)	5.05 (1.28)	**5.32** (1.45)	3.23	0.022
Madeira	5.40 (1.12)	5.32 (1.38)	5.11 (1.32)	5.22 (1.43)	1.04	0.373
Malta	**5.28** (1.19)	4.90 (1.35)	**4.77** (1.46)	5.22 (1.56)	3.54	**0.015**
Sardinia	**5.28** (1.17)	5.18 (1.24)	**4.79** (1.53)	5.05 (1.33)	2.94	**0.033**
Sicily	5.03 (1.32)	4.96 (1.27)	4.89 (1.37)	**5.51** (1.32)	5.30	**0.001**
Martinique/Guadeloupe	**5.41** (1.32)	4.95 (1.25)	4.63 (1.41)	4.90 (1.40)	6.71	**0.000**

As can be seen in Figure 4, the impacts of climate change impacts on traveling decisions are very significant, slicing a large share of the market intentions to visit the most favourite destinations across the sample. That is, it is found that about 53% of individuals would stay at home ('very likely' and 'for sure') if infectious diseases become more widespread at their chosen destinations. This is followed by wildfires occurring more often (47.5% would stay at home) and temperature becoming uncomfortably hot (46.6%). The climate change impacts that affect less to travellers' decisions are the damages to coastal infrastructures (40.3%), the corals severely bleaching (39.9%), and the damages to cultural heritage (38.8%). In addition, as depicted in Figure 8, there are significant differences in these decisions across countries of origin. On average, French travellers would be the most likely to stay at home under any CC impact, while travellers from the UK show the less likely intention to stay at home.

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Figure 4. 'Stay at home' under climate change impacts at destination.

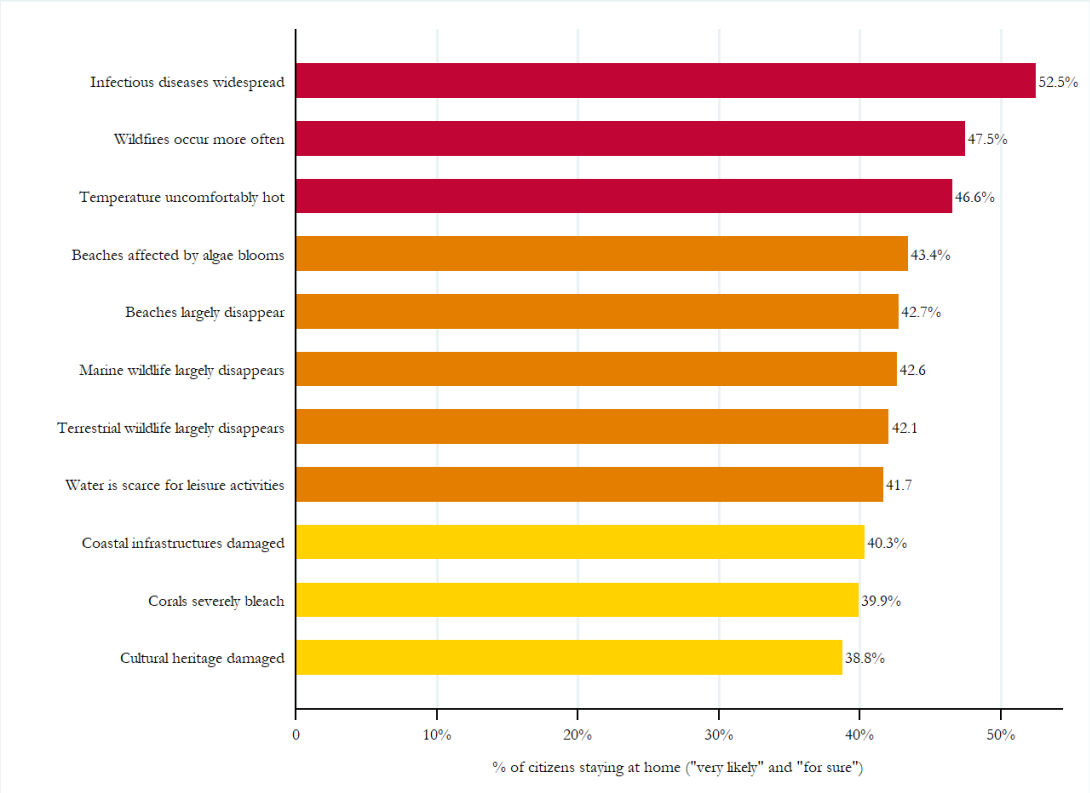
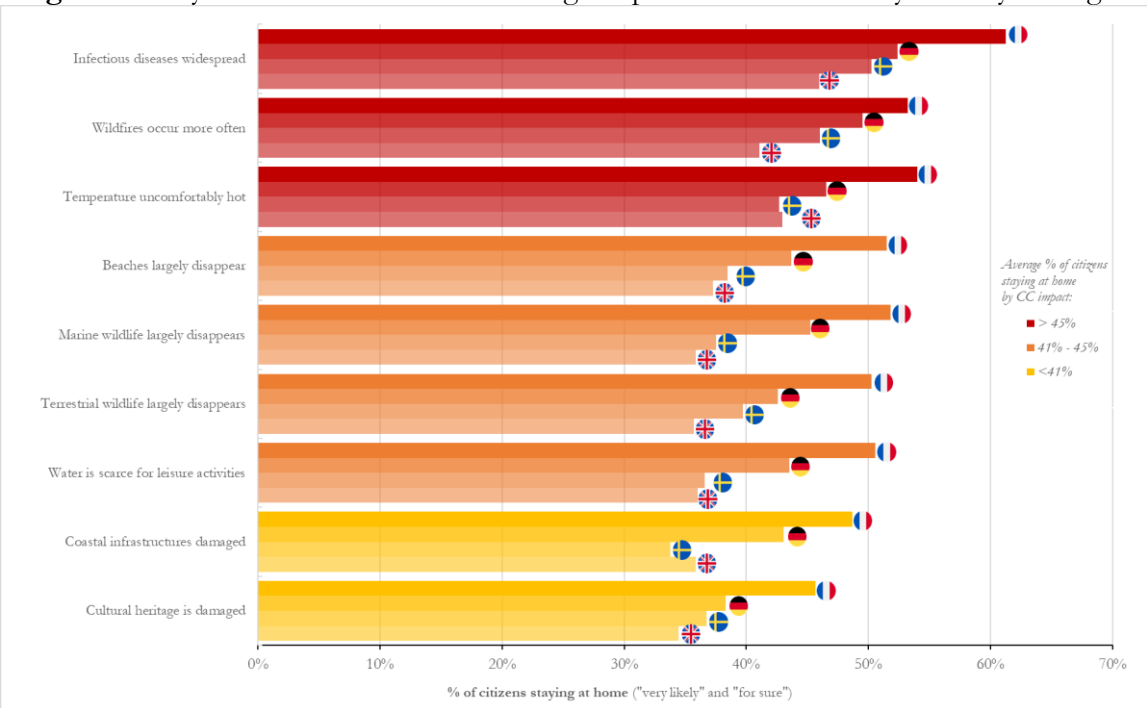


Figure 5. 'Stay at home' under climate change impacts at destination by country of origin.



4.1.5. Valuation of Climate Change Impacts at Island Destinations

This section presents results of the analysis of the questions on the discrete choice experiments for the origin or source countries. Here, results are presented only for the pre-COVID-19 subsample, i.e. the results are not subject to the turbulence of the health crisis, which may be assumed to be transitory and tend to tail out in the medium and long terms, as the health situation become similar to the one enjoyed in tourist markets before the pandemic started. Results for the post-COVID-19 subsample and their comparison with pre-COVID-19 outcomes are presented in the next section.

Table 8 presents the results of the discrete choice modelling leading to the economic valuation of the climate change impacts at island destinations. Since the number of survey respondents was 4,838 and each individual answered 8 choice questions, the total number of observations for model estimation is 38,704. Covariates explaining tourists' choices of alternative destinations in the model are specified for all the attributes considered in the discrete choice experiments. These attributes were designed to coincide with the climate change impact chains modelled in WP3 of the project for the tourism industry in the island destinations. Some of these impact attributes were defined in three levels (current, moderate and strong/high), so the explanatory variables are defined in the corresponding upper levels of the scale, leaving the lowest level as the baseline for comparison.

It can be seen in Table 8 that all attributes considered, i.e. climate change impacts in the tourism sector, are significant at the 0.01 level in explaining the changes in tourists' utility and decision making. They all have negative signs, indicating that the presence of any of these impacts at the island destinations will reduce the utility and satisfaction of the individual tourist and will induce a substitution effect towards some other destination that does not have the expected impact. The highest negative impacts in the choice decision will be for the attributes of infectious diseases (severe), forest fires (high) and terrestrial habitats (strong). The lowest negative impacts are found for the reduction of beach availability and the presence of heat waves.

For the first two negative impacts, the results are consistent with the qualitative assessments presented in Figure 4 about the decision to stay at home facing climate change impacts. Thus, the expected risks of both infectious diseases and forest fires coming out from climate change at island destinations are potential deterrents of the intentions of tourists to visit these destinations and to experience satisfaction and utility from these visits. However, although both the risk of heat waves and the risk of beach availability reduction were found to be somewhat highly ranked in terms of the decision to stay at home (Figure 4), the discrete choice results show that their impacts on the decision about travelling to a destination can be traded for a lesser presence of some other potentially harmful attributes.

The discrete choice model in Table 8 also incorporates results on the destination labels. These should be interpreted as the contribution to the tourist's utility arising from the visit to the destination, i.e. the brand value of the destination. The brand value can be related to all the attributes which are not explicitly considered in the choice experiment profiles and that contribute to the image that tourists hold about the destination. As can be seen in Table 8, all destination labels are positive and significant, with small differences in their values across destinations. Thus, the visit to an island destination, irrespective of the climate change impacts, do have a positive contribution to tourists' utility or satisfaction, which can be explained because of the interplay of all other attributes offered by visiting the destinations, and which can be comprised into the concept of destination's image. Within these small differences observed across destination labels, those with higher impacts on utility are found for Crete, the Canary Islands, Cyprus, Sardinia and Malta, while the lowest impacts are found for Azores and Balearic Islands.

Table 8. Pre-COVID-19 origin countries discrete choice result (*MNL*) and willingness to pay (WTP) effects of CC impacts.

Covariate	Estimation	WTP (€)
Price	-0.00185*** (0.002)	-
Heat Waves	-0.00934*** (0.001)	-5.05
Infectious diseases (*Moderate*)	-0.29020*** (0.032)	-156.86
Infectious diseases (*Severe*)	-0.73540*** (0.034)	-397.51
Beach availability	-0.00343*** (0.001)	-1.85
Water shortages	-0.02919*** (0.005)	-15.78
Forest fires (*Moderate*)	-0.15636*** (0.051)	-84.52
Forest fires (*High*)	-0.46624*** (0.074)	-252.02
Terrestrial habitats (*Moderate*)	-0.22630*** (0.044)	-122.32
Terrestrial habitats (*Strong*)	-0.38184*** (0.049)	-206.40
Marine habitats (*Moderate*)	-0.09523** (0.042)	-51.48
Marine habitats (*Strong*)	-0.28467*** (0.045)	-153.88
Infrastructures (*Moderate*)	-0.21595*** (0.055)	-116.73
Infrastructures (*Strong*)	-0.26488*** (0.084)	143.18
Cultural heritage (*Moderate*)	-0.12128*** (0.056)	-65.56
Cultural heritage (*Strong*)	-0.26799*** (0.036)	-144.86
Average of Climate Change Impacts		-127,87
Antilles	2.81681*** (0.316)	1522.60
Azores	2.73110*** (0.291)	1476.27
Balearic Islands	2.78419*** (0.151)	1504.97
Canary Islands	2.98224*** (0.287)	1612.02
Corsica	2.86439*** (0.221)	1548.32
Crete	3.00329*** (0.205)	1623.40
Cyprus	2.92211*** (0.188)	1579.52
Madeira	2.85363*** (0.243)	1542.50
Malta	2.88672*** (0.204)	1560.39
Sardinia	2.89303*** (0.271)	1563.80
Sicily	2.86384*** (0.107)	1548.02
Average of destination brands		1552,89
N individuals	4,838	
Observations	38,704	

Note: *p<0.1; **p<0.05; ***p<0.01 significance test. Standard errors within parentheses. Sociodemographic characteristics included in the regression.

Table 8 also shows the WTP estimates for all the attributes considered in the discrete choice experiment. It can be seen that the values in Euro terms of these attributes are all negative, indicating that tourists would reduce their willingness to pay for a visit to the island destinations if these climate change impacts are present. Those attributes that impact more negatively on WTP are the severe risk of infectious diseases (-397.51 €) and the high risk of forest fires (-252.02 €), while those with lesser impacts on WTP are the reduction in beach availability (-1.85 €) and the risk of heat waves (-5.05 €). In general, it is found that severe, strong or high risks levels have higher impacts on WTP than moderate levels for all the risks involved in climate change at European island destinations. These results support theoretical consistency to 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.

Finally, Table 8 also presents results of the values of destination labels or destination images. It can be seen that those destinations with higher image values are the Canary Islands (1,612.02 €) and Crete (1,923.40 €), while those with less values are Azores (1,476.27 €) and the Balearic Islands (1,504.97 €). Thus, there is about 136 € value difference (or 8.7%) between the EU islands with the highest and the lowest image values, which reflects a strong positive and quite homogeneous images for all the islands considered. These results are consistent with those shown in Table 7 for the qualitative assessments of the images of the destinations. Therefore, it can be concluded that EU island destinations show a moderately high image perceptions that are also strongly valued in monetary terms by potential visitors. However, these images may change as a consequence of climate change impacts, thereby inducing a systematic reduction in the monetary values of the destination labels and images.

4.1.6. The Effects of COVID-19 on the Economic Values of Climate Change Impacts

The COVID-19 pandemic has had an important impact on the tourism industry, with a substantial decline in tourist flows worldwide. In 2020 the decline of international tourist arrivals was 74%, from a number of 1,461 billion in 2019 to a number of 381 million, according to the World Tourism Organization. This major turbulence in the tourism industry may have potential consequences on the economic values of climate change impacts at island destinations, as well as on the preferences that tourists have for those destinations affected by the expected impacts. This section explores what have been the changes in the preferences for travelling to islands destinations after the impact of COVID-19 epidemic in the context of the expected impacts of climate change. To this aim, a sample was taken at the source countries of the tourists after the COVID-19 epidemic started.

The post-COVID-19 survey design and sampling plan followed the same specifications as in the field-work conducted before the COVID-19, reported earlier in deliverable D5.4. Thus, an extra sample of 2,062 individuals was randomly taken at the source countries of Germany, United Kingdom, France and Sweden in the first quarter of 2021, well after the first disease outbreak at the end of March 2020 and while some travel restrictions were still in place in many countries, including the ones under study. The data has been modelled with a MNL model with the same specifications as the model for the data set previous to the pandemic (Table 8).

Table 9 presents the results with the after-COVID-19 sample and the difference in the WTP values with respect to those obtained with the before-COVID-19 sample. It shows that the climate change impacts maintain their significance in explaining the choice between the alternative island destinations for tourists in the origin countries. The significance of the parameters of the climate change attributes and the destination labels are similar to the model estimated with the pre COVID-19 sample (Table 8). That is, all parameters are significant a 0.01 level and the climate change impacts with higher effect on the destination choices and utility levels of tourists are those concerned with the risk of infectious diseases, forest fires (high) and terrestrial habitats (strong).

Table 9. Discrete choice estimation results (*MNL*) after COVID-19 and WTP comparative difference (DIFF) with pre- COVID-19 sample results.

Covariate	Estimation	WTP (€)	DIFF (€)	% DIFF
Price	-0,00215*** (0.009)			
Heat Waves	-0,00913*** (0.003)	-4,25	-0,80	-15,91
Infectious diseases (*Moderate*)	-0,35518*** (0.041)	-165,20	8,34	5,32
Infectious diseases (*Severe*)	-0,72795*** (0.037)	-338,58	-58,93	-14,82

Beach availability	-0,00395*** (0.005)	-1,84	-0,01	-0,69
Water shortages	-0,03187*** (0.009)	-14,82	-0,96	-6,06
Forest fires (*Moderate*)	-0,21349*** (0.068)	-99,30	14,78	17,48
Forest fires (*High*)	-0,42879*** (0.083)	-199,44	-52,58	-20,86
Terrestrial habitats (*Moderate*)	-0,10848*** (0.059)	-50,46	-71,86	-58,75
Terrestrial habitats (*Strong*)	-0,29727*** (0.062)	-138,27	-68,13	-33,01
Marine habitats (*Moderate*)	-0,0706*** (0.022)	-32,84	-18,64	-36,21
Marine habitats (*Strong*)	-0,24376*** (0.054)	-113,38	-40,50	-26,32
Infrastructures (*Moderate*)	-0,09815*** (0.091)	-45,65	-71,08	-60,89
Infrastructures (*Strong*)	-0,21625*** (0.088)	-100,58	-42,60	-29,75
Cultural heritage (*Moderate*)	-0,12251*** (0.074)	-56,98	-8,58	-13,09
Cultural heritage (*Strong*)	-0,33892*** (0.082)	-157,64	12,78	8,82
Average of Climate Change Impacts		-101,28	-26,59	-18,98
Antilles	3,76689*** (0.502)	1752,04	-229,44	15,07
Azores	3,51627*** (0.481)	1635,47	-159,20	10,78
Balearic Islands	3,65916*** (0.621)	1701,93	-196,96	13,09
Canary Islands	3,74443*** (0.706)	1741,60	-129,58	8,04
Corsica	3,71503*** (0.588)	1727,92	-179,60	11,60
Crete	3,6906*** (0.419)	1716,56	-93,16	5,74
Cyprus	3,64024*** (0.631)	1693,13	-113,61	7,19
Madeira	3,60581*** (0.492)	1677,12	-134,62	8,73
Malta	3,63859*** (0.662)	1692,37	-131,98	8,46
Sardinia	3,70862*** (0.601)	1724,94	-161,14	10,30
Sicily	3,74519*** (0.331)	1741,95	-193,93	12,53
Average of destination brands		1709,55	-156,66	10,14
N individuals		2,062		
Observations		16,496		

Note: *p<0.1; **p<0.05; ***p<0.01 significance test. Standard errors within parentheses. Sociodemographic characteristics included in the regression.

The parameters of the brand values of the island destinations as given by the destination dummies are also highly significant in all cases. The destinations brands with the highest values are Antilles, Sicily, the Canary Islands, Corsica and Sardinia, while those with the lowest are Azores, Madeira and Malta. Thus, the parameters reflecting the characteristics of the images of the destinations, and not contained in the other attributes of the choice experiment, are also significant after the COVID-19, in a similar vein as the climate change attribute parameters.

The comparison of the results after the COVID-19 with those before the pandemic started shows that there are some changes in the parameter estimates that lead to changes in the economic values of the climate impacts at island destinations. The price parameter has risen by 16.2% in absolute terms, from -0.00185 to -0.00215, indicating that the demand for the island destinations has become more sensitive to price. In addition, there have been changes in the parameters of the attribute impacts and the destination labels. Most of the attribute impacts have reduced their utility sensitivity, i.e. the values of the parameters have become smaller in absolute terms, or less negative in influencing tourist destination choice. However, some impacts have experienced a larger sensitivity. This is the case of the impact of the infectious diseases (moderate) for which the parameter has increased by a 22.3% in absolute terms, from -0.29 to -0.35. Other impact attributes that have also increased in utility sensitivity are the beach availability (15.1%), water shortages (9.18%), forest fires (high) (36.5%), cultural heritage (moderate) (1%) and cultural heritage (strong) (26.4%).

Thus, the COVID-19 crisis there has had an effect on the sensitivities of the utility of tourists to the climate change impacts, with some impacts having a less negative effect on the choice of destination while some other impacts having a higher negative effect. The latter is particularly the case for the impacts related with the spread of the moderate risk of infectious diseases in the chosen destination, to which tourists have become more sensitive as a result of the COVID-19 health crisis.

The DC model parameter sensitivity experienced after the COVID-19 outbreak has a consequence on the economic value of the climate change impacts. As shown in Table 9, most climate change impacts have reduced their economic values with an average reduction of -18.9%, and an average decrease in economic value of -26.58€. The impacts with largest reduction in economic value are the infrastructures (moderate) (-60.8%), terrestrial habitats (moderate) (-58.7%), and the marine habitats (moderate) (-36.2%). Only three impacts have raised their economic values after the health crisis: infectious diseases (moderate) (5.3%), cultural heritage (strong) (8.8%) and forest fires (moderate) (17.4%).

Although the average economic values of the climate change impacts on island destinations have been reduced after the COVID-19 pandemic, the economic values of the destination brands have all increased by an average of 10.1%. The islands with the highest increments in the destination brand values are the Antilles (+15.06%), Balearic Islands (+13.08%), Sicily (+12.52%) and Corsica (+11.59%).

Thus, the COVID-19 pandemic has produced a reduction in the economic value of the climate change impacts at island destinations in favour of the values of the destination brands, or the other tourist characteristics of the islands. This implies that tourists have are less sensitive to the impacts of climate change after COVID-19, therefore becoming more reluctant to change destination, or not to travel, if the climate change impacts do occur at their favourite island destination.

4.2. The Value of Climate Change Policies at Islands Destinations

4.2.1. Socio-demographic Characteristics of the Participants

Table 9 presents the socio-demographic characteristics of the participants in the 10 destination surveys. In most of the destinations the gender of the tourists interviewed is around 50% for the male-female distribution, except for the cases of Malta and Sicily where there is a majority of female respondents. Regarding the age of respondents, there is a large variability across the sample destinations, with a larger proportion of aged individuals for the subsamples of Fehmarn islands and Crete. The tourists interviewed came from a wide range of countries of origin. In total, the highest percentages correspond to Germany, France, United Kingdom and Italy, which altogether make about a 60% of the total sample. Regarding the education level and the employment status of the tourists, in most of the destinations, the majority of tourists have a bachelor degree, or have completed high school studies. With respect to the personal income level, a 50.5% of the total sample earn 1200-2800€/month.

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Table 9. Socio-demographic Characteristics.

Variable	Antilles (AN)	Azores (AZO)	Balearic (BAL)	Fehmarn (FEH)	Canary (CAN)	Crete (CRE)	Cyprus (CYP)	Madeira (MAD)	Malta (MAL)	Sicily (SIC)	Total
Gender (%)											
Male	46.0	56.0	50.2	53.6	52.7	47.8	49.6	53.6	38.4	32.8	**48.0**
Female	54.0	43.7	49.8	46.4	47.0	51.8	50.4	46.4	61.2	66.6	**51.8**
Age (%)											
<30 years	14.0	31.0	29.2	10.2	23.3	28.6	53.1	31.0	71.4	36.6	**33.7**
30 – 60 years	79.0	55.3	64.0	56.6	67.7	50.9	36.4	60.3	27.1	58.3	**55.3**
> 60 years	7.0	13.7	6.7	33.2	9.0	20.5	10.5	8.7	1.6	5.2	**11.0**
Country of Origin (%)											
France	**100.0**	7.0	11.5	-	11.0	18.8	2.3	10.7	**19.2**	8.6	**17.1**
Germany	-	16.3	**20.6**	**99.5**	15.3	**39.3**	7.8	**17.5**	6.3	6.2	**20.9**
Greece	-	-	-	-	-	-	17.1	-	-	-	**1.7**
Italy	-	1.3	12.3	-	6.7	16.5	4.7	5.6	7.8	**58.6**	**12.2**
Portugal	-	**37.3**	0.8	-	17.3	-	0.8	16.7	-	-	**8.3**
Spain	-	3.0	12.3	-	6.7	6.7	3.9	10.3	7.5	4.5	**5.7**
United Kingdom	-	2.7	18.6	-	**17.7**	7.6	**26.0**	11.5	18.0	2.8	**10.9**
Education level (%)											
High school or less	4.5	24.0	66.3	29.5	33.3	83.9	4.7	38.2	23.4	28.3	**33.4**
Technical/vocational training	36.0	14.0	10.3	43.0	17.3	15.2	9.3	15.9	7.9	15.5	**17.4**
Bachelor degree or higher	59.5	62.0	23.4	27.5	49.3	0.9	86.0	46.1	68.7	56.2	**49.2**
Monthly Income level (%)											
<1200€	18.0	39.6	7.5	13.8	24.4	36.6	33.0	25.1	54.5	24.0	**29.0**
1200 – 2800 €	63.5	37.0	47.0	52.9	53.8	63.4	57.7	44.3	29.0	57.0	**50.5**
>2800 €	18.5	23.4	45.5	33.3	21.8	-	9.3	30.6	16.5	19.0	**20.5**

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Table 10. Characteristics of the trip.

Variable	AN	AZO	BAL	FEH	CAN	CRE	CYP	MAD	MAL	SIC	Total
First time visiting the island (%)	39.0	72.3	69.6	26.0	65.7	74.1	72.1	70.6	78.8	60.0	**64.2**
# previous visits	5.1	2.7	4.0	21.6	3.6	2.5	3.6	3.2	4.6	4.2	**6.7**
# Nights at the island	18.5	7.2	5.4	9.1	6.5	6.8	7.4	6.8	8.9	9.1	**8.3**
Type of accommodation (%)											
Hotel	18.5	19.7	54.5	6.2	50.0	88.0	46.5	44.4	38.4	24.3	**39.4**
Apartment/Bungalow	35.0	27.3	24.1	52.3	21.3	12.1	14.7	21.4	38.8	25.0	**26.5**
Rural Accommodation	1.0	19.3	6.7	4.7	9.7	-	5.8	11.5	1.2	1.8	**6.6**
Family/Friend's House	44.5	19.3	11.5	13.0	12.3	-	31.0	15.1	11.4	18.3	**17.4**
Hostel	-	3.7	3.2	-	3.0	-	1.9	2.0	5.9	1.1	**2.2**
Travelling party (%)											
Alone	20.0	15.3	14.2	6.1	16.0	-	13.6	14.7	7.1	8.6	**11.8**
With partner	32.5	47.7	34.8	42.9	43.3	44.0	35.7	42.7	36.5	34.5	**39.6**
With children	28.0	5.7	18.2	27.0	13.7	30.9	19.8	10.3	5.1	18.3	**16.8**
With other relatives	6.5	6.7	9.5	9.7	9.7	3.1	5.8	9.1	16.5	11.7	**8.9**
With friends/mates	12.5	19.3	22.9	7.1	15.3	22.0	25.2	18.7	34.1	24.1	**20.5**
# people in trip	2.8	2.6	2.8	3.0	2.3	2.8	2.7	2.3	4.0	3.3	**2.8**
Total Expenses (per person, in €)	1557	844	937	508	967	697	919	947	673	1180	**933**
Knew about destination (%)											
Internet	20.5	42.0	47.4	10.8	34.7	47.3	56.6	42.9	56.5	36.7	**40.8**
TV/radio/newspaper	20.0	4.3	-	2.5	9.0	22.3	4.3	5.6	1.2	6.6	**7.2**
Friends and relatives	70.5	34.3	19.0	36.4	28.0	26.8	43.8	29.0	41.2	26.6	**34.6**
Had visited the island before	41.5	15.3	10.7	74.9	15.7	17.4	21.3	15.5	11.4	24.5	**23.0**
Travel agency/Tour operator	12.5	7.7	34.8	0.5	20.3	58.9	12.4	14.3	0.4	4.1	**16.3**

4.2.2. Visits to the Destinations

Table 10 presents the sample statistics of the trip characteristics for the tourists interviewed. Tourists were asked if it was the first time they had visited the islands, the number of nights they were staying at the islands, the type of accommodation they had chosen, the travelling party, how they knew about the destination (more than one option could be chosen) and the average expenses per person at the destination.

It can be seen in Table 10 that on average for the total sample a 64% of the tourists were visiting the island for the first time. This average varies somewhat across destinations, with Malta, Azores, Crete and Cyprus standing as those in which the proportions of first time visitors were higher. For those subjects who have visited the destination islands before, the average numbers of previous visits were 6 or 7 on average. The most common accommodation was in hotels (39.4%), while most tourists were traveling with their partners (39.6%). In addition, the most common channel utilized to get information about the destination islands was based on the Internet (40.8%). Finally, tourists spent on average, a total of 933 € per person in their trip to the chosen island destination, which ranged from the lowest 508 € for the Fehmarn islands to the highest 1557 € for the Antilles.

4.2.3. Image and Perception of the Destinations

Tourists were asked about the general perceptions of the images of the island destination they were visiting on a scale from 1 to 7. Results are presented in Figure 6. The Balearic Islands, Canary Islands and Madeira show the highest levels of destination image, and the lowest destination images are found for Malta, Crete and Fehmarn islands. In addition, respondents were asked about the specific affective images of the island destinations and the perceptions they had about the status of conservation of the natural environments of the island destinations.

Results are presented in Figure 7 and Figure 8 respectively. Regarding the four dimensions of the affective destination image, it can be seen that the most pleasant destinations are the Balearic Islands, Madeira, the Canary Islands and the Antilles, while the most unpleasant destinations are Malta and Crete. The Balearic Islands also have high scores in terms of the other dimensions of the affective image, thereby confirming as one of the destination with the largest positive perception of affective image, together with the Canary Islands and the Antilles. Considering the perception of the state of the natural environment (Figure 7), Malta stands out as the island destination with the lowest perception, while Azores, Cyprus, Crete and the Fehmarn islands have the highest positive perceptions of the conservation of environmental assets.

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Figure 6. Destination image.

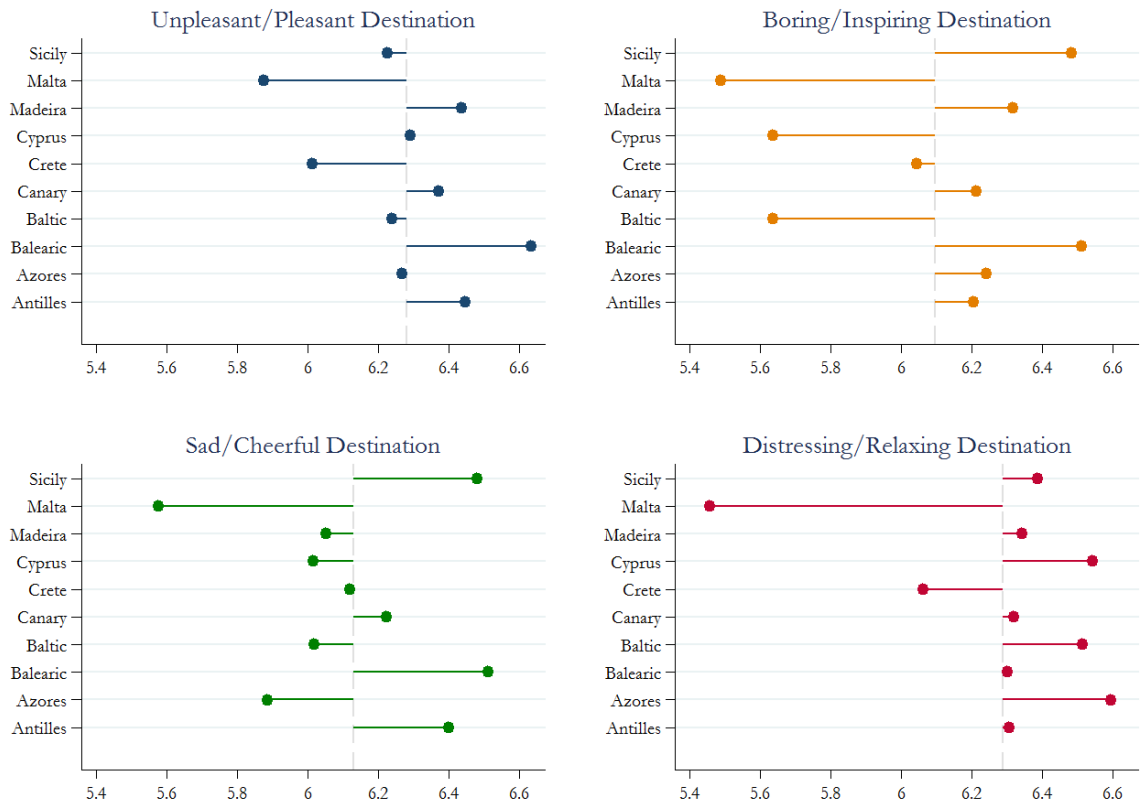


Figure 7. Destination's affective image.

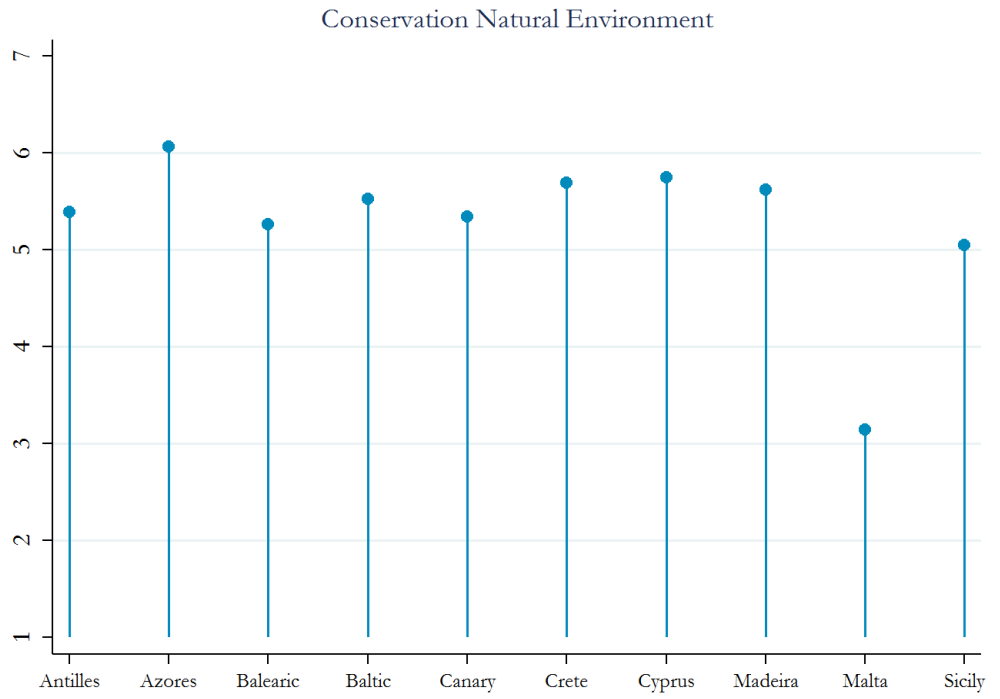


Figure 8. State of conservation of the natural environment of the destination.
Note: In the case of Malta, the possible answers ranged from 1 to 5, while in the other islands they ranged from 1 to 7.

4.2.4.Importance of Environmental Attributes and Climate Change Impacts for Travelling Decisions

Survey respondents in the islands destinations were asked about the importance of environmental attributes when deciding upon traveling to an island destination, and if they would change their chosen tourist destination whenever facing the climate change impacts. The first question in answered on a scale from 1 to 7, and results are presented in Figure 9. The results to the second question are depicted in Figure 10, for potential answers ranging in a scale from 1 to 5, where 1 is "definitely, I would not change destination", 2 is "I would choose different dates, but same destination", 3 is "maybe no, I would not change destination", 4 is "maybe yes, I would change destination, and 5 is "definitely, I would change destination. For simplification of the exposition, answers 1 and 2 have been grouped into a single category.

Figure 9 shows that sample respondents rank first the lack of infectious diseases whenever deciding upon a tourist destination, followed by water availability and the quality of landscapes. Beach size availability becomes at the bottom of the environmental attributes that tourists consider whenever deciding upon alternative destinations. For all other environmental attributes, the level of consideration is high, ranging between 5 and 6 in the Likert scale. Therefore, tourists are much concerned about the state of environmental quality at destinations when choosing between alternative destinations. This result is somewhat consistent with those observed in Figure 10 for the expected behavioural changes whenever facing the climate change impacts at destinations. More than 70% of tourists would change their destination if infectious diseases become widespread at their most favoured destination. For most of the impacts of climate change at destinations there are large behavioural sensitivities in tourists' decision

making, since more than 50% of tourists would decide upon an alternative destination with a high degree of certainty.

Figure 9. Importance of environmental attributes for travelling decisions in general.

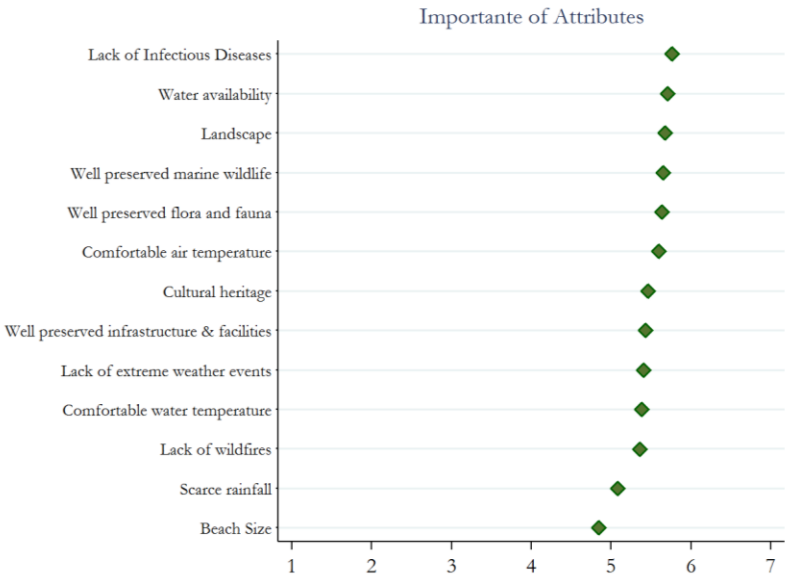
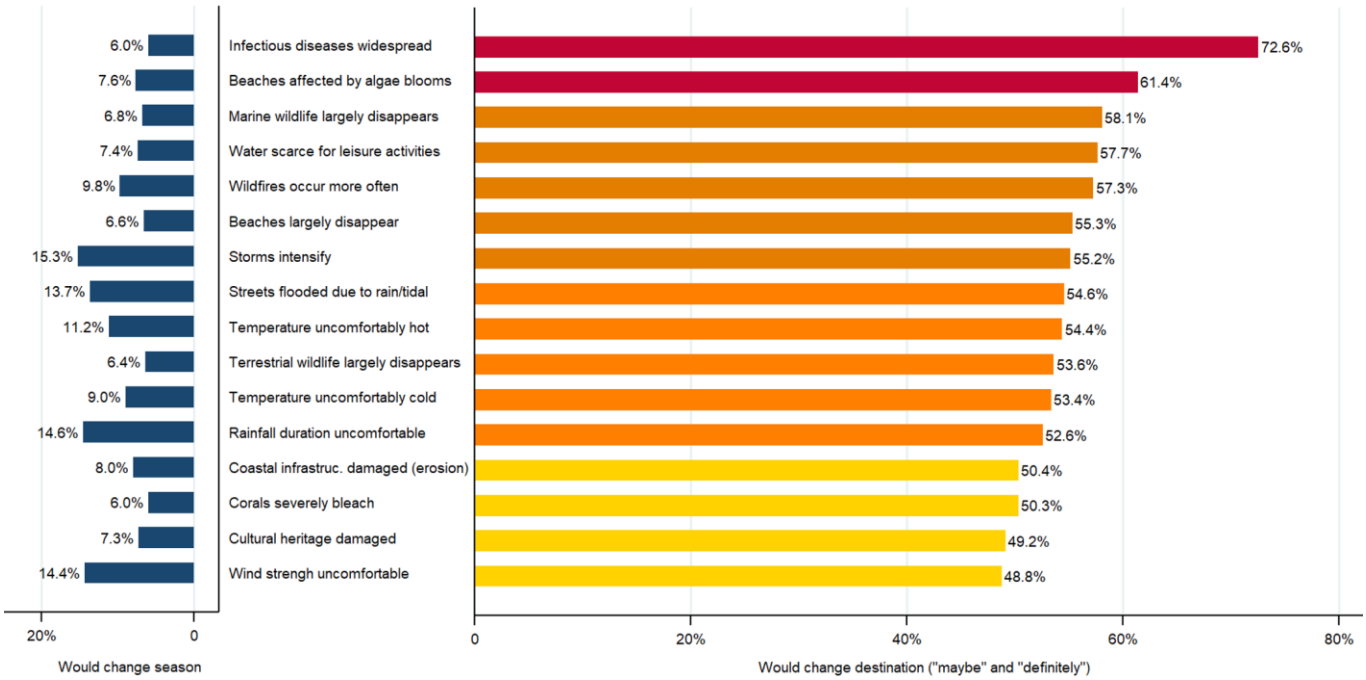


Figure 10. Change of travelling decisions under climate change impacts at destination.



4.2.5. Valuation of Policies to counteract Climate Change Impacts at Destination

The discrete choice experiment data are analysed with logistic regressions where the probability of choosing some of the policy alternatives in the choice sets presented to the respondents is explained by the climate change policy attributes. Both the CL and the MLM have been estimated and the results presented in Table 11, Table 12, Table 13, and Table 14. The results for the CL model are not substantially different from those of the MLM in terms of attribute significance and WTP value estimates, but the former model allows for the consideration of cross sample heterogeneity in the respondents' preferences for the climate change policy measures.

Since there are 2,528 individuals in the aggregated sample for all destinations, and each of them answered 6 discrete choice questions, then the total number of observations potentially available for the estimation of discrete choice models is 15,168. However, after screening for protest responses and discarding missing information in some of the choice questions, the number of usable observations for discrete choice analysis was reduced by 24.62% to a total number of 11,493. Protest responses were identified by those subjects who answered the no policy alternative in all the discrete choice questions but had a personal income level above the median income of the sample. These are individuals who rejected to take part in the market construct for the policy alternatives for some other reasons beyond the condition of not having personal income availability. In the focus groups and pre-test work we found that some tourists rejected to take on any of policy alternative in the choice sets because of the argument that tourists should not pay for these policies but should be instead a matter of concern of the local government involved with tourism policy at the destination.

Table 11 presents the results of the Conditional Logit model estimates. The price attribute is significant at the 0.01 level for the models of all island destinations, and takes a negative sign, indicating that the higher the price the lower is the probability of choosing some policy alternative to counteract climate change impacts. The sensitivity to the price level is higher for the destinations of the Balearic Islands and Crete (-0.60 and -0.50 respectively), and the lowest price sensitivity is found for Malta and the Canary Islands (-0.06 and -0.07 respectively). The contributions of climate change policies to individuals' utility are positive and high for all models, since most of the policy attributes are significant at the 0.01 level and take a positive sign for all destinations.

The significance levels are 0.05 only for the attributes of water supply policy in the Antilles, heat wave amelioration in Azores, forest fires prevention in Cyprus, land habitat restoration in Sicily, and heat waves amelioration, coastal infrastructure protection and cultural heritage protection in Madeira. A lower significance level of 0.10 is found for the policy of forest fires prevention in the Antilles and land habitat restoration in Cyprus. Non-significant effects on the respondents' utility level are found for the policies of cultural heritage protection in the Antilles and Cyprus, and water supply provision in Crete. Thus, only two climate change impact policies at island destinations are found not to have a significant effect on tourists' utility in three different destinations.

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Table 11. Conditional Logit estimation results by destinations (Adaptation Policies).

	Antilles	Azores	Balearic	Canary	Crete	Cyprus	Fehmarn	Madeira	Malta	Sicily
Heat waves amelioration	0.51***	0.14**	0.57***	0.31***	0.73***	0.73***	0.34***	0.19**	0.27***	0.63***
	(0.07)	(0.06)	(0.09)	(0.05)	(0.11)	(0.06)	(0.06)	(0.06)	(0.05)	(0.06)
Infectious diseases prevention	0.75***	0.55***	0.59***	0.50***	0.99***	0.58***	0.31***	0.45***	0.53***	0.76***
	(0.08)	(0.06)	(0.09)	(0.06)	(0.12)	(0.07)	(0.07)	(0.07)	(0.05)	(0.06)
Beaches protection	0.87***	0.29***	0.43***	0.22***	0.70***	0.92***	0.62***	0.25***	0.23***	0.58***
	(0.07)	(0.06)	(0.08)	(0.05)	(0.1)	(0.06)	(0.06)	(0.06)	(0.05)	(0.06)
Water supply	0.56**	1.01***	0.62***	0.75***	0.69***	0.57***	1.01***	0.68***	0.48***	0.55***
	(0.11)	(0.09)	(0.15)	(0.08)	(0.18)	(0.08)	(0.08)	(0.09)	(0.07)	(0.08)
Forest fires prevention	0.29*	0.45***	0.43***	0.34***	0.72***	0.26**		0.44***		0.65***
	(0.13)	(0.1)	(0.16)	(0.09)	(0.19)	(0.09)		(0.1)		(0.09)
Land habitats restoration	0.81***	0.58***	0.58***	0.38***	1.21***	0.27**	0.47***	0.30***	0.18***	0.53**
	(0.11)	(0.09)	(0.14)	(0.1)	(0.19)***	(0.1)	(0.11)	(0.11)	(0.07)	(0.13)
Marine habitats restoration	0.57***	1.20***	0.37***	0.82***	0.69***	0.50***	0.70***	0.86***	0.33***	0.70***
	(0.09)	(0.07)	(0.12)	(0.08)	(0.16)	(0.09)	(0.09)	(0.08)	(0.06)	(0.1)
Coastal infrastructures protection	0.62***	0.57***	0.69***	0.52***	0.92***	0.47***	0.74***	0.47**	0.25***	0.51***
	(0.1)	(0.09)	(0.11)	(0.08)	(0.16)	(0.09)	(0.09)	(0.09)	(0.06)	(0.09)
Cultural heritage protection	0.14	0.76***	0.42***	0.53***	0.84***	0.23**	0.44***	0.45***	0.21***	0.75***
	(0.12)	(0.09)	(0.11)	(0.08)	(0.16)	(0.1)	(0.1)	(0.1)	(0.06)	(0.08)
Price	-0.10***	-0.12***	-0.60***	-0.07***	-0.50***	-0.08***	-0.09***	-0.08***	-0.06***	-0.22***
	(0.02)	(0.01)	(0.03)	(0.01)	(0.04)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
AIC	1674.55	2648.39	1209.82	3042.74	439.82	2300.87	2203.55	2468.89	1135.21	2282.04
BIC	1734.42	2712.16	1269.03	3107.06	491.33	2364.07	2258.97	2531.01	1186.52	2344.92
ll	-827.28	-1314.20	-594.91	-1511.37	-209.91	-1140.43	-1092.77	-1224.45	-558.61	-1131.02
N. observations	981	1449	918	1530	425	1368	1067	1228	1105	1326

Note: *p<0.1; **p<0.05; ***p<0.01 significance test. Standard errors within parentheses.

Table 12 shows the WTP estimates coming out from the Conditional Logit model for the 9 climate change adaptation policies in the 10 tourist destinations across the European islands. On average, the policy of guaranteeing enough water supplies for the stay the destinations facing climate change is the policy most valued by respondents, with 5 out of 10 destinations considering it as the first or second most valued climate change policy. That is, the water supply policy ranks first in economic value for the Fehmarn islands and second for Azores, Canaries, Madeira y Malta. The average value of the water supply policy across destination is 6.59 €, ranging from 1 € in the Balearics to 11.9 € in the Fehmarn islands. The second most valued policy across all destinations is the policy of marine habitat restoration, with an average value of 6.39 €, ranging from 0.6 € in the Balearics to 12.5 € for the Canaries. The third policy with highest values across most destinations is the policy devoted to the containment of infectious diseases, with an average value of 5.19 €, which oscillates between the lowest value of 1 € for the Balearics to the highest of 9.2 € for Malta.

Table 13 presents the results of the estimation of the Mixed logit models for all island destinations. Mixed logit is a more general model than then Conditional Logit model in that it allows for the consideration of sample heterogeneity by modelling the climate change policy parameters as dependent on a random term, which in this case has been assumed to follow a normal distribution. Therefore, preference parameters are not constant across individuals but vary across individuals reflecting the heterogeneity of tourists' preferences for the policy proposals to counteract climate change impacts in island destinations.

It can be seen that the results are quite similar to those obtained with the Conditional Logit model in terms of the significance levels of the climate change adaptation policy parameters. Most of the parameters are highly significant at the 0.01 level for all policy proposals and have a positive sign, indicating that they contribute positively to tourists' utility, and therefore are demanded from the point of view of the tourists. Only the policy proposal of cultural heritage protection is not significant for the destinations of Antilles and Cyprus. A lower level of significance of 0.05 is obtained for the fire prevention policy in Cyprus, the water supply policy in the Antilles and Balearics, the beach protection policy in the Canaries, the heat wave amelioration policy in Madeira, the land habitat restoration policy in Madeira and Sicily, the coastal infrastructure protection in Crete and Cyprus, and the forest fires prevention in Cyprus. A significance level of 0.10 is found for the policies of forest fires prevention in the Antilles, heat waves amelioration in Azores and water supply guarantee in Crete.

Table 12. Tourists' WTP (€) for adaptation policies (Conditional Logit model)

	Antilles	Azores	Balearic	Canary	Crete	Cyprus	Fehmarn	Madeira	Malta	Sicily
Heat waves amelioration	5.3	1.1	1.0	4.7	1.5	8.7	4.0	2.3	4.6	2.9
Infectious diseases prevention	7.9	4.6	1.0	7.7	2.0	6.9	3.7	5.4	9.2	3.5
Beaches protection	9.2	2.4	0.7	3.3	1.4	11.0	7.3	3.0	3.9	2.7
Water supply	5.9	8.4	1.0	11.5	1.4	6.8	11.9	8.2	8.2	2.6
Forest fires prevention	3.1	3.7	0.7	5.3	1.4	3.1		5.3		3.0
Land habitats restoration	8.5	4.8	1.0	5.8	2.4	3.3	5.6	3.6	3.1	2.4
Marine habitats restoration	6.0	10.0	0.6	12.5	1.4	5.9	8.3	10.3	5.7	3.2
Coastal infrastructures protection	6.5	4.8	1.2	8.0	1.8	5.6	8.7	5.7	4.3	2.4
Cultural heritage protection	1.4	6.3	0.7	8.1	1.7	2.8	5.2	5.4	3.6	3.5

Thus, tourists show strong positive preferences for the climate change policies at the destinations that should be designed with the aim of counteracting the effects of climate change on the natural assets, and coastal and cultural infrastructures of the destinations. These positive preferences are also heterogeneous across the individual respondents as can be seen by the high significance levels of the standard deviations of the preference parameters in the models of all the island destinations.

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Table 13. Mixed Logit model estimation results by island destinations (Adaptation Policies).

	ISLAND DESTINATIONS									
MODEL VARIABLE	Antilles	Azores	Balearic	Canary	Crete	Cyprus	Fehmarn	Madeira	Malta	Sicily
Price	-0.14***	-0.24***	-1.23***	-0.10***	-1.15***	-0.11***	-0.17***	-0.12***	-0.18***	-0.27***
	(0.02)	(0.02)	(0.09)	(0.01)	(0.12)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
Forest fires prevention	0.26*	0.90***	1.46***	0.46***	1.40***	0.38**		0.67***		0.88***
	(0.15)	(0.16)	(0.31)	(0.12)	(0.36)	(0.12)		(0.13)		(0.11)
Land habitats restoration	1.31***	1.20***	1.03***	0.48***	1.46***	0.24*	0.58***	0.41**	1.08***	0.46**
	(0.14)	(0.15)	(0.25)	(0.12)	(0.40)	(0.13)	(0.17)	(0.13)	(0.22)	(0.15)
Marine habitats restoration	1.05***	2.03***	0.90***	1.02***	2.22***	0.49***		1.13***	1.44***	0.81***
	(0.13)	(0.13)	(0.23)	(0.11)	(0.44)	(0.12)	1.13***	(0.12)	(0.23)	(0.14)
Coastal infrastructures protection	0.46***	0.52***	1.21***	0.52***	0.90**	0.32**	(0.15)	0.37**	0.75***	0.45***
	(0.13)	(0.12)	(0.22)	(0.10)	(0.35)	(0.12)		(0.11)	(0.16)	(0.11)
Cultural heritage protection	-0.08	0.80***	1.12***	0.52***	1.99***	0.04	1.03***	0.40***	0.87***	0.96***
	(0.15)	(0.13)	(0.23)	(0.11)	(0.40)	(0.18)	(0.14)	(0.12)	(0.16)	(0.11)
Heat waves amelioration	0.55***	0.13*	0.99***	0.36***	1.78***	0.82***		0.22**	0.98***	0.74***
	(0.09)	(0.07)	(0.19)	(0.07)	(0.34)	(0.06)	0.68***	(0.07)	(0.14)	(0.07)
Infectious diseases prevention	0.93***	0.96***	1.65***	0.61***	2.35***	0.68***	(0.17)	0.57***	2.15***	0.92***
	(0.09)	(0.11)	(0.20)	(0.08)	(0.33)	(0.08)		(0.09)	(0.23)	(0.08)
Beaches protection	1.07***	0.39***	1.12***	0.21**	1.62***	1.02***	0.50***	0.29***	1.04***	0.64***
	(0.08)	(0.10)	(0.18)	(0.07)	(0.26)	(0.06)	(0.12)	(0.07)	(0.14)	(0.08)
Water supply	0.42**	1.65***	0.99**	0.92***	0.62*	0.67***		0.86***	1.72***	0.60***
	(0.13)	(0.27)	(0.34)	(0.18)	(0.37)	(0.11)	0.30**	(0.20)	(0.28)	(0.10)
SD										
Heat waves amelioration	0.58***		1.12***	0.42***	0.98**	1.05***	1.00***	0.39**	0.58**	0.13
	(0.14)		(0.20)	(0.12)	(0.31)	(0.21)	(0.16)	(0.15)	(0.23)	(0.24)
Infectious diseases prevention		1.05***	0.97***	0.66***	0.82**			0.62***	1.53***	-0.14
		(0.13)	(0.27)	(0.11)	(0.39)		1.16***	(0.13)	(0.22)	(0.16)
Beaches protection		0.98***	0.78***	0.28*	0.03		(0.17)	0.09	0.64**	0.20
		(0.13)	(0.23)	(0.17)	(0.46)			(0.24)	(0.21)	(0.13)
Water supply		-2.11***	1.00**	1.29***	0.24		1.51***	1.23***	0.36	0.13
		(0.30)	(0.49)	(0.19)	(0.59)		(0.17)	(0.21)	(0.70)	(0.38)
ll	-823.10	-1238.13	-578.46	-1481.67	-205.94	-1130.41	-994.73	-1203.97	-532.72	-1130.47
AIC	1668.20	2502.26	1184.92	2991.33	439.88	2282.82	2015.47	2435.94	1091.44	2288.95
BIC	1734.04	2585.15	1267.81	3081.38	511.99	2352.34	2095.51	2522.91	1165.55	2376.99
N. observations	981	1449	918	1530	425	1368	1163	1228	1105	1326

Note: *p<0.1; **p<0.05; ***p<0.01 significance test. Standard errors within parentheses.

Table 14 shows the results of the WTP value estimates from the Mixed Logit model. Again, the value estimates do not change too much from the patterns of evidence previously obtained with the CL model. The policies which are most valued by tourists across all destinations are the policies designed to deal with marine habitats protection, water supply guarantee and infectious disease prevention. For the policy of marine habitats protection, the average value across all destinations stands out at 5.99 € per individual tourist, ranging from the lowest value of 0.73 € for the Balearics to the highest value of 10.66 € for the Canaries. For the policy of guaranteeing adequate water supply at the island destinations during the tourist visits, the average value is 5.37 € across destinations, varying between 0.81 € for Balearics and 9.55 € for the Canaries. And for the policy of preventing infectious diseases at the destinations, the average value across all destinations is 4.81 €, oscillating between 1.34 € for the Balearics and 11.64 € for Malta.

Table 14. Tourists' WTP (€) for adaptation policies (Mixed Logit model)

	ISLAND DESTINATIONS									
POLICY	Antilles	Azores	Balearic	Canary	Crete	Cyprus	Fehmarn	Madeira	Malta	Sicily
Heat waves amelioration	3.88	0.53	0.80	3.71	1.54	7.28	2.89	1.77	5.29	2.75
Infectious diseases prevention	6.89	4.00	1.34	6.38	2.03	6.03	1.73	4.69	11.64	3.40
Beaches protection	7.69	1.60	0.91	2.22	1.41	9.09	5.49	2.36	5.63	2.39
Water supply	2.99	6.83	0.81	9.55	0.54	6.01	8.39	7.03	9.31	2.21
Forest fires prevention	2.13	3.72	1.19	4.81	1.21	3.38		5.52		3.26
Land habitats restoration	9.46	4.96	0.84	4.98	1.26	2.17	3.38	3.34	5.86	1.71
Marine habitats restoration	7.25	8.43	0.73	10.66	1.92	4.34	6.55	9.26	7.80	3.00
Coastal infrastructures protection	2.74	2.17	0.98	5.40	0.78	2.87	6.01	3.00	4.06	1.68
Cultural heritage protection	0	3.32	0.91	5.45	1.72	0.34	3.96	3.29	4.74	3.57

5. Discussion

The results of the economic values of climate change impacts at island destinations have been based on the utilization of the methodology of non-market economic valuation of Discrete Choice Experiments. In deliverable 5.4 it was presented all the material that was produced in order implement the Discrete Choice Experiments methodology. Basically, this has consisted on the design of a market situation implemented in a questionnaire in which individuals are asked about their preferences for island destinations based on different scenarios in terms of the potential impacts of climate change and the policies that can be designed to counteract their effects.

The application of the methodology for the measurement of the economic values has been theoretically and empirically designed with the specific aim to fit into the macroeconomic evaluation of the socioeconomic effects, in terms of employment and gross domestic product over the medium and long term up to 2100, of the climate change impacts at island destinations. However, the methodology has been particularly applied to the case of the climate change impacts in the economic sector of tourism, and no attempt has been made to apply it to the other Blue Economy sectors.

The impacts assessed for the tourism sectors are impacts on the demand side of the market, and affect the direct gross revenues from the tourism industry in the prospect of facing potential climate change impacts at island destinations. The macroeconomic models of WP6 incorporate these direct effects into the sectoral modelling of the island economies in order to evaluate the indirect and induced effects throughout the respective economic systems.

The results for the climate change impacts on island economies in this document are limited to those impacts that have been considered based on the climate change impact chain modelling of WP3. Even though there has been made an effort to contemplate all the panoply of expected climate change impacts in tourist destinations, still there is a large degree of uncertainty about the future impacts. Thus, the principal limitation of the results is that they may not accurately anticipate the dynamic effects on tourist preferences as the impacts of climate change evolve over time. This could lead to biased results in the estimation of the economic impacts of climate change on tourism demand. Although the range of uncertainty in the estimated economic values cannot be determined with precision, it can be expected that their magnitude will be larger if the projected physical impacts become accelerated or have larger consequences, and lower if those impacts become contained and limited.

For instance, the emergence of the global health crisis of COVID-19 has been shown to produce a reduction in the values of most climate change impacts besides those concerned with the risks of infectious diseases, and their substitution for higher economic values of the characteristics of destination brands that are related to the features of the tourist services at destinations.

The effect of COVID-19 can be expected to be a temporary shock on the tourism demand that will be recovered once the new normality in the global tourism markets is re-established. However, the evidence of COVID-19 on the economic values of climate change impacts proves the uncertainty of the results to any future climate, natural or social shocks to the natural and economic systems.

6. Conclusions

This deliverable report (D5.5) has presented the results obtained from the assessment of the climate change impact chains in the tourism sector. To this aim, it has focused on assessing the impacts on tourism demand of the climate change impact chains defined from the previous WPs of the project. The methodology has involved careful survey work conducted both at the countries of origin and at the island destinations involved in the project.

From a qualitative perspective, it was found that tourists are highly prone to definitely change their destinations' choices if infectious diseases become more widespread, but also if temperature becomes too hot, if fires occur more often at destinations, and if water becomes increasingly scarcer. Some of these results are corroborated with the evidence obtained from the quantitative methodology of discrete choice experiments on the economic valuation of climate change impacts at islands destinations. That is, DCEs results at the island destinations show that tourists attribute the highest willingness to pay to policies dedicated to marine habitats restoration, followed by policies aiming at supplying sufficient water, preventing infectious diseases, and protecting the beaches.

Further, results from the data DCEs collected at origin countries also shows that tourists would change destination choices because of climate change impacts, and that these impacts would reduce significantly their willingness to pay to visit the European islands destinations. Those impacts that will have higher impacts on the economic value of tourism at the destinations are related with the higher risks of infectious diseases and the higher risks of forest fires, while those with lesser impacts on the economic value of tourism are concerned with the higher risks of heat waves and the expected reduction in beach space because of water intrusion.

The economic values of the climate change impacts have changed after the pandemic of the COVID-19 that has affected international travel worldwide. Tourists' preferences at origin countries have changed towards a more negative perception of the risks of infectious diseases and forest fires and a less negative sensitive to the other risks of climate change impacts at island destinations. This means that the average economic value of the climate change impacts has been reduced by an 18% in favour of higher values for the touristic characteristics of the destinations, reflecting higher preferences for travelling in a context of the restrictions imposed by the pandemic. It may be expected that these effects are transitory and will tail out as the tourist market recovers its pre-pandemic health and sanitary conditions.

References

Araña. J. E. & León. C. J. (2012). Scale-perception bias in the valuation of environmental risks. *Applied Economics*. 44 (20). 2607–2617.

Araña. J. E. & León. C. J. (2013a). Correcting for scale perception bias in tourist satisfaction surveys. *Journal of Travel Research*. 52 (6). 772–788.

Araña. J. E. & León. C. J. (2013b). Dynamic hypothetical bias in discrete choice experiments: Evidence from measuring the impact of corporate social responsibility on consumers demand. *Ecological Economics*. 87. 53–61.

Burkhard. B.. Petrosillo. I.. & Costanza. R. (2010). Ecosystem services–bridging ecology. economy and social sciences. *Ecological complexity.7*(3). 257.

Chaniotis. P.. Royo Gelabert. E. & Doria. L.. unpublished. Lessons learned through considering the application of CICES (v4.3) in a marine context. Internal paper for the European Environment Agency from the European Topic Centre on Inland. Coastal and Marine Waters. December 2015 (synthesis work).

Culhane. FE. White. LJ. Robinson. LA. Scott. P. Piet. G. Miller. DCM. van Overzee. HMJ & Frid. CLJ (2014) Development of an operational EU policy-based marine ecosystem (services) assessment framework. Deliverable 9: Report to the European Environment Agency from the University of Liverpool. December 2014. University of Liverpool. UK. ISBN: 978-0-906370-90-2: pp. 432 (development work). This report has been revised and will be published as a Report from the European Topic Centre on Inland. Coastal and Marine Waters in 2018.

Costanza. R.. d'Arge. R.. De Groot. R.. Farber. S.. Grasso. M.. Hannon. B.. ... & Raskin. R. G. (1997). The value of the world's ecosystem services and natural capital. *nature. 387*(6630). 253.

Costanza. R.. & Farber. S. (2002). Introduction to the special issue on the dynamics and value of ecosystem services: integrating economic and ecological perspectives.

Costanza. R.. Kubiszewski. I.. Ervin. D.. Bluffstone. R.. Boyd. J.. Brown. D.. ... & Shandas. V. (2011). Valuing ecological systems and services. *F1000 biology reports. 3*.

Daily. G.C. (1997) Introduction: What Are Ecosystem Services? In: Daily. G.C.. Ed.. Nature's Services: Societal Dependence on Natural Ecosystems. Island Press. Washington DC. 1-10

De Groot. R. D.. Fisher. B.. Christie. M.. Aronson. J.. Braat. L.. Haines-Young. R.. ... & Portela. R. (2010). Integrating the ecological and economic dimensions in biodiversity and ecosystem service valuation. In The Economics of Ecosystems and Biodiversity (TEEB): Ecological and Economic Foundations. Earthscan.

European Commission (2013). Mapping and Assessment of Ecosystems and their Services. An analytical framework for ecosystem assessments under Action 5 of the EU Biodiversity Strategy to 2020. Discussion paper – Final. April 2013

Farber. S. C.. Costanza. R.. & Wilson. M. A. (2002). Economic and ecological concepts for valuing ecosystem services. *Ecological economics*. *41*(3). 375-392.

Haynes-Young. R.. & Potschin. M. (2013). Common International Classification of Ecosystem Services (CICES): Consultation on Version 4. August-December 2012. Report to the European Environment Agency. EEA/IEA/09/003.

Haines-Young. R. & Potschin. M. B. (2018): Common International Classification of Ecosystem Services (CICES) V5.1 and Guidance on the Application of the Revised Structure.

Hoyos. D. (2010). The state of the art of environmental valuation with discrete choice experiments. *Ecological Economics*. 69. 1595-1603.

Lancaster, K. (1971). *Consumer Demand: A New Approach*. New York: Columbia University Press.

León. C. J.. de León. J.. Araña. J. E. & González. M. M. (2015). Tourists' preferences for congestion. residents' welfare and the ecosystems in a national park. *Ecological Economics*. 118. 21-29.

MA [Millennium Ecosystem Assessment] (2005). Ecosystems and Human Well-being: Synthesis. Island Press. Washington. DC.

Maes. J.. Liquete. C.. Teller. A.. Erhard. M.. Paracchini. M. L.. Barredo. J. I.. ... & Meiner. A. (2016). An indicator framework for assessing ecosystem services in support of the EU Biodiversity Strategy to 2020. Ecosystem services. 17. 14-23.

Maes. J.. Teller. A.. Erhard. M.. Liquete. C.. Braat. L.. Berry. P. … & Bidoglio. G. (2013) Mapping and Assessment of Ecosystems and their Services. An analytical framework for ecosystem assessments under action 5 of the EU biodiversity strategy to 2020. Publications office of the European Union. Luxembourg.

McFadden. D. (1974). The measurement of urban travel demand. *Journal of Public Economics*. 3. 303-328.

McFadden, D., & Train, K. (2000). Mixed MNL models for discrete response. *Journal of Applied Econometrics*, 15, 447-470.

TEEB- http://www.teebweb.org/about/the-initiative/. Consulted on 27/11/2019

Train (2003). *Discrete choice methods with simulation*. Eds. Cambridge University Press, New York.

StataCorp. (2013). Stata: Release 13. Statistical Software. College Station. TX: StataCorp LP.

Worm. B.. Barbier. E. B.. Beaumont. N.. Duffy. J. E.. Folke. C.. Halpern. B. S.. ... & Sala. E. (2006). Impacts of biodiversity loss on ocean ecosystem services. *Science*. *314*(5800). 787-790.

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Annex 1 – Survey at Destination

SOCLIMPACT
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No776661

Dear Sir / Madam.
The aim of this questionnaire is to find out and understand your opinions and perceptions of climate change when undertaking travel decisions as tourists and as citizens. This study is part of a large research project funded by the European Commission on the impacts of climate change on islands across Europe and the Caribbean. Your participation is anonymous. and the information shall be used exclusively for the purposes of the research undertaken. Please take your time and read the questions carefully. Thank you very much for your time and cooperation.

1.- Is it the first time you visit this island? 1. ☐ Yes 2. ☐ No. this is my _____ time in this island

2.- How many nights are you staying in this island? _____ nights

3.- Specify your type of accommodation:

	1. Hotel		4. Family / Friends' House
	2. Apartment / Bungalow		5. Hostel
	3. Rural Accommodation		6. Other: _____

4.- On this occasion. which of the following options best describes the group you are travelling with?

	1. Alone		4. With other relatives
	2. With my partner		5. With your friends / work mates
	3. With my children		6. Others: _____

5.- How many people came to the trip (also count yourself)? _____ people

6.- How did you organize the trip?

	1. Organized it myself
	2. Travel agency/tour operator
	3. Other: _____

7.- How did you know about the destination? (It is possible to specify more than one option)

	1. Internet		4. Had visited the island before
	2. Advertisement on TV/radio/newspapers		5. Travel agency/ Tour operator
	3. Friends and relatives		6. Other: _____

8.- Approximately. how much money have you spent on your trip to this island on average (<u>PER PERSON</u>)?

Flight / Transport to the island	_____ €
Accommodation	_____ €
Transport (in the island)	_____ €
Food and drinks	_____ €
Tours/ excursions	_____ €
Other expenses: _____	
Total	**_____ €**

9.- From a general point of view. on a scale from 1 to 7. how positive or negative is the image you have of this island?
Please. note that 1 indicates very negative and 7 very positive.

Very negative image	1 2 3 4 5 6 7	Very positive image

10.- The following table indicates a series of opposing adjectives that can describe your opinion about this island.

Please. indicate on a scale from 1 to 7 to what degree your opinion of the island is closer to the adjective on the right or on the left.

Unpleasant destination	1	2	3	4	5	6	7	Pleasant destination
Boring destination	1	2	3	4	5	6	7	Inspiring destination
Sad destination	1	2	3	4	5	6	7	Cheerful destination
Distressing destination	1	2	3	4	5	6	7	Relaxing destination

11.- How would you rate the <u>state of conservation of the natural environment</u> of this island in general. based on your knowledge and information?

Please. consider the following scale: 1=very badly preserved; 2=badly preserved; 3=neither badly nor well preserved; 4=well preserved; 5=very well preserved; N/A= no answer.

State of conservation of the natural environment						
1	2	3	4	5	6	7

12.- For the following <u>environmental attributes</u>. how would you rate their importance for your <u>travelling decisions in general</u>?

Please. consider the following rating: 1=not important at all; 2=not very important; 3=neutral; 4=quite important; 5=very important.

Attribute	Importance						
Comfortable air temperature	1	2	3	4	5	6	7
Comfortable water temperature	1	2	3	4	5	6	7
Lack of infectious diseases	1	2	3	4	5	6	7
Beach size	1	2	3	4	5	6	7
Water availability	1	2	3	4	5	6	7
Lack of wildfires	1	2	3	4	5	6	7
Well preserved marine wildlife	1	2	3	4	5	6	7
Well preserved land flora and fauna	1	2	3	4	5	6	7
Landscape	1	2	3	4	5	6	7
Well preserved infrastructures and facilities	1	2	3	4	5	6	7
Cultural heritage	1	2	3	4	5	6	7
Scarce rainfall	1	2	3	4	5	6	7
Lack of extreme weather events	1	2	3	4	5	6	7

Let me briefly inform you about Climate Change:

Climate change is a global phenomenon created predominantly by burning fossil fuels (petrol. carbon. gas ...). which adds heat-trapping gases to Earth's atmosphere. Consequences include increased temperature. sea level rise. ice mass loss in the Earth's Poles. shifts in flower/plant blooming. and extreme weather events.

Below you can find a description of the major potential impacts of climate change in European Islands. such as the one we are now. In this study we are interested in knowing how you would value SOME POLICIES that would combat these climate change impacts in this island. Consider that THESE POLICIES are going to be implemented by the local authorities. and there is the need to know how valuable they are to you as tourists. <u>Please. read carefully the description of potential impacts of climate change and the POLICIES that can be undertaken for each of the impacts of climate change in this island.</u>

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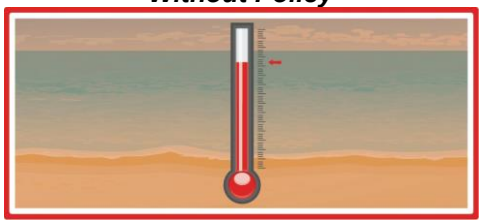
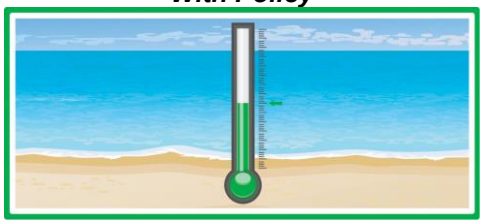
IMPACT	POLICY
Thermal Comfort: Climate Change increases the frequency and severity of heat waves. which are periods of several days or weeks of excessive hot weather. including warmer nights and hotter days.	**HEAT WAVES AMELIORATION:** This policy consists of early warning. proper information for vulnerqable groups. air conditioning in public indoor and outdoor places. increasing green and watered areas and provision of proper medical care for heat-related diseases.

Without Policy

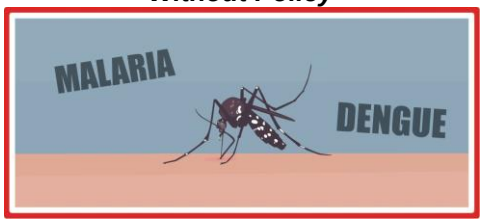


With Policy

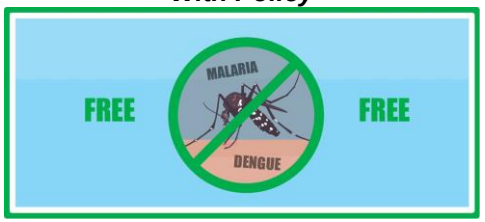


Infectious Diseases: Climate change is likely to increase the occurrence of infectious diseases such as malaria and dengue. which are transported by some species of mosquitos that manage to survive under the new climatic conditions.	**INFECTIOUS DISEASES PREVENTION:** This policy consists of proper information and advisement to face outbreaks. fumigation of mosquitoes' prone areas. and emergency medical care plans.

Without Policy



With Policy



Beaches Availability: Climate change may cause sandy beaches disappear because of sea level rise and the increase of storms.	**BEACHES PROTECTION:** This involves building seawalls and breakwaters. nourishment of sandy beaches when needed and building compensatory artificial beaches across coastal areas.

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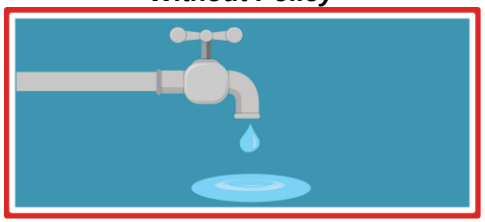
Without Policy

With Policy

IMPACT	POLICY
Water Availability: Climate change is reducing the water availability. Many areas around the world will present water shortages and scarcity. facing droughts.	**WATER SUPPLY:** This includes desalination plants and water facilities reinforcement to guarantee fresh water supply.

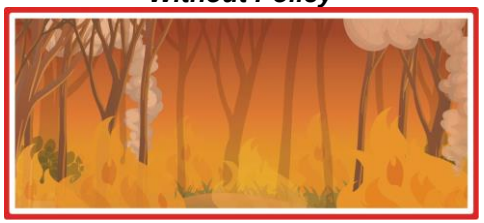
Without Policy



With Policy

Forest Fires: Climate change is increasing the number and effects of forest fires fuelled by warmer climatic conditions and droughts.	**FOREST FIRES PREVENTION:** This policy consists of improving forest management to reduce combustibility. increasing firefighting technical and human resources. and investing more in post-fires landscape and habitats restoration.

Without Policy



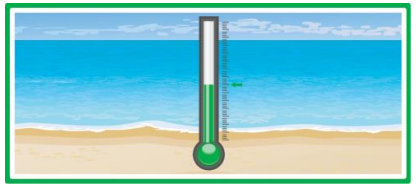
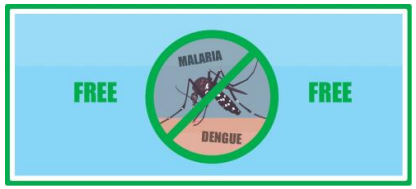
With Policy

13. – How would you CHANGE your travelling decisions if the following impacts occur AT THIS ISLAND?
Please. consider the following answers: 1=Definitely. I would NOT change destination; 2=I would choose different dates. but same destination; 3=Most likely. I would NOT change destination; 4=Most likely. I would change destination; 5=Definitely. I would change destination.

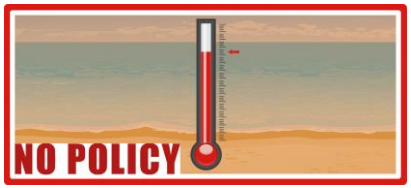
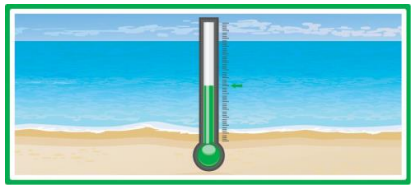
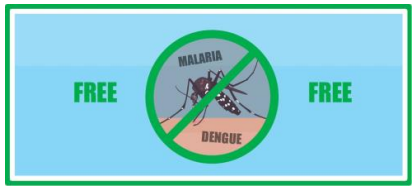
Climate Change Impact	Would you CHANGE destination?				
	No	No. but I'd change date	Probably No	Probably Yes	Yes
Infectious diseases become more widespread	1	2	3	4	5
Streets are frequently flooded as a result of rain or tidal surge	1	2	3	4	5
Beaches largely disappear	1	2	3	4	5
Storms intensify throughout the year	1	2	3	4	5
Temperature becomes uncomfortably hot to me	1	2	3	4	5
Rainfall daily duration becomes uncomfortable to me	1	2	3	4	5
Wind strength becomes uncomfortable to me	1	2	3	4	5
Marine wildlife largely disappears	1	2	3	4	5
Corals severely bleach	1	2	3	4	5
Beaches are affected by algae blooms	1	2	3	4	5
Wildfires occur more often	1	2	3	4	5
Coastal infrastructures are damaged due to coastal erosion	1	2	3	4	5
Terrestrial wildlife largely disappears	1	2	3	4	5
Temperature becomes uncomfortably cold to me	1	2	3	4	5
Cultural heritage is damaged due to weather conditions	1	2	3	4	5
Water is scarce for leisure activities	1	2	3	4	5

14.- Now. you are going to be presented with various combinations of the aforementioned climate change POLICIES to be undertaken in this island that would counteract the impacts described. and you are asked to choose the one that you prefer.
For each option describing a set of climate change policies. you are asked to pay an extra price per person per day of your stay. above the current expenses that you have incurred in your vacation in this island.
For each model. please choose your preferred option (ONLY ONE) between the alternatives proposed.

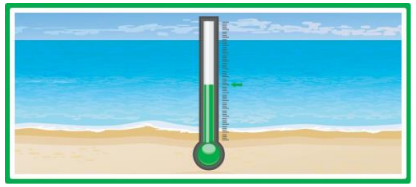
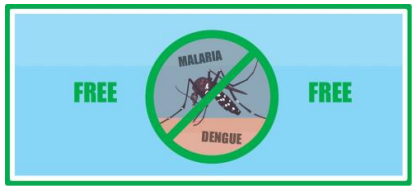
Model A.1

	Option A	Option B	Neither Option
Heat Waves Amelioration			NO POLICY
Infectious Diseases Prevention			
Beaches Protection			
Water Supply			
Forest Fires Prevention			
Price (per day per person)	3€	5€	0€
Mark your choice	☐	☐	☐

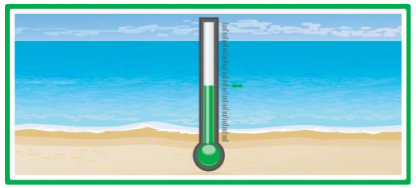
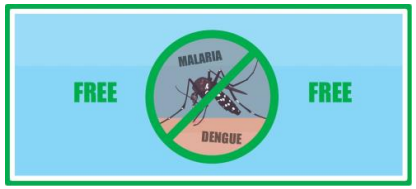
Model A.2

	Option A	Option B	Neither Option
Heat Waves Amelioration			NO POLICY
Infectious Diseases Prevention			
Beaches Protection			
Water Supply			
Forest Fires Prevention			
Price (per day per person)	7€	1€	0€
Mark your choice	☐	☐	☐

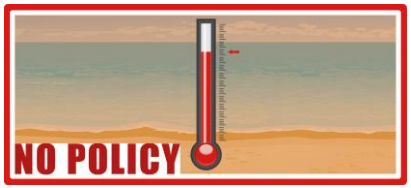
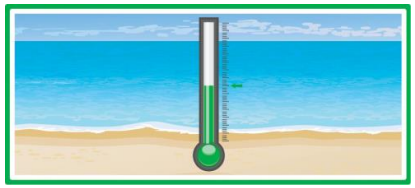
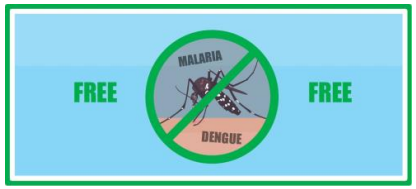
Model A.3

	Option A	Option B	Neither Option
Heat Waves Amelioration			NO POLICY
Infectious Diseases Prevention			
Beaches Protection			
Water Supply			
Forest Fires Prevention			
Price (per day per person)	3€	5€	0€
Mark your choice	☐	☐	☐

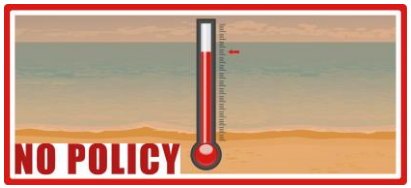
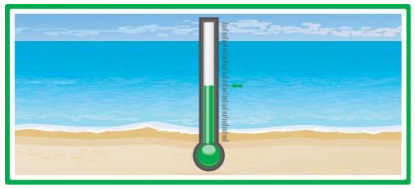
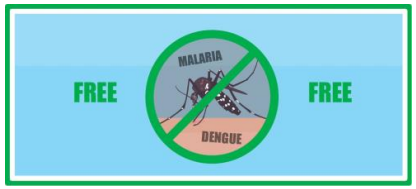
Model A.4

	Option A	Option B	Neither Option
Heat Waves Amelioration			NO POLICY
Infectious Diseases Prevention			
Beaches Protection			
Water Supply			
Forest Fires Prevention			
Price (per day per person)	3€	5€	0€
Mark your choice	☐	☐	☐

Model A.5

	Option A	Option B	Neither Option
Heat Waves Amelioration			NO POLICY
Infectious Diseases Prevention			
Beaches Protection			
Water Supply			
Forest Fires Prevention			
Price (per day per person)	5€	3€	0€
Mark your choice	☐	☐	☐

Model A.6

	Option A	Option B	Neither Option
Heat Waves Amelioration			NO POLICY
Infectious Diseases Prevention			
Beaches Protection			
Water Supply			
Forest Fires Prevention			
Price (per day per person)	1€	7€	0€
Mark your choice	☐	☐	☐

OTHER INFORMATION

15.- Country of Residence: _____ **Province:** _____

16.- Gender: 1. ☐ Male 2. ☐ Female 3. ☐ Other

17.- Age: _____

18.- Education level:

	1. No schooling completed		4. Technical/vocational training
	2. Primary school		5. Bachelor's degree
	3. Secondary school		6. Master or Doctorate degree

19.- Employment <u>status</u>:

	1. Unemployed		4. Employee
	2. Student		5. Retired
	3. Self-employed		6. Other: _____

20.- How many people live in your household (also count yourself)? _____

21.- <u>Net monthly income</u>:

Individual			
	<500€		2001-2800€
	500-1200€		2801-3500€
	1201-2000€		>3501€

Household (total)			
	<500€		2201-3000€
	500-1500€		3001-4000€
	1501-2200€		>4001€

THANK YOU very much for your participation!

To be completed by the interviewer:	**Interview #:** _____
Name of the island: _____	Date: _____/_____/20____
Location of the interview: _____	Time: _____:_____
Duration of the interview: _____ min	Interviewer: _____

Annex 2 – Survey at Origin

Dear Sir – Madam.
The aim of this questionnaire is to find out and understand your opinions and perceptions of climate change when undertaking travel decisions as tourists and as citizens. This study is part of a large research project funded by the European Commission on the impacts of climate change on islands across Europe and the Caribbean. Your participation is anonymous. and the information shall be used exclusively for the purposes of the research undertaken. Please take your time and read the questions carefully. Thank you very much for your time and cooperation.

1.- Have you visited any Mediterranean islands or North Atlantic islands (Canary Islands. Madeira or Azores) in the last 5 years?

☐ 1. Yes ☐ 2. No

2.- Do you expect or plan to visit any Mediterranean islands or North Atlantic islands (Canary Islands. Madeira or Azores) in the next year?

☐ 1. Yes ☐ 2. No

3.- Listed below are statements about the relationship between humans and the environment. Which is your opinion about them?
Please, consider the following answers: 1=Strongly disagree; 2=Mildly disagree; 3=Unsure; 4=Mildly agree; 5=Strongly agree.

Statements	Strongly disagree	Mildly disagree	Unsure	Mildly agree	Strongly disagree
Humans have the right to modify the natural environment to suit their needs.	1	2	3	4	5
Humans are severely abusing the environment.	1	2	3	4	5
Plants and animals have as much right as humans to exist.	1	2	3	4	5
Nature is strong enough to cope with the impacts of modern industrial nations.	1	2	3	4	5
Humans were meant to rule over the rest of nature.	1	2	3	4	5
The balance of nature is very delicate and easily upset.	1	2	3	4	5

4.- Listed below are statements about climate change. Which is your opinion about them?
Please, consider the following answers: 1=Strongly disagree; 2=Mildly disagree; 3=Unsure; 4=Mildly agree; 5=Strongly agree.

Statements	Strongly disagree	Mildly disagree	Unsure	Mildly agree	Strongly disagree
I feel a moral duty to do something about climate change.	1	2	3	4	5
Recent floods and heat-waves in this country are due to climate change.	1	2	3	4	5
The effects of climate change are likely to be catastrophic.	1	2	3	4	5
I consider climate change to be an unacceptable risk.	1	2	3	4	5
Climate change is too complicated for me to understand.	1	2	3	4	5
I often talk about climate change to family or friends.	1	2	3	4	5
It is difficult to know which products are better for the environment.	1	2	3	4	5
I need more information to form a clear opinion about climate change.	1	2	3	4	5

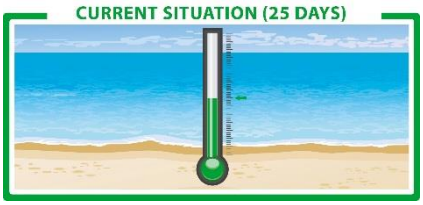
Let me briefly inform you about Climate Change:

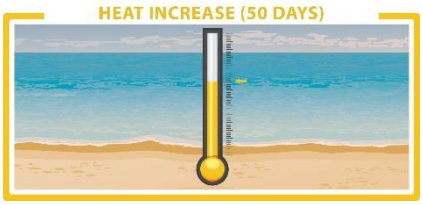
Climate change is a global phenomenon created predominantly by burning fossil fuels (petrol. carbon. gas ...). which adds heat-trapping gases to Earth's atmosphere. Consequences include increased temperature. sea level rise. ice mass loss in the Earth's Poles. shifts in flower/plant blooming. and extreme weather events.

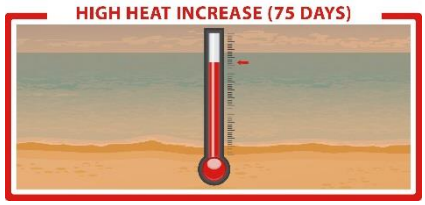
The impacts of climate change can vary across islands and tourist destinations because of the variability of climate and the local policies that can be undertaken to avoid or ameliorate these impacts.

Below you can find a description of the major potential impacts of climate change in European Islands. Please. read carefully the description of potential impacts of climate change.

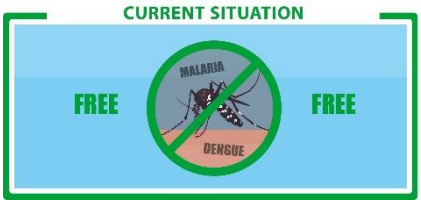
Heat Waves: Climate Change increases the frequency and severity of **heat waves**. which are periods of several days or weeks of excessive hot weather. including warmer nights and hotter days.
The current situation is about 25 days/year of extreme heat. Please. consider two other scenarios with **50 days** and **75 days** of extreme heat per year.

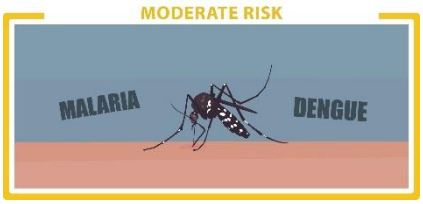


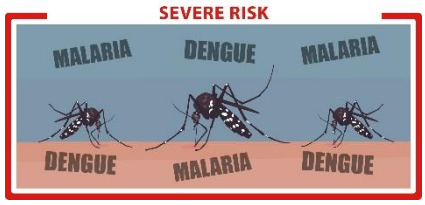




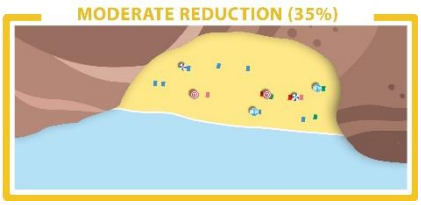
Infectious Diseases: Climate change is likely to increase the occurrence of **infectious diseases** such as some type of encephalitis. malaria and dengue. which are transmitted by some species of mosquitos that manage to survive under the new climatic conditions. Currently. the probability of getting infected is insignificant. but experts predict a **moderate** (0.5-2%) or **severe** (over 4%) risk of infection.

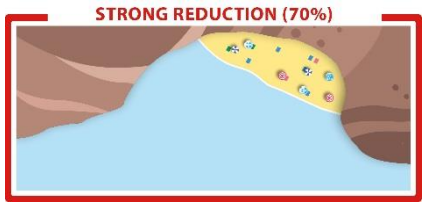






Beaches Availability: Climate change may cause sandy beaches disappear. to some extent. because of **sea level rise** and the increase of **storms**. Considering the beach surface you enjoy currently. please consider two other scenarios in which beaches surface would reduce about **35%** (**moderate** impact) and **70%** (**strong** impact) as a result of erosion and inundation.





Water Shortages: Climate change is reducing the water availability. Many areas around the world will present **water scarcity** and shortages. by facing droughts and facilities breakage. Please consider. in addition to a scenario without any water restrictions during your stay. other two scenarios of **3 hours** (**moderate** restriction) and **9 hours** (**severe restriction**) without water supply between 8 am and 12 pm.

Forest Fires: Climate change is increasing the number and effects of **forest fires** fuelled by warmer climatic conditions and droughts. More than 1.600 wildfires have been recorded in the European Union so far this year - more than three times higher than the average over the past decade. Experts predict that burnt areas will increase by nearly 50% (**moderate** increase) and by about 200% (**high** increase).

5. – How would you CHANGE your travelling decisions if the following impacts occur at the destination you have already chosen?

Please, consider the following answers: 1=Definitely, I would NOT change destination; 2=I would choose different dates, but same destination; 3=Maybe no, I would NOT change destination; 4=Maybe yes, I would change destination; 5=Definitely, I would change destination.

Climate Change Impact	Would you CHANGE destination?				
	No	No, but I'd change date	Maybe No	Maybe Yes	Yes
Infectious diseases become more widespread	1	2	3	4	5
Beaches largely disappear	1	2	3	4	5
Temperature becomes uncomfortable to me	1	2	3	4	5
Marine wildlife largely disappears	1	2	3	4	5
Corals severely bleach	1	2	3	4	5
Beaches are affected by algae blooms	1	2	3	4	5
Wildfires occur more often	1	2	3	4	5
Coastal infrastructures are damaged due to coastal erosion	1	2	3	4	5
Terrestrial wildlife largely disappears	1	2	3	4	5
Cultural heritage is damaged due to weather conditions	1	2	3	4	5
Water is scarce for leisure activities	1	2	3	4	5

6. – How likely is it that you STAY at your country of origin if the following impacts occur at the destination you have already chosen?

Please, consider the following answers: 1=Will not stay at all; 2=Very unlikely; 3=Unlikely; 4=Neutral; 5=Likely; 6=Very likely; 7=Will stay for sure.

Climate Change Impact	STAY at country of origin?						
	Not at all	Very unlikely	Unlikely	Neutral	Likely	Very likely	For sure
Infectious diseases become more widespread	1	2	3	4	5	6	7
Beaches largely disappear	1	2	3	4	5	6	7
Temperature becomes uncomfortable to me	1	2	3	4	5	6	7
Marine wildlife largely disappears	1	2	3	4	5	6	7
Corals severely bleach	1	2	3	4	5	6	7
Beaches are affected by algae blooms	1	2	3	4	5	6	7
Wildfires occur more often	1	2	3	4	5	6	7
Coastal infrastructures are damaged due to coastal erosion	1	2	3	4	5	6	7
Terrestrial wildlife largely disappears	1	2	3	4	5	6	7
Cultural heritage is damaged due to weather conditions	1	2	3	4	5	6	7
Water is scarce for leisure activities	1	2	3	4	5	6	7

7.- In this study we are interested in knowing how you would choose between alternative island tourist destinations in the context of climate change.

Consider you are planning your next holidays in some Europen island. Next, you are going to be posed with alternative destinations facing different impacts of climate change. In the next questions, you are asked to choose between two alternative destinations, or staying at home. Please, choose as if these were the only options available.

For each option of travelling there is a <u>price per day per person</u> to be paid (for a 5-days trip) if you decide for it that includes:

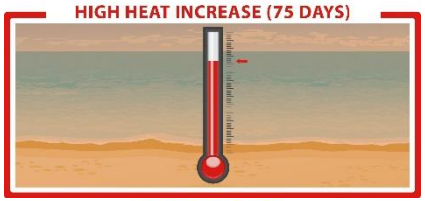
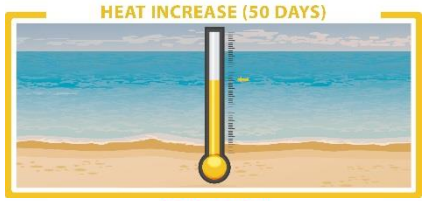
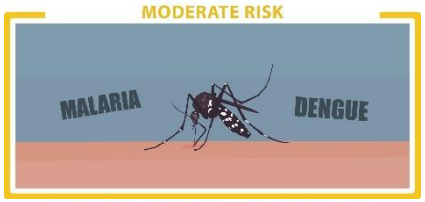
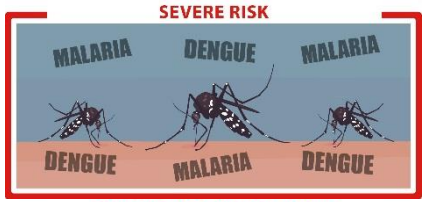
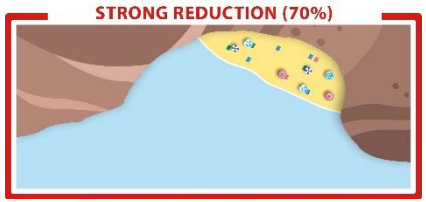
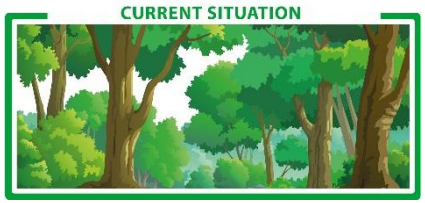
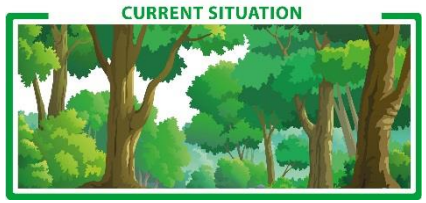
1. **The <u>transportation cost</u> to the island tourist destination.**
2. **The <u>cost of lodging</u> of a four stars hotel accommodation or equivalent.**

For the following alternatives, which one would you choose?

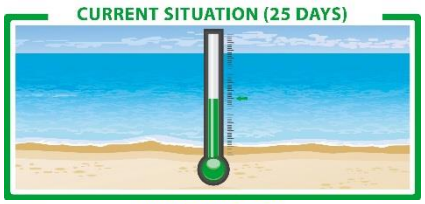
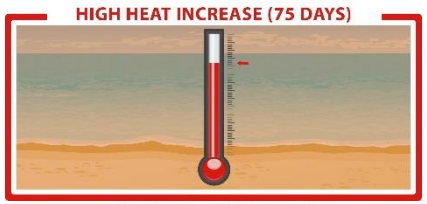
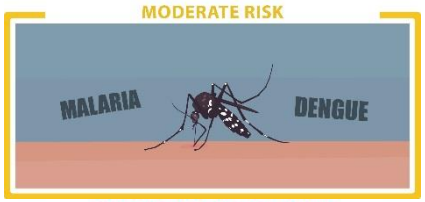
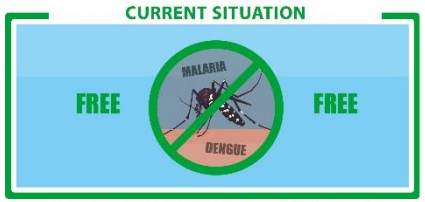
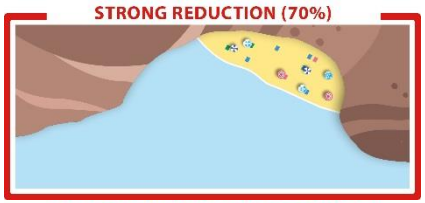
Example: You have to choose between the following options.

- **Option 1:** A five-day trip holiday in Cyprus, paying 120€ per person and night and with the following Climate Change impacts: strong risk of catching an infectious disease and moderate reduction of beach availability (35%).
- **Option 2:** A five-day trip holiday in Azores, paying 230€ per person and night and with the following Climate Change impact: high heat increase (75 days per year).
- **Option 3:** Stay at home instead of considering the other two options.

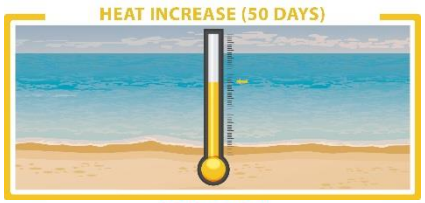
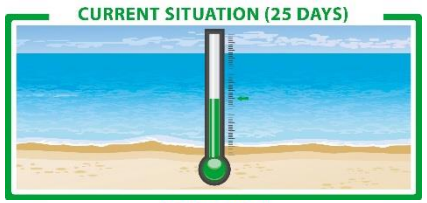
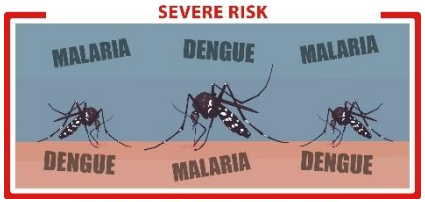
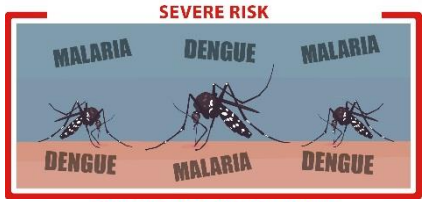
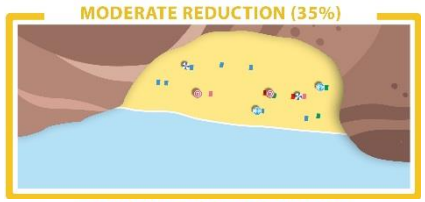
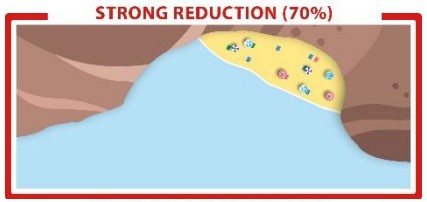
Model A.1

	Canary Islands	Malta	Neither Option
Thermal Comfort			
Infectious Diseases			
Beaches Availability			Stay at home
Water Shortages			
Forest Fire			
Price	300 €	100 €	0 €
Mark your choice	☐	☐	☐

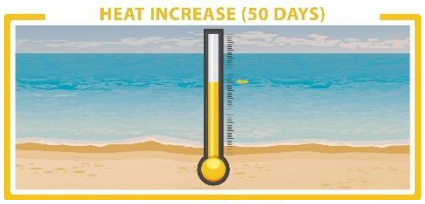
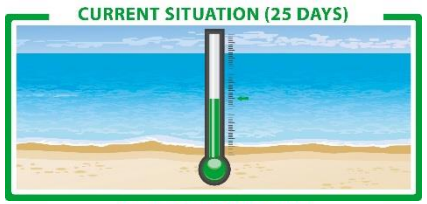
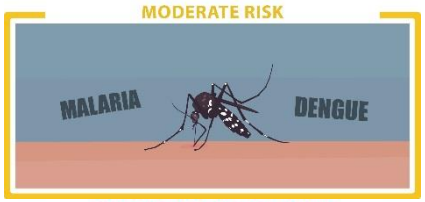
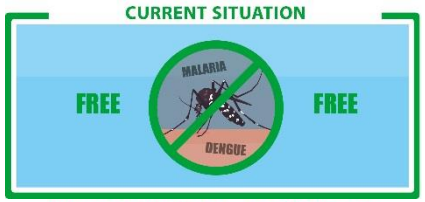
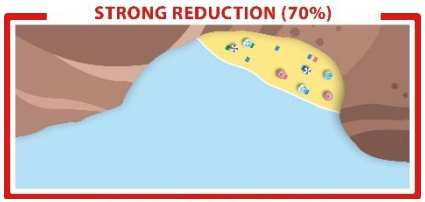
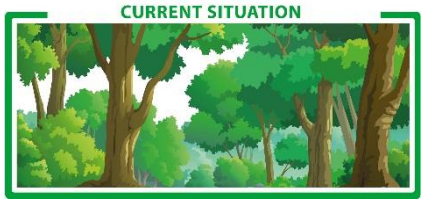
Model A.2

	Corsica	Cyprus	Neither Option
Thermal Comfort			
Infectious Diseases			
Beaches Availability			**Stay at home**
Water Shortages			
Forest Fire			
Price	**200 €**	**100 €**	**0 €**
Mark your choice	☐	☐	☐

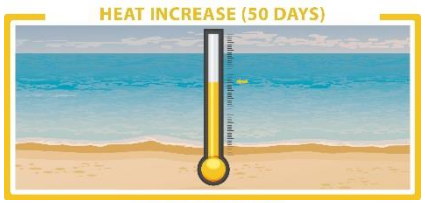
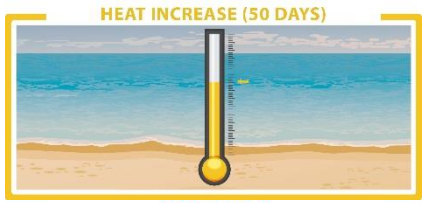
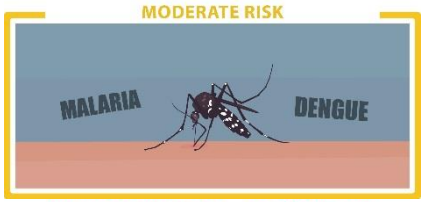
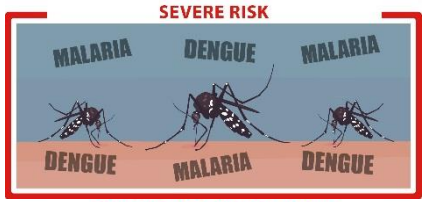
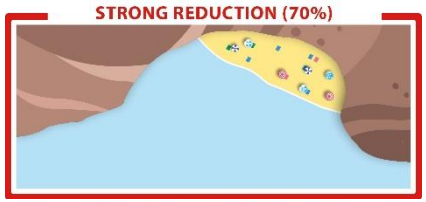
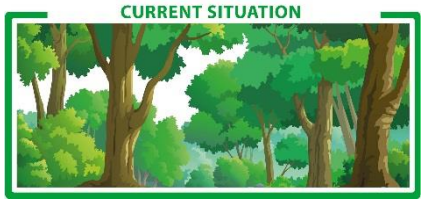
Model A.3

	Madeira	Sardinia	Neither Option
Thermal Comfort			
Infectious Diseases			
Beaches Availability			**Stay at home**
Water Shortages			
Forest Fire			
Price	**200 €**	**150 €**	**0 €**
Mark your choice	☐	☐	☐

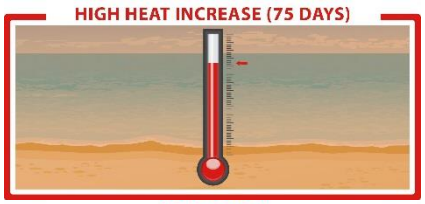
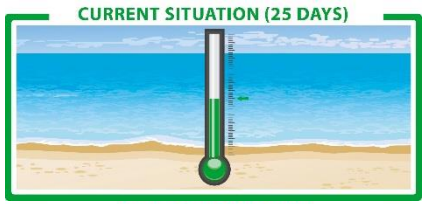
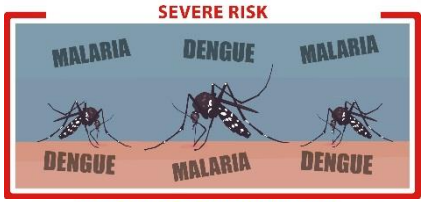
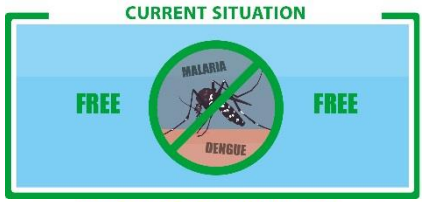
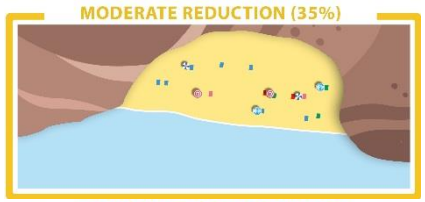
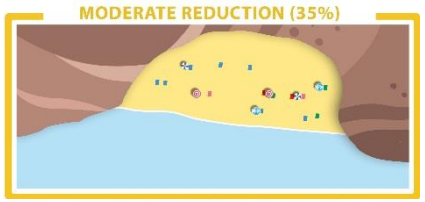
Model A.4

	Madeira	Corsica	Neither Option
Thermal Comfort			
Infectious Diseases			
Beaches Availability			**Stay at home**
Water Shortages			
Forest Fire			
Price	**100 €**	**300 €**	**0 €**
Mark your choice	☐	☐	☐

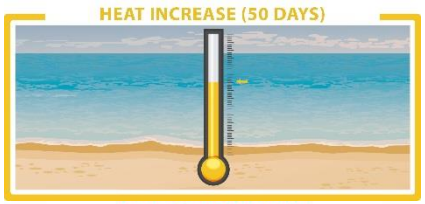
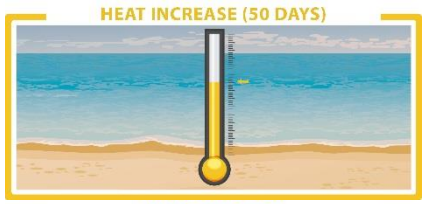
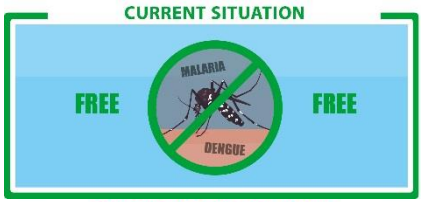
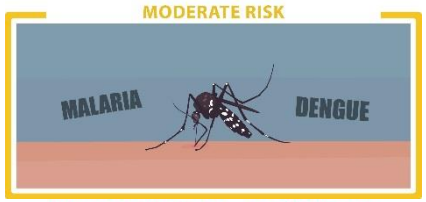
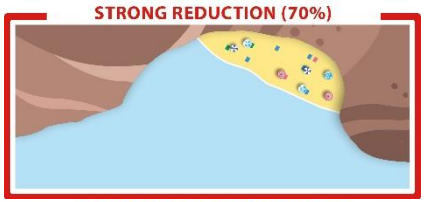
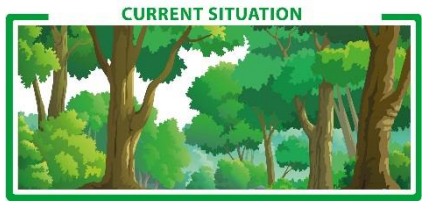
Model A.5

	Malta	Sicily	Neither Option
Thermal Comfort			
Infectious Diseases			
Beaches Availability			**Stay at home**
Water Shortages			
Forest Fire			
Price	**200 €**	**150 €**	**0 €**
Mark your choice	☐	☐	☐

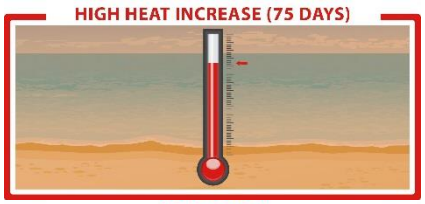
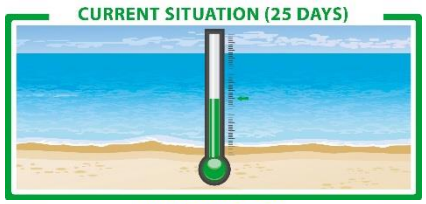
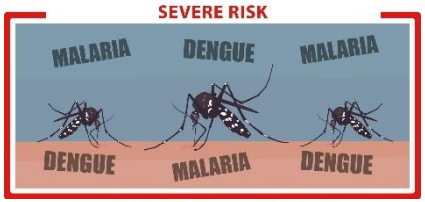
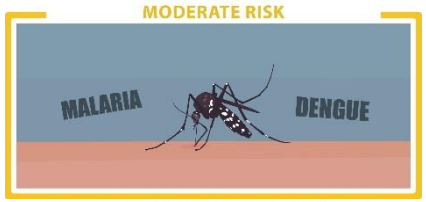
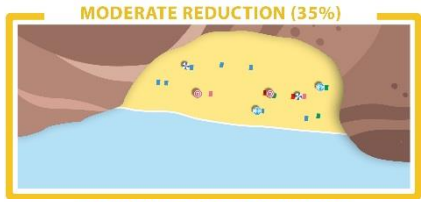
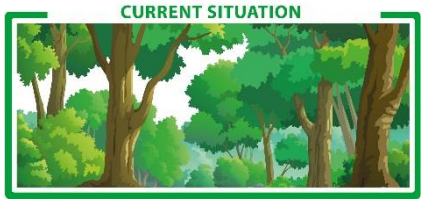
Model A.6

	Azores	Balearic Islands	Neither Option
Thermal Comfort			
Infectious Diseases			
Beaches Availability			**Stay at home**
Water Shortages			
Forest Fire			
Price	**200 €**	**200 €**	**0 €**
Mark your choice	☐	☐	☐

Model A.7

	Sicily	Crete	Neither Option
Thermal Comfort			
Infectious Diseases			
Beaches Availability			Stay at home
Water Shortages			
Forest Fire			
Price	100 €	300 €	0 €
Mark your choice	☐	☐	☐

Model A.8

	Malta	Azores	Neither Option
Thermal Comfort			
Infectious Diseases			
Beaches Availability			**Stay at home**
Water Shortages			
Forest Fire			
Price	**150 €**	**150 €**	**0 €**
Mark your choice	☐	☐	☐

8.- Approximately, how many overnight trips do you usually do in a year? Please consider only those in which you leave your location/city of residence.

	0		1		2		3		4		More than 4

9a.- Please indicate which of the following islands have you visited before, and how many times have you visited the island(s) in the last five years.
Please, leave it blank if you haven't visited the island(s).

Visited before	Island(s)	No. of visits (last 5 yrs.)	Last Island Visited
	1. Azores		
	2. Madeira		
	3. Balearic Islands (Mallorca, Menorca, Ibiza, Formentera, Cabrera)		
	4. Canary Islands (Tenerife, Gran Canaria, Lanzarote, Fuerteventura, La Palma, La Gomera, El Hierro)		
	5. Martinique		
	6. Guadeloupe		
	7. Corsica		
	8. Crete		
	9. Cyprus		
	10. Malta		
	11. Sardinia		
	12. Sicily		
	13. Santorini		
	14. Corfu		
	15. Capri		
	16. Mikonos		
	17. Rhodes		
	18. Evia		
	19. Lesbos		
	20. Folegandros		
	21. Kelafonia		
	22. Hvar		
	23. Krk		
	24. Mljet		
	25. Otras: _____		

9b.- If the person hasn't visited any island at all, then ask for which island he/she is planning to visit in the next year:

Island(s)	Planning to visit
1. Azores	
2. Madeira	
3. Balearic Islands (Mallorca, Menorca, Ibiza, Formentera, Cabrera)	
4. Canary Islands (Tenerife, Gran Canaria, Lanzarote, Fuerteventura, La Palma, La Gomera, El Hierro)	
5. Martinique	
6. Guadeloupe	
7. Corsica	
8. Crete	
9. Cyprus	
10. Malta	
11. Sardinia	
12. Sicily	
13. Santorini	
14. Corfu	
15. Capri	
16. Mikonos	
17. Rhodes	
18. Evia	
19. Lesbos	
20. Folegandros	
21. Kelafonia	
22. Hvar	
23. Krk	
24. Mljet	
25. Otras: _____	

10.- From a general point of view, on a scale from 1 to 7, how positive or negative is the image you have of this/these island(s)?

Please, note that 1 indicates very negative perception and 7 very positive perception.

Island	Image of the island						
	Very negative						Very positive
Martinique/Guadeloupe	1	2	3	4	5	6	7
Azores	1	2	3	4	5	6	7

11.- The following table indicates a series of opposing adjectives that can describe your opinion about the island(s).

Please, indicate on a scale from 1 to 7 to what degree your opinion of the island is closer to the adjective on the right or on the left.

Island	Pleasant Destination						
	Very unpleasant						Very pleasant
Martinique/Guadeloupe	1	2	3	4	5	6	7
Azores	1	2	3	4	5	6	7

Island	Exciting Destination						
	Very gloomy						Very exciting
Martinique/Guadeloupe	1	2	3	4	5	6	7
Azores	1	2	3	4	5	6	7

12.- Below you can find a list of attributes that could define the perception you have regarding the tourist destination. How would you rate each of them?
Please, consider the following scale: from 1=totally disagree; to 7=totally agree with the statement.

Attributes	My perception of	
	Martinique/ Guadeloupe	Azores
Good level of general infrastructure (hotels, roads, airport, etc.)	*	*
Well preserved natural resources and environment	*	*
High variety of leisure and recreational tourist resources and activities	*	*
Hospitality and friendliness of local residents	*	*
Diversity of cultural and artistic resources	*	*
High economic and social development and political stability	*	*

13.- Listed below are statements about climate change. Which is your opinion about them?
Please, consider the following answers: 1=Strongly disagree; 2=Mildly disagree; 3=Unsure; 4=Mildly agree; 5=Strongly agree.

Statements	Strongly disagree	Mildly disagree	Unsure	Mildly agree	Strongly disagree
Claims that human activities are changing the climate are exaggerated.	1	2	3	4	5
Climate change is just a natural fluctuation in earth's temperatures.	1	2	3	4	5
I do not believe climate change is a real problem.	1	2	3	4	5
I am uncertain about whether climate change is really happening.	1	2	3	4	5
It is too early to say whether climate change is really a problem.	1	2	3	4	5
The evidence for climate change is unreliable.	1	2	3	4	5
There is too much conflicting evidence about climate change to know whether it is actually happening.	1	2	3	4	5
Climate change is too complex and uncertain for scientists to make useful forecasts.	1	2	3	4	5
Too much fuss is made about climate change.	1	2	3	4	5
Floods and heat-waves are not increasing, there is just more reporting of it in the media these days.	1	2	3	4	5
Many leading experts still question if human activity is contributing to climate change.	1	2	3	4	5
The media is often too alarmist about issues like climate change.	1	2	3	4	5
Talking about climate change is boring.	1	2	3	4	5
The thought of climate change fills me with dread.	1	2	3	4	5
Climate change is something that frightens me.	1	2	3	4	5

14.- What is your opinion regarding the following elements towards risk?
Please, indicate in each case whether you: 1=totally disagree; 5=totally agree.

Statements	Totally disagree				Totally agree
Traveling is risky right now	1	2	3	4	5
I would feel very comfortable traveling anywhere right now	1	2	3	4	5
Domestic travel is just as risky as international travel	1	2	3	4	5
Tourists should avoid visiting some destinations which have been attacked	1	2	3	4	5
Vacation travel is perfectly safe	1	2	3	4	5
I feel nervous about traveling right now	1	2	3	4	5
Additional security measures at airports make traveling safer	1	2	3	4	5
Travel to nature areas (such as protected areas or forests) is not risky	1	2	3	4	5
Visiting art galleries, museums are safe tourist activities	1	2	3	4	5
Visits to other parks and campgrounds should be avoided right now	1	2	3	4	5
Safety is the most important attribute a destination can offer	1	2	3	4	5
Safety is the most serious consideration when I am choosing a destination	1	2	3	4	5
Trips to natural area scenic attractions are safer right now	1	2	3	4	5

15. – How likely do you consider will be the following impacts at tourist destinations?
Please, consider the following answers: 1=Will not happen at all; 2=Very unlikely; 3=Unlikely; 4=Neutral; 5=Likely; 6=Very likely; 7=Will happen for sure.

Climate Change Impact	How likely will be these impacts at tourist destinations?						
	Not at all	Very unlikely	Unlikely	Neutral	Likely	Very likely	For sure
Infectious diseases become more widespread	1	2	3	4	5	6	7
Beaches largely disappear	1	2	3	4	5	6	7
Temperature becomes uncomfortable to me	1	2	3	4	5	6	7
Marine wildlife largely disappears	1	2	3	4	5	6	7
Corals severely bleach	1	2	3	4	5	6	7
Beaches are affected by algae blooms	1	2	3	4	5	6	7
Wildfires occur more often	1	2	3	4	5	6	7
Coastal infrastructures are damaged due to coastal erosion	1	2	3	4	5	6	7
Terrestrial wildlife largely disappears	1	2	3	4	5	6	7
Cultural heritage is damaged due to weather conditions	1	2	3	4	5	6	7
Water is scarce for leisure activities	1	2	3	4	5	6	7

16.- Country of Residence: _____ **Province:** _____

17.- Gender: 1. ☐ Male 2. ☐ Female 3. ☐ Other

18.- Age: _____

19.- Education level:

	1. No schooling completed		4. Technical/vocational training
	2. Primary school		5. Bachelor's degree
	3. Secondary school		6. Master or Doctorate degree

20.- Employment status:

	1. Unemployed		4. Employee
	2. Student		5. Retired
	3. Self-employed		6. Other: _____

21.- How many people live in the household (also count yourself)? _____

22.- <u>Net monthly income</u>:

Individual			
	<500€		2001-2800€
	500-1200€		2801-3500€
	1201-2000€		>3501€

Household (total)			
	<500€		2201-3000€
	500-1500€		3001-3400€
	1501-2200€		>4001€

23.- Would you like to add any comment?

THANK YOU very much for your participation!