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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. (This first draft has not been submitted to the revision, according to the quality review internal process, but the results of the surveys were presented at the General Assembly 2019 in Sicily).

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1. Introduction

This deliverable aims at providing values for the impacts of climate change on the blue economy sectors tackled in Soclimpact, occurring as a consequence of the scope, intensity and persistence of different expressions of climate change in the atmosphere, ocean and land of the European islands under study.

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.

How and to what extent blue economy sectors are affected by changes in climatic parameters may be presented as alterations on the services that ecosystems provide to those sectors (Daily, 1997; Haynes-Young and Potschin, 2013)¹. The concept of Ecosystem Services has arisen since the 1990s to assess goods and services provided to people by nature. 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).

The economic valuation of climate change impacts on the blue economy sectors of the European islands carried out by Soclimpact's researchers builds on the conceptual framework built around the concept of ecosystem services. 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. Or 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 modifies the referred environmental conditions by harming most of the time (sometimes benefiting) those economic activities, by affecting their production costs and/or their market demand.

The Work Package 5 (WP5) in general, and particularly this deliverable 5.5, gathers the economic valuation measured as increased costs or diminished benefits of the blue economy sectors of the European islands due to the alterations of the services that nature provide to them (ecosystem services), as a consequence of the climate change. All deliverables of the WP5 series, in addition to yielding results that are worth by themselves, flow towards the

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.

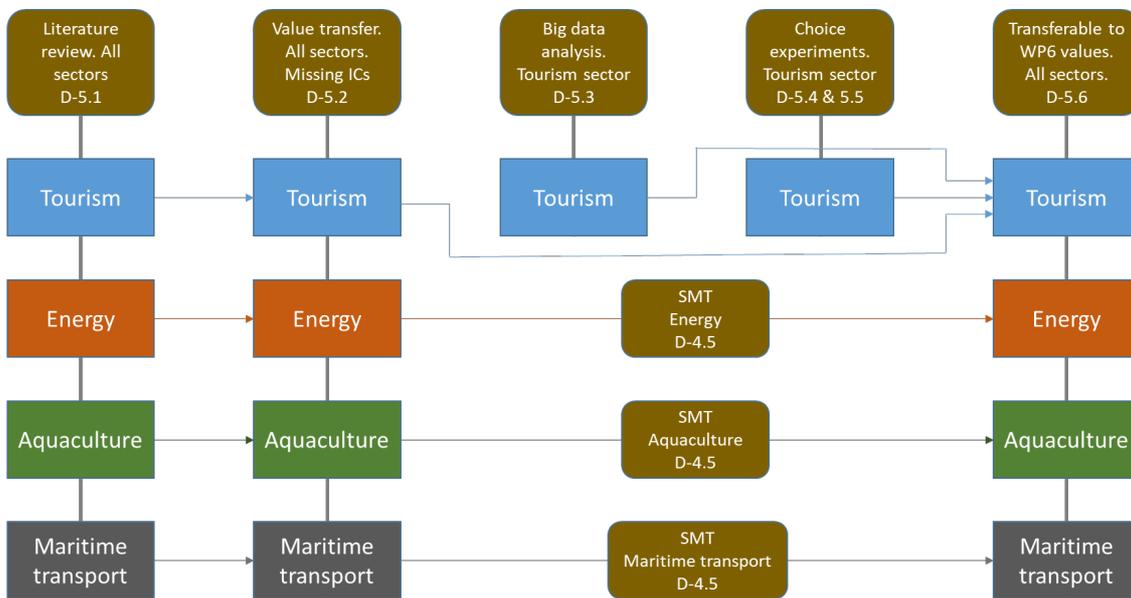


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deliverable 5.6, which supplies values in a way that are applicable to the macroeconomic modelling developed by WP6.

Deliverable 5.5 specifically gathers the economic valuation of changes in the ecosystem services that support coastal and marine tourism due to climate change impacts. Then, it joins the values for all sectors collected from literature after a discussion on their transferability (deliverable 5.2), and values coming up from big data analysis applied to the tourism sector (deliverable 5.3), to arrive to the deliverable that presents all of them together (deliverable 5.6). It will contain the economic valuation for all the blue economy sectors that will be used to feed the macroeconomic modelling (see Figure 1).

Figure 1. The flow chart of the economic valuation.



This deliverable is structured as follows. The next section briefly develops the concept of ecosystem services to the extent it is needed to properly support the whole economic valuation. Also, it depicts the chief research developments carried out to accurately define and classify the categories of ecosystem services that will be used, to firstly define and then value the impacts of climate change on the blue economy sectors of the islands. The section three explains the methodology employed to obtain the values of interest. The section four is part of the deliverable devoted to present the results of the economic valuation. The first part of the section gathers the economic values of the climate change impacts that may occur at the island destinations studied in this project, obtained from the pre-testing phase carried out in one country of origin (United Kingdom). Therefore, these results are still provisional but already point out to the comparative relevance of the set of climate change impacts on tourism, as they are perceived by tourists that have visited or have considered visiting the islands. The second part of section 4 delivers the results regarding how tourists value alternative measures of adaptation to the studied impacts of climate change, which could be implanted at the island destinations. It provides useful information, additional and comparable to the information coming from the economic valuation of the climate change impacts, which will be used to feed the pathways scenarios for adaption to climate change in the islands. Finally, section 5 provides some concluding remarks regarding economic



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valuation and summarizes the following steps to be undertaken to properly complete the whole picture of the economic valuation of the impacts of climate change on the selected blue economy sectors of the islands.

2. Ecosystem Services and the Economic Valuation of Climate Change on Blue Economy Sectors

2.1. Initiatives to Develop a Common Framework for Ecosystem Services Valuation

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, 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 relationship 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 as showed 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 them in policy making. The practical results do not differ very much from those delivered by MA (2005). Table 1 shows TEEB' ecosystem services classification.

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



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)
	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 Projects and research undertaken under the guidance of developing the concept of ecosystem services to achieve a practical tool to properly orientate decision-making on bringing into a sustainable path the relationship between human and natural systems have led to 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.

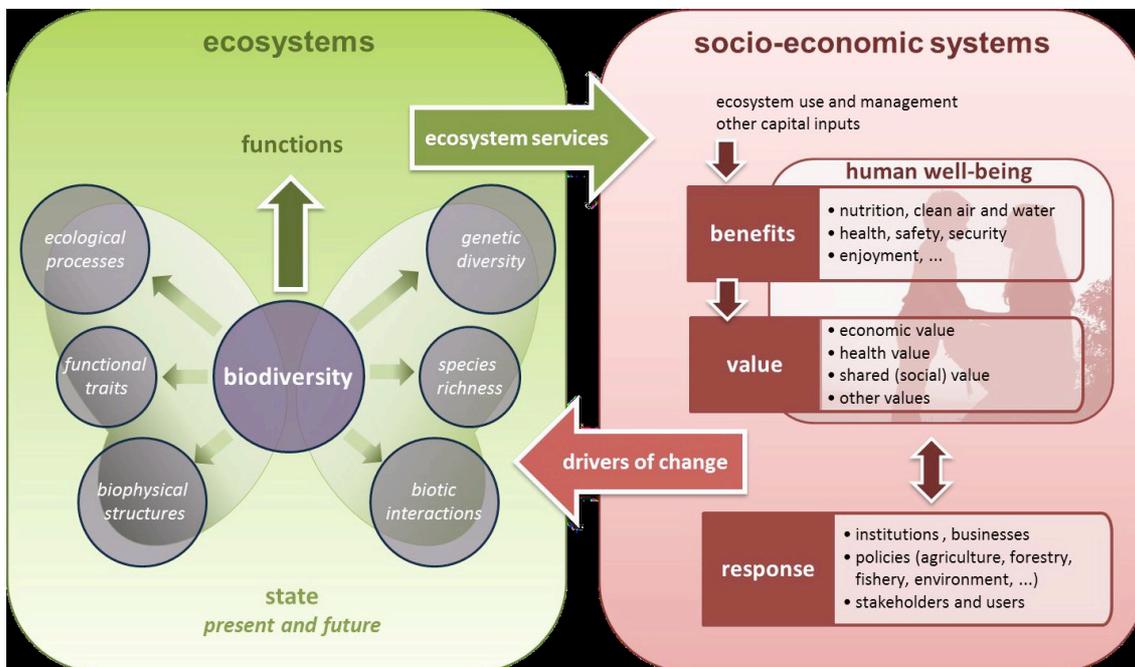
The CICES classification was aimed to integrate contributions from most of related scientific literature with previous efforts of sorting ecosystem services as those carried out by the Millennium Ecosystem Assessment and The Economic of Ecosystems and Biodiversity; and also make it compatible with the 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.



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The European Union has adopted the CICES framework to the development of a coherent analytical framework to be applied by the EU and its Member States in order to ensure consistent approaches are used. To this, a Working Group on Mapping and Assessment on Ecosystems and their Services (MAES) was created. It worked around a conceptual framework that links human societies and their well-being with the environment, in order to achieve a typology of ecosystems to be assessed and mapped and the use of the Common International Classification of Ecosystem Services (CICES) developed 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

2.2. 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 funded by the European Union through the Esmeralda and OpenNESS Projects. In the section 3.5 of this work 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

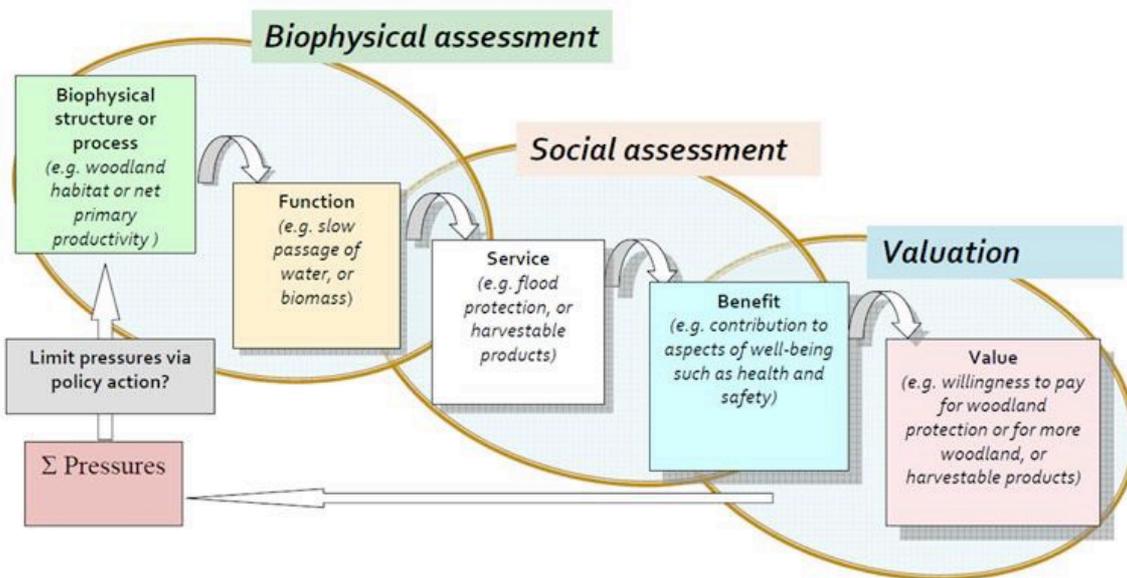


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present onward in this section the complex relationships tracking how climate change ultimately affects the blue economy sectors in the European islands. We also will have as reference the application of the conceptual framework provided by Haines-Young and Potschin (2018) to the specific context of marine environments as done in Chaniotis et al. (2015) and Culhane et al. (2014).

The rationale under the economic valuation presented onward in this deliverable is represented in Figure 3 as a 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 all the above mentioned sources of information, Table 2 shows the relational flow from the hazards considered in the impact chains defined to represent the impacts of climate change on blue economy sectors, to the economic valuation of the changes in the ecosystem services damaged by climate change, either captured from the demand side or from the supply side. As said before, we will follow the las 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 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

The main objective of WP5 is to understand the effect of climate change on tourists behavior and to estimate the economic values of changes in the Environmental Services of the marine and coastal ecosystems due to climate change impacts and related policies. The definition of climate change impacts that will be considered in the analysis comes from the work developed within WP3.

In order to obtain the desired values, an important sample of European tourists have been interviewed at the different islands destinations, and will also be surveyed in their countries of origins. In the former, tourists are asked how much they value the potential adaptation policies that could be implemented at destination, as an extra payment per day. In the latter, tourists are asked how climate change impacts can affect their travelling decisions and the destination choice.

Designing an appropriate survey is not an easy task. The selection of elements, 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 knowledge of the researchers working in the project. In addition, Focal Groups (FG) meetings have constituted a crucial step of WP5, as they are useful for the pre-testing of the questionnaire and the evaluation of its effectiveness according to the research needs, and were conducted in 6 different islands. This is, to ensure that the questionnaire is going to be clearly understood by the respondents during the fieldwork. The following step involves running some pre-tests of the improved version of the questionnaire. In this case, a larger group of participants is required to be surveyed in a second Pre-Testing step. They are asked to fill in the survey as if it was the final version, to double-check whether the questionnaire is well designed or whether it needs further modification.

An example of the final surveys carried out at destination can be found in Annex 1, and the surveys at origin used for the pre-testing phase can be found in Annex 2. In these surveys tourists are asked how they would change their travelling decisions if climate change impacts occur at destination, the perception or image they have about different destinations, socio-economic characteristics, and some other information about the trip when the survey is carried out at destination. The main part of the surveys, in both case, is the one aiming at eliciting the economic values and tourists' preferences regarding climate change impacts and adaptation policies at destination.

In order to evaluate these preferences we utilize the technique of discrete choice experiments (DCEs) following León et al. (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 and Ronning, 1997](#); [Huybers, 2003](#)). The growing body of literature on this field serves to emphasize the increasing role that DCEs are playing in environmental decision making in the last decade. The first application of a DCE in the context of environmental resources was reported by Adamowicz et al. (1994). It involves asking tourists to choose between alternative profiles or sets of attributes of the tourist destination or policy measures. The principal advantage of this method is that it allows researchers to investigate the preferences of various attributes of the tourist product simultaneously and, at the same time, it avoids the extensively found "scale perception bias" when using likert scales to elicit individual preferences ([Araña and León, 2012](#); [2013a](#); [León et al, 2013a,b](#)).

As Hoyos (2010) states, DCEs consist of several choice sets, each containing a set of mutually exclusive hypothetical alternatives between which respondents are asked to choose their preferred



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one. 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, he will pick the one providing the highest utility, which depends on the attribute levels of the alternatives. Socio-economic characteristics of the individual may influence this decision. The resulting choices are finally analyzed to estimate the contribution that each attribute and level add to the overall utility of individuals. Moreover, when the cost or price of the program is included as an attribute, marginal utility estimates can easily be converted into willingness-to-pay (WTP) estimates for changes in the attribute levels and, by combining different attribute changes, welfare measures may be obtained.

The econometric model used to estimate the results is called ASC-Logit, using the software Stata (StataCorp. 2013). This model fits the McFadden's choice model, which is a specific case of the more general conditional logistic regression model (McFadden 1974). *asclogit* requires multiple observations for each case (individual or decision), where each observation represents an alternative that may be chosen. *asclogit* allows 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.

4. Economic Values from the Tourism Sector

The purpose of this deliverable is to provide the results from the economic valuation of changes in Environmental Services, due to Climate Change impacts, in the Tourism sector. For this purpose, we have created two different types of surveys. One of them aims at measuring how Climate Change impacts affect the willingness to pay for visiting a destination. The second one analyses tourists' willingness to pay for adaptation policies at the island destination

In order to do so, a total of 5000 surveys will be carried out at different countries of origin. Given that this process is taking place, only the results of the pre-testing phase are presented in this analysis. A total of 141 individuals from the United Kingdom were surveyed for this purpose. The sample was taken randomly from the adult population of tourists on the islands subject to the quotas of gender and age group

In addition, a total of 2500 surveys have been carried out at destination (with the participation of several partners). The locations where the surveys took place are the following: Antilles (Martinique and Guadeloupe), Azores (Faial, Ilha de Sao Miguel, Ilha do Pico), Balearic Islands (Mallorca), Baltic Islands (Fehmarn), Canary Islands (Gran Canaria), Crete, Cyprus, Madeira, Malta and Sicily. The final design of the questionnaire resulted from a process of Focus Group meetings to test it and from the pre-testing phase. A total of 6 Focus Groups were conducted (Balearic Islands, Canary Islands, Crete, Cyprus, Malta, Sicily) and 60 individuals participated in the pre-test (Gran Canaria and Mallorca). More information about the Focus Groups and the pre-test can be found in deliverable D5.4.

The results of the pre-testing phase of the surveys at origin, and the results from the surveys at destination are presented in this section.



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4.1. Climate Change Impacts: Surveys at Origin (Pre-Test)

A total of 141 travelers from the United Kingdom have been interviewed during the pre-testing phase.

4.1.1. Socio-demographic Characteristics of the Participants

The descriptive statistics of the characteristics of the participants can be found in Table 3. While each gender representation is almost 50%, the most represented age category is >55 years old.

Table 3. Characteristics of the participants.

# participants	Gender (%)		Age (%)		
	Male	Female	<35	35 - 55	>55
141	49.6	50.4	27.0	35.4	37.6

Regarding the level of education, a great share of the participants have at least completed high school (24.1%), while most of the sample has a bachelor degree, as reflected in Table 4. On the other hand, 49% of the surveyed tourists are employed for wage. Moreover, 32.6% the surveyed individuals earn around 1201-2000€/month.

Table 4. Education level, employment status and net monthly income of participants.

Education Level	(%)	Employment Status	(%)	Monthly Income	(%)
No schooling completed	0.7	Unemployed	6.4	<500€	5.0
Nursery school	-	Student	1.4	500-1200€	9.9
High school	24.1	Self-employed	10.6	1201-2000€	32.6
Technical/vocational training	27.0	Employed for wage	49.0	2001-2800€	21.3
Bachelor's degree	31.2	Retired	25.5	2801-3500€	12.1
Master/Doctorate degree	17.0	Other	7.1	>3501€	14.9

4.1.2. Visits to the Islands

Table 5 contains the descriptive statistics related to previous visits to the corresponding island and to the archipelago. The surveyed tourists make on average 2.4 trips per year. Around 91% of the participants have visited Mediterranean islands or North Atlantic islands in the last 5 years, and the 82% of the sample expect to also do so in the next year. With respect to the destinations of interest (the islands or archipelagos under study in the project), the most visited ones are Canary Islands (61%), Balearic Islands (44.7%) and Crete (40.4%).

Table 5. Previous visits to the islands destinations.

Variable	Total
# Overnight trips per year	2.4
Visited Mediterranean islands or North Atlantic islands in the last 5 years (% Yes)	91.5
Expect to visit Mediterranean islands or North Atlantic islands in the next year (% Yes)	81.6
<i>Visited before these islands (%):</i>	
Azores	7.8
Balearic Islands	44.7
Canary Islands	61.0
Corsica	17.7
Crete	40.4
Cyprus	39.7
Madeira	28.4
Malta	37.6
Sardinia	17.0
Sicily	21.3
Martinique/Guadeloupe	4.3
Fehmarn (Baltic Islands)	4.3

4.1.3. Image and Perception of the Destinations

Tourists are asked in the survey to state their perception of the different islands, on a scale from 1 (very negative perception) to 7 (very positive perception). In the successive question, they are asked their opinion of the islands, also on a scale from 1 to 7, with respect to the following characteristics: unpleasant/pleasant destination; gloomy/exciting destination. Results are presented in Figure 4 and Figure 5.

Tourists have a very positive perception of the Canary Islands and of Sicily, while the lowest ranked are the Antilles and the Baltic Islands. However, when asked about the affective image of the destination, Crete is the one obtaining a higher punctuation.

Figure 4. Destination Image

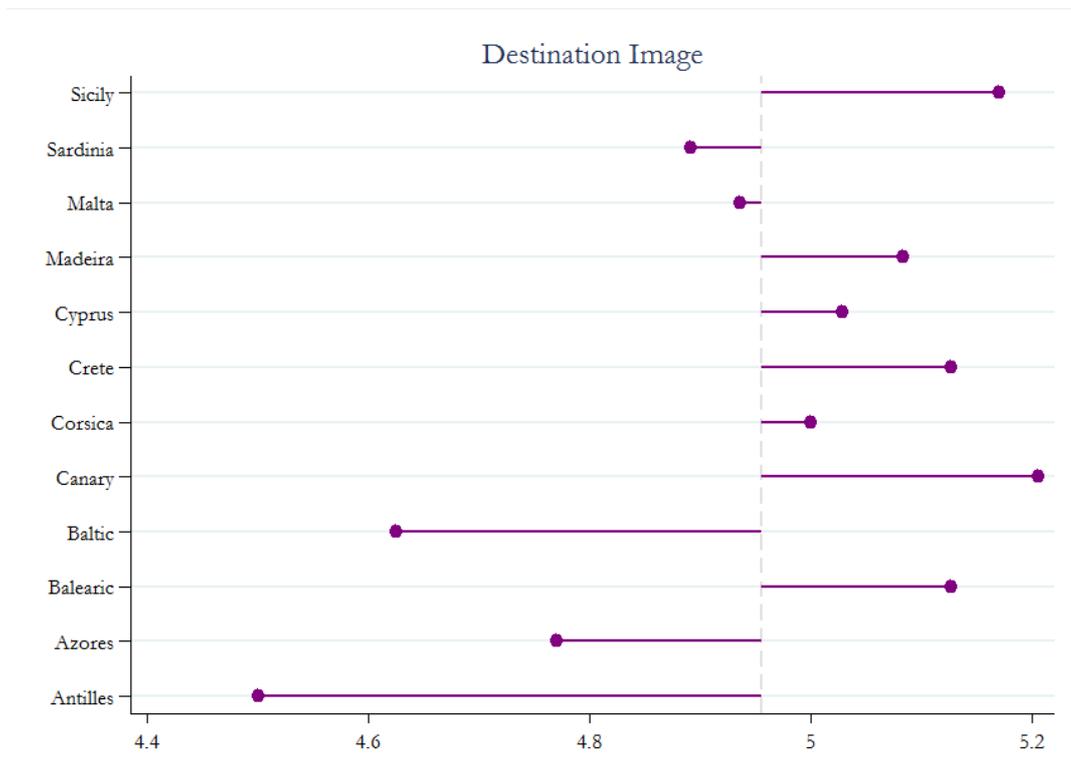
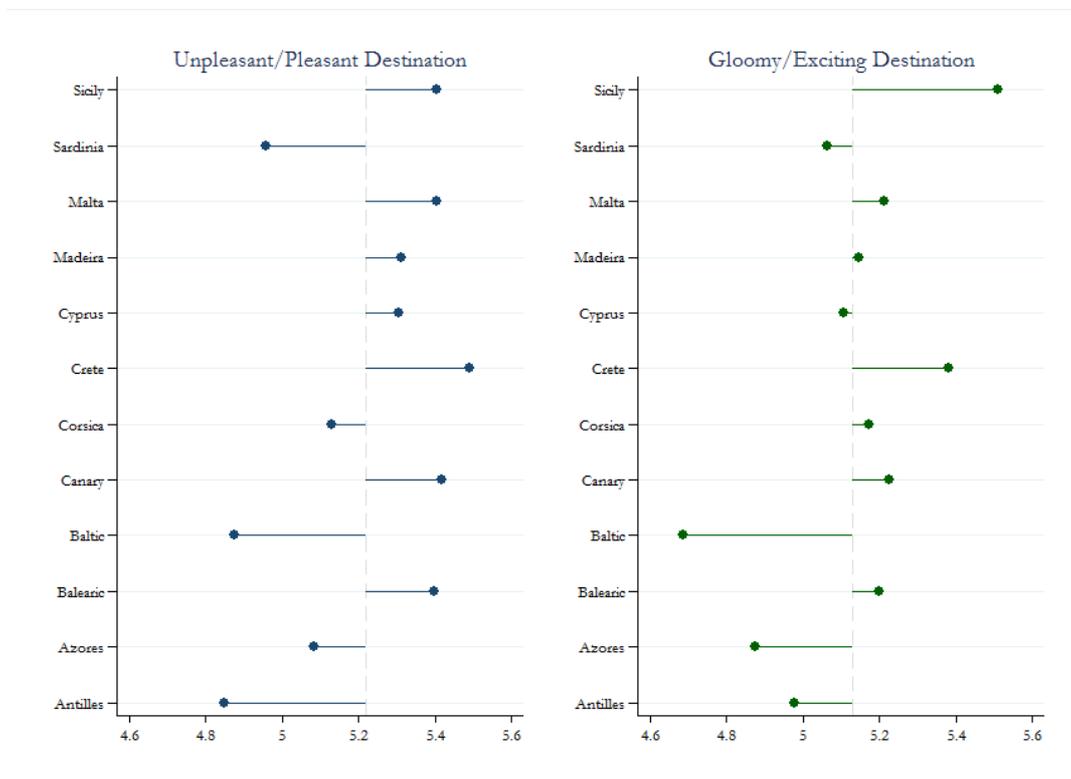


Figure 5. Destination's affective image.

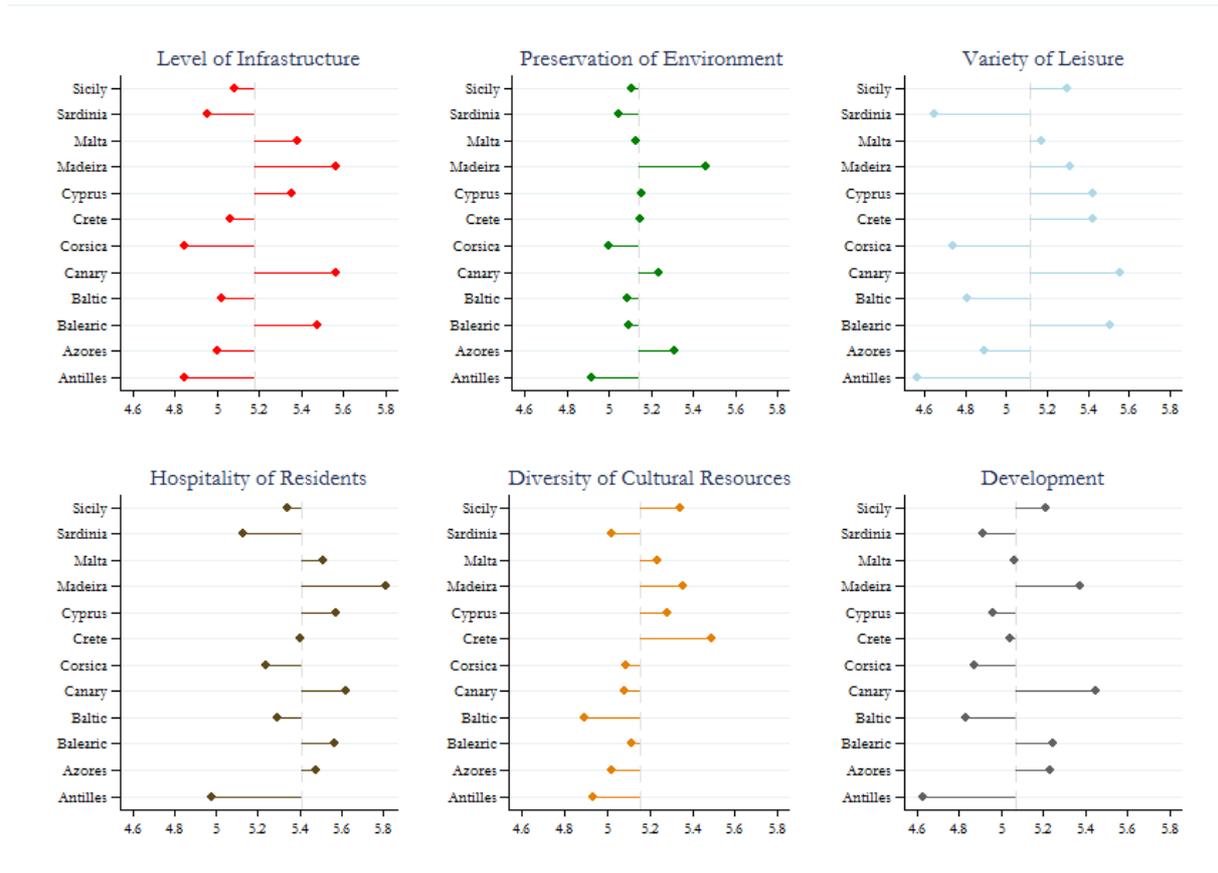




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In addition, a list of attributes has been rated by participants (also from 1 to 7), in order to know their opinion or perception with respect to a set of characteristics of the destination. Results are summarized in Figure 6. In most of the cases, Madeira and Canary Islands are the islands considered to have the better attributes, while the Antilles, the Baltic Islands and Sardinia get the lowest scores.

Figure 6. Attributes of the islands destinations.



4.1.4. Importance of Climate Change Impacts for Travelling Decisions

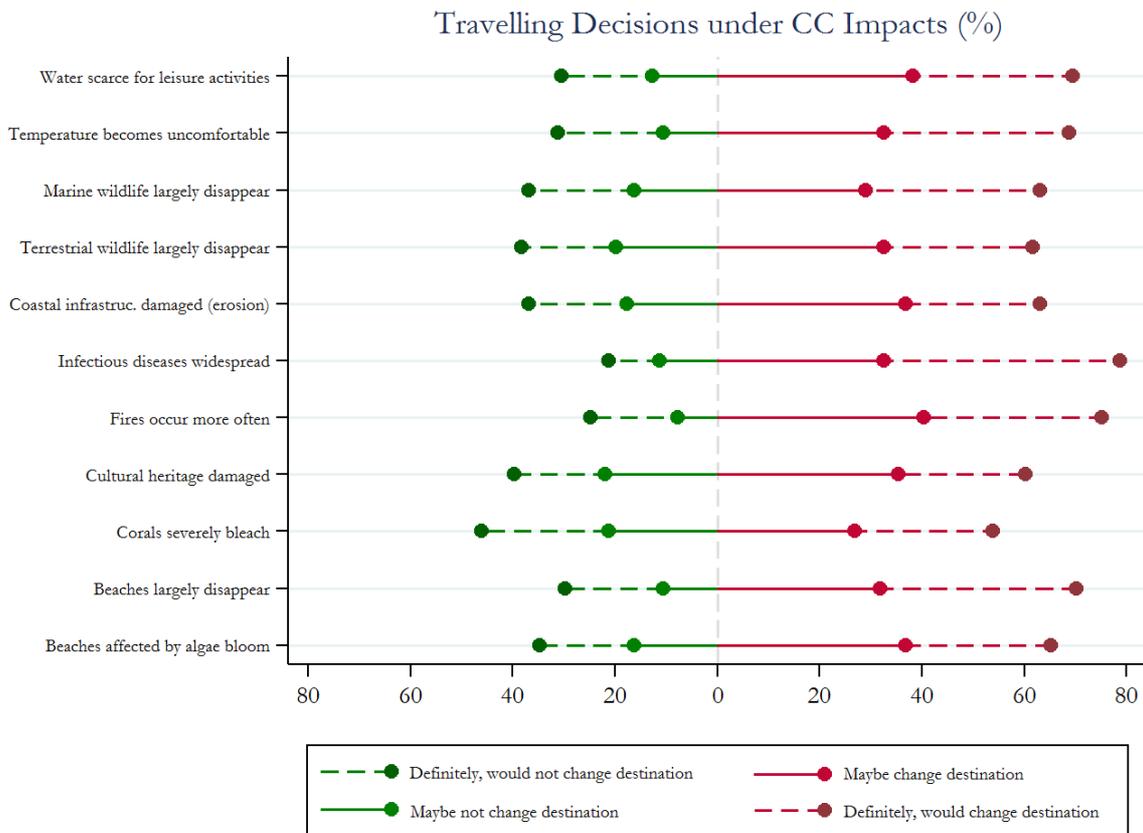
An important question of the survey is the one in which tourists are asked if they would change their travelling decision if a specific climate change impact occurs at the destination. This allows us to get an idea regarding the percentage of tourists arrivals that would be affected by climate change impacts. The possible answers are the following: 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. For the purpose of simplifying the exposition, answers 1 and 2 have been grouped together.

Results are presented in Figure 7. In most of the cases, around 30-40% of tourists would most likely choose a different destination if CC impacts occur, and 10-20% more would definitely change the destination. The highest percentages are found if infectious diseases become widespread at the destination.



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Figure 7. Change of travelling decisions under climate change impacts at destination.



4.1.5. Valuation of Climate Change Impacts at Destination

In order to further analyze the results of the Discrete Choice Experiments, a logistic regression has been estimated. More specifically, the *asclogit* model has been estimated. This regression models the probability of choosing an alternative depending on the explanatory variables. In this case, the explanatory variables used are the corresponding climate change impacts that may take place at destination, the hypothetical price paid for visiting the island (and staying in a 4 stars hotel) per day, and the individuals and islands fixed effects. It should be noted that each impact could take three levels³: no impact at all, moderate impact or strong impact. These levels take on different values for some impacts, while in the other cases they are considered as binary variables.

Results are presented in Table 6. No interpretation of the results is provided because these results are preliminary (they correspond to the pre-testing phase), and they have no economic value given the small size of the sample.

³ Further information can be found in Annex 2.



Table 6. Estimations results: Alternative-specific constant logistic regression.

	(1)	(2)	(3)	(4)
Thermal Comfort	-0.01** (0.00)	-0.01 (0.00)	-0.01** (0.00)	-0.01 (0.00)
<i>Moderate</i> Infectious Diseases	-0.27** (0.11)	-0.31*** (0.11)	-0.27** (0.11)	-0.32*** (0.11)
<i>Strong</i> Infectious Diseases	-0.75*** (0.13)	-0.79*** (0.15)	-0.75*** (0.13)	-0.80*** (0.15)
Beaches Availability	-0.004** (0.00)	-0.003 (0.00)	-0.004** (0.00)	-0.003 (0.00)
Water Shortages	-0.01 (0.02)	0.01 (0.02)	-0.01 (0.02)	0.01 (0.02)
<i>Moderate</i> Forest Fires	0.06 (0.17)	0.03 (0.19)	0.07 (0.17)	0.04 (0.19)
<i>Strong</i> Forest Fires	-0.33 (0.20)	-0.48** (0.22)	-0.34* (0.20)	-0.49** (0.22)
<i>Moderate</i> Marine Habitats	-0.46** (0.22)	-0.42* (0.22)	-0.47** (0.23)	-0.42* (0.23)
<i>Strong</i> Marine Habitats	-0.45** (0.22)	-0.54** (0.23)	-0.45** (0.22)	-0.55** (0.23)
<i>Moderate</i> Land Habitats	-0.32 (0.20)	-0.25 (0.21)	-0.34* (0.20)	-0.25 (0.21)
<i>Strong</i> Land Habitats	-0.40* (0.21)	-0.48** (0.22)	-0.40* (0.21)	-0.48** (0.22)
<i>Moderate</i> Damages to Infrastructures & Facilities	0.01 (0.24)	0.07 (0.24)	0.03 (0.25)	0.10 (0.25)
<i>Strong</i> Damages to Infrastructures & Facilities	-0.41* (0.23)	-0.52** (0.24)	-0.40* (0.23)	-0.48** (0.25)
<i>Moderate</i> Damages to Cultural Heritage	-0.04 (0.23)	0.06 (0.24)	-0.01 (0.23)	0.09 (0.25)
<i>Strong</i> Damages to Cultural Heritage	-0.24 (0.21)	-0.30 (0.22)	-0.23 (0.21)	-0.30 (0.23)
Price	-0.004 (0.00)	-0.001 (0.00)	-0.004 (0.00)	-0.001 (0.00)
N. cases	1128	1128	1128	1128
Chi2	83.65	97.65	164.78	177.33
p-val	0.00	0.00	0.00	0.00
Island Fixed Effect	No	Yes	No	Yes
Socioeconomic variables	No	No	Yes	Yes



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4.2. Policies to counteract Climate Change Impacts: Surveys at Destination

A total of 2528 tourists have been surveyed at the different islands destinations. It should be noted that, due to some mistakes, the surveys carried out in Malta were different from the rest of the islands, concerning only the Discrete Choice Experiment. Therefore, this island has been excluded from the estimated regression.

4.2.1. Socio-demographic Characteristics of the Participants

Table 7 presents the characteristics of the participants by gender and age. In most of the destinations the gender of the tourists surveyed is around 50%, while the different age categories vary more depending on the destination.

Table 7. Characteristics of the participants.

Island	# participants	Gender (%)		Age (%)		
		Male	Female	< 30	30 - 60	>60
Antilles (AN)	200	46.0	54.0	14.0	79.0	7.0
Azores (AZO)	300	56.0	43.7	31.0	55.3	13.7
Balearic (BAL)	253	50.2	49.8	29.2	64.0	6.7
Baltic (BLT)	196	53.6	46.4	10.2	56.6	33.2
Canary (CAN)	300	52.7	47.0	23.3	67.7	9.0
Crete (CRE)	224	47.8	51.8	28.6	50.9	20.5
Cyprus (CYP)	258	49.6	50.4	53.1	36.4	10.5
Madeira (MAD)	252	53.6	46.4	31.0	60.3	8.7
Malta (MAL)	255	38.4	61.2	71.4	27.1	1.6
Sicily (SIC)	290	32.8	66.6	36.6	58.3	5.2
Total	2528	48.0	51.8	33.7	55.3	11.0

The tourists interviewed come from a wide range of countries of origin. A summary can be found in Table 8. In total, the highest percentages correspond to Germany, France, United Kingdom and Italy.

Table 9 and Table 10 present the education level and the employment status of the tourists by destination, respectively. In most of the destinations, tourists have a bachelor degree, or have completed high school studies at least. With respect to the employment status, on average 56% of the tourists are employees for a wage.



Table 8. Country of origin of participants (%) by island destination.

Origin	AN	AZO	BAL	BLT	CAN	CRE	CYP	MAD	MAL	SIC	Total
Austria	-	2.0	1.2	-	1.3	-	2.3	2.8	0.4	-	1.1
Belgium	-	3.0	2.8	-	3.7	-	2.3	3.2	7.1	-	2.3
Canada	-	5.3	-	-	1.3	-	0.8	2.4	0.8	0.7	1.3
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
Netherlands	-	7.3	2.8	-	4.0	-	1.2	4.0	3.9	1.4	2.7
Other	-	5.3	10.7	-	5.3	9.4	15.9	7.9	12.6	6.2	7.6
Poland	-	-	0.4	0.5	2.0	1.8	1.2	0.4	7.5	0.7	1.5
Portugal	-	37.3	0.8	-	17.3	-	0.8	16.7	-	-	8.3
Russia	-	1.7	0.8	-	0.7	-	8.5	1.2	-	1.4	1.5
Spain	-	3.0	12.3	-	6.7	6.7	3.9	10.3	7.5	4.5	5.7
Sweden	-	0.7	5.1	-	3.3	-	2.3	3.6	4.7	-	2.1
Switzerland	-	3.0	0.4	-	2.0	-	-	1.2	2.0	4.5	1.5
UK	-	2.7	18.6	-	17.7	7.6	26.0	11.5	18.0	2.8	10.9
USA	-	4.0	-	-	1.7	-	3.1	1.2	2.4	4.5	1.9
Pearson Chi ² =3.9e03			P-value=0.000			Reject H ₀ of independence					

Table 9. Education level of participants (%) by island destination.

Education Level	AN	AZO	BAL	BLT	CAN	CRE	CYP	MAD	MAL	SIC	Total
No schooling completed	2.0	0.3	6.7	-	3.3	-	-	2.8	0.8	0.7	1.7
Nursery school	1.0	6.0	13.8	15.0	9.0	38.4	-	6.8	1.2	2.4	8.9
High school	1.5	17.7	45.8	14.5	21.0	45.5	4.7	28.6	21.4	25.2	22.8
Technical/vocational training	36.0	14.0	10.3	43.0	17.33	15.2	9.3	15.9	7.9	15.5	17.4
Bachelor's degree	34.0	28.7	20.2	11.4	31.3	0.9	62.0	27.4	42.1	42.4	31.0
Master/Doctorate degree	25.5	33.3	3.2	16.1	18.0	-	24.0	18.7	26.6	13.8	18.2

Table 10. Employment status of participants (%) by island destination.

Employment Status	AN	AZO	BAL	BLT	CAN	CRE	CYP	MAD	MAL	SIC	Total
Unemployed	5.0	5.0	7.5	1.0	3.3	1.8	1.6	7.9	5.6	3.1	4.2
Student	4.5	11.7	19.0	4.2	15.0	0.5	15.5	11.9	40.6	22.1	15.1
Self-employed	20.0	7.7	19.0	11.9	16.3	44.6	12.0	11.5	8.4	9.0	15.5
Employed for wage	63.5	62.0	44.3	60.6	61.3	30.4	62.4	66.7	44.2	62.1	56.1
Retired	6.5	12.0	6.3	22.3	2.7	22.8	8.5	1.2	1.2	3.8	8.2
Other	0.5	1.7	3.9	-	1.3	-	-	0.8	-	-	0.9



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Table 11. Characteristics of the trip.

Variable	AN	AZO	BAL	BLT	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
<i>Type of accommodation (%)</i>											
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
<i>Travelling party (%)</i>											
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
<i>Knew about destination (%)</i>											
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. Visit to the Destinations

During the survey, tourists are asked about the characteristics of their trip to the destination. They are asked whether it is the first time they visit the island or not, the number of nights they are staying at the island, the type of accommodation they have chosen, the travelling party, how they knew about the destination (more than one option could be chosen) and the average expenses per person at destination.

From Table 11 it can be seen that, on average, 64% of the tourists are visiting the island for the first time. Those who have visited the islands before, they have visited the island 6 or 7 times on average. The most common accommodation is the hotel (39.4%) and most of the tourists travel with their partner (39.6%). In addition, the most common way to know about the destination is through the internet (40.8%). Finally, tourists spend in total, on average, 933€ per person in their trip to the selected island, while it ranges from 508€ to 1557€.

4.2.3. Image and Perception of the Destinations

Tourists are asked the general perception they have about the destination they have visited, on a scale from 1 to 7. Results are presented in Figure 8. The Balearic islands, Canary islands and Madeira are the highest ranked. In addition, they are asked about the affective image of the destination and the perception they have on the status of conservation of the natural environment. Results are presented in Figure 9 and Figure 10.

Figure 8. Destination image.

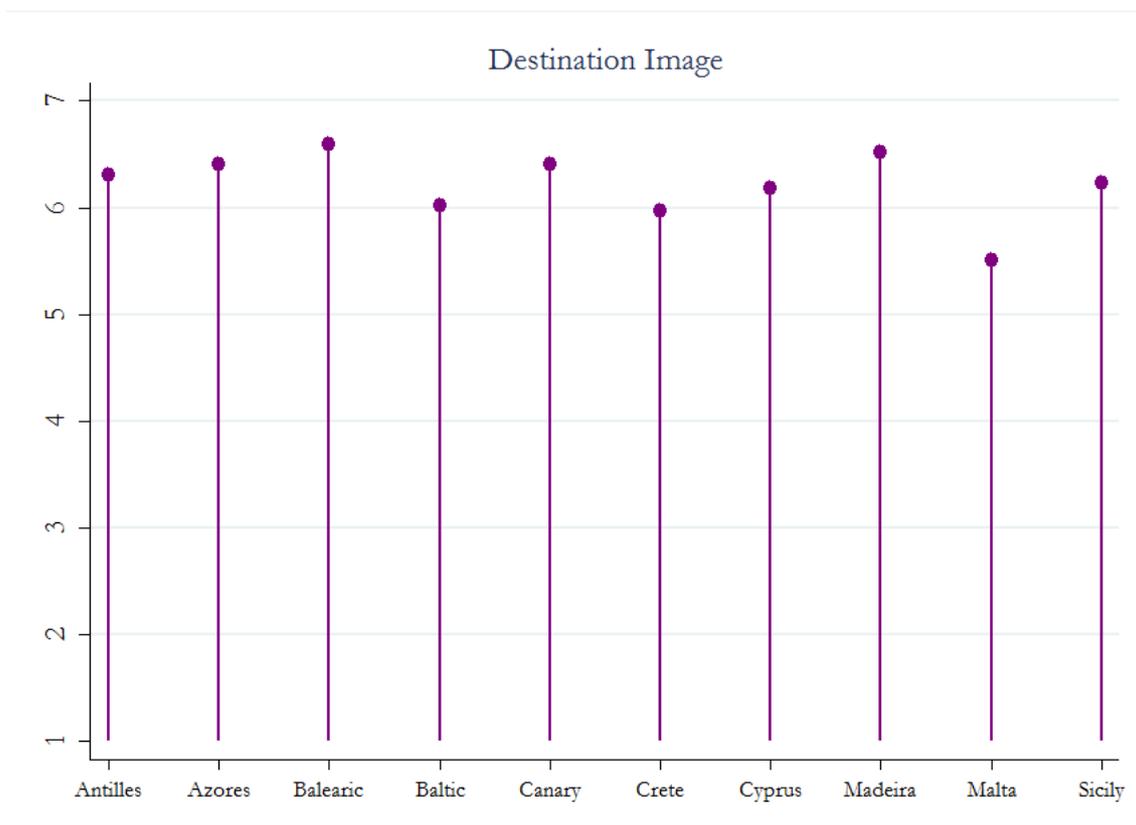




Figure 9. Destination's affective image.

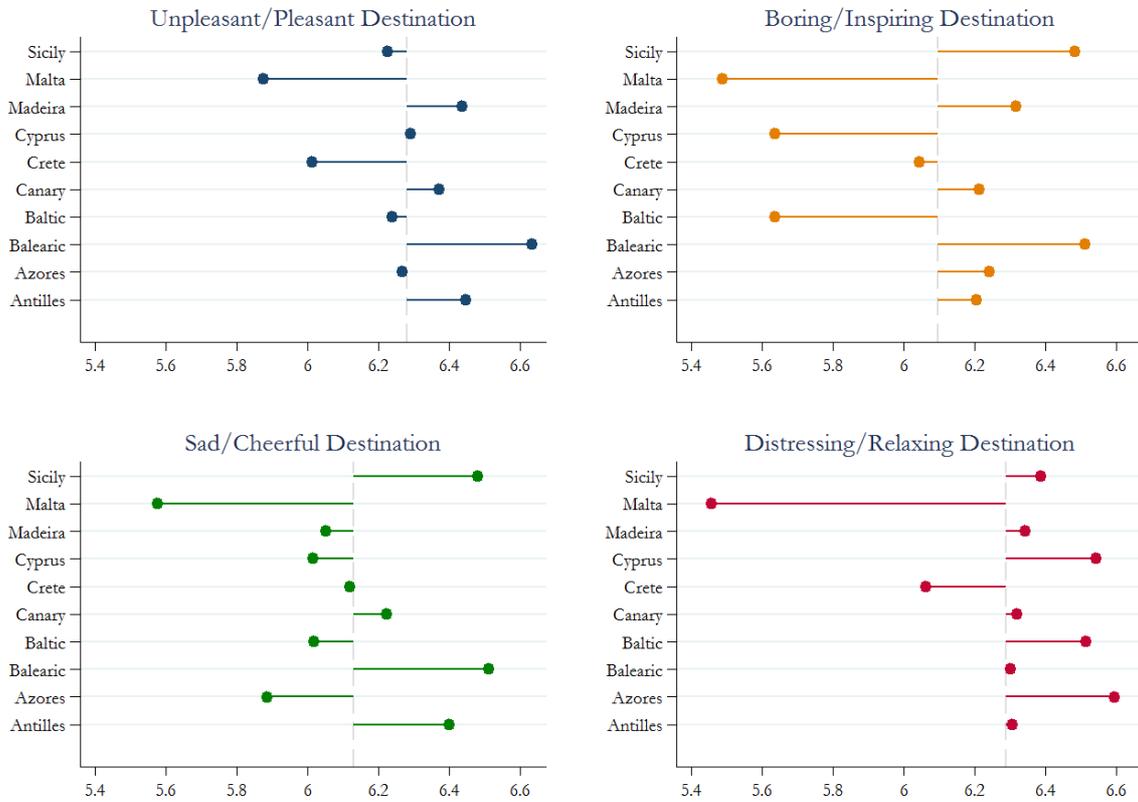
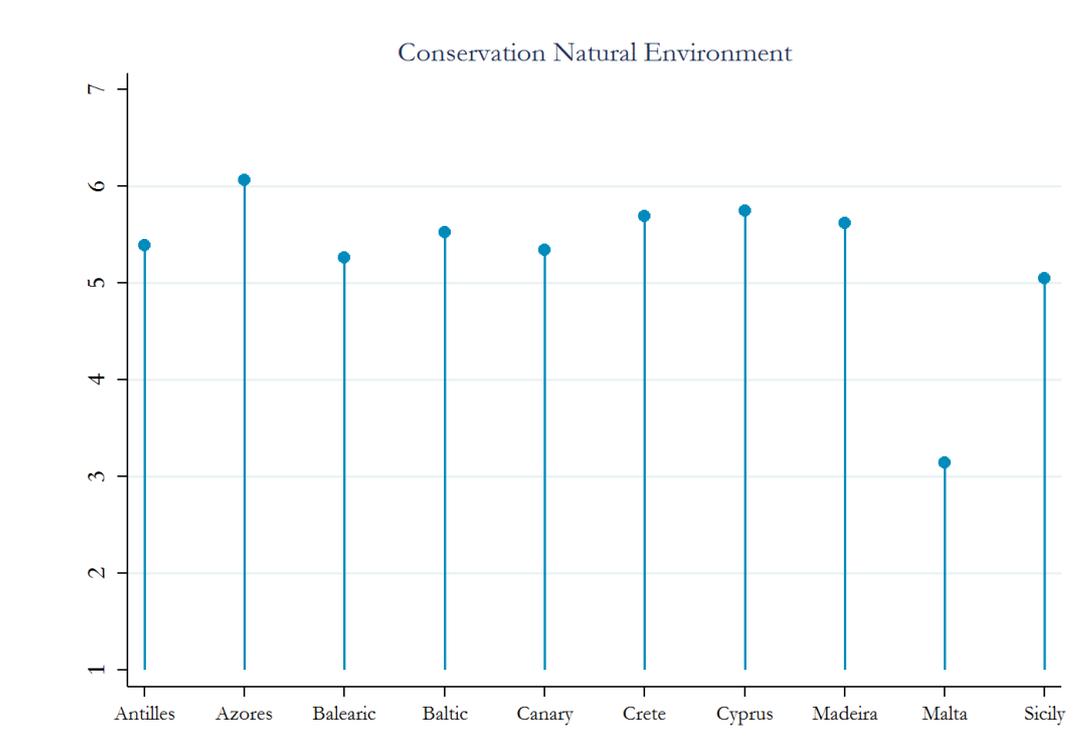


Figure 10. State of conservation of the natural environment of the destination.



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.



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

Two important questions are the importance tourists assign to environmental attributes for their travelling decisions in general, and whether they would change their destination choice if climate change impacts occur at the visited destination. The first question is answered on a scale from 1 to 7, and results are presented in Figure 11. The second one is summarized in

Figure 12, and the potential answers are: 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. For the purpose of simplifying the exposition, answers 1 and 2 have been grouped together.

In both cases, tourists attribute the highest importance to the lack of infectious diseases at the island destination, and more than 40% of them would definitely change the destination choice if infectious diseases are widespread at the destination, being this figure more than the 60% when counting those tourists that would most likely change destination.

Figure 11. Importance of environmental attributes for travelling decisions in general.

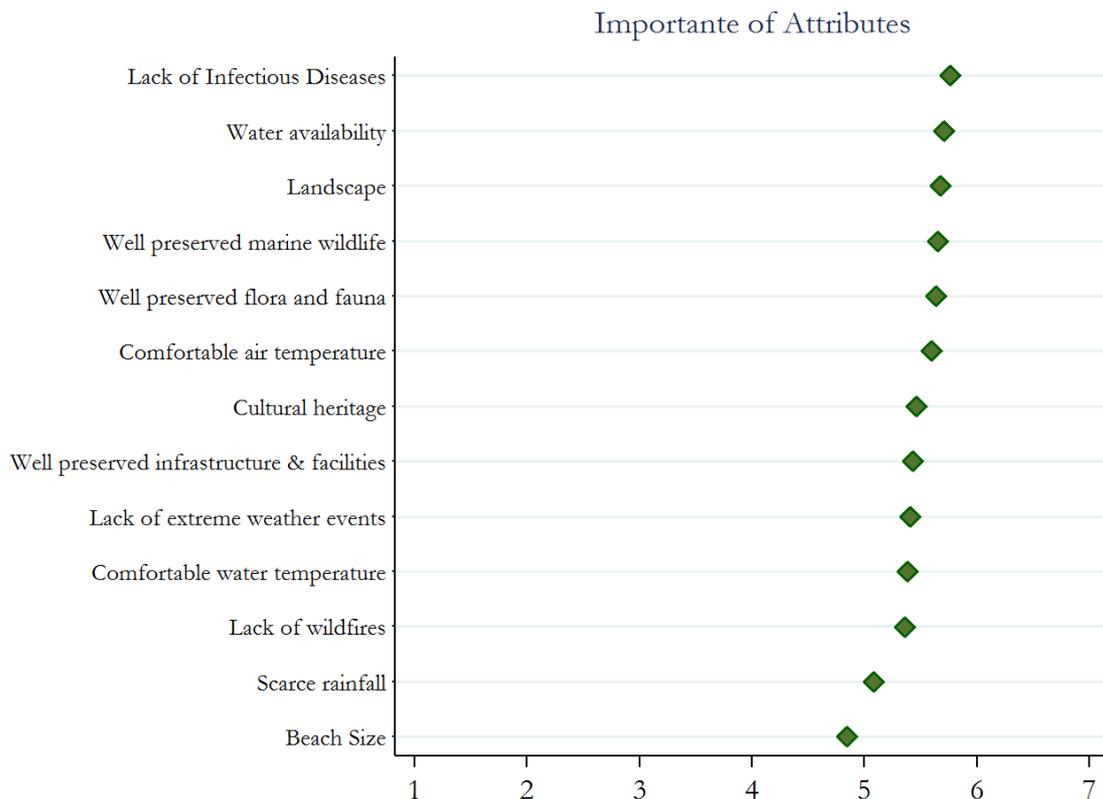
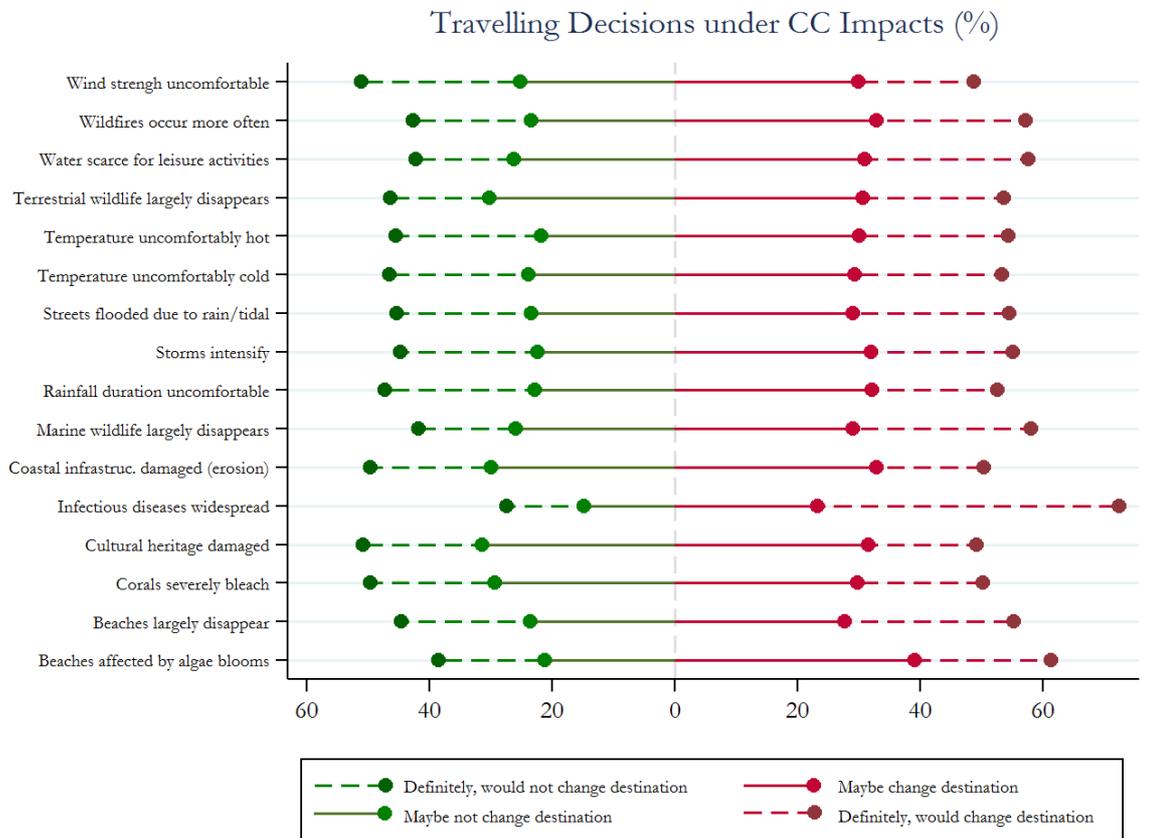




Figure 12. Change of travelling decisions under climate change impacts at destination.



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

In order to further analyze the results of the Discrete Choice Experiments, a logistic regression has been estimated. More specifically, the *asclogit* model has been estimated. This regression models the probability of choosing an alternative depending on the explanatory variables. In this case, the explanatory variables used are the corresponding adaptation policies and price considered in the alternative, a dummy variable for each possible destination (island fixed effects), and socioeconomic characteristics. Results are presented in

Table 12.

Table 12. Estimations results: Alternative-specific constant logistic regression & Willingness-to-pay for climate policies at destination.

From the last column it can be seen that the highest ranked policy is the one corresponding to marine habitats restoration. Tourists would be willing to pay up to 4.46€ per day of stay at the island destination for this policy. In addition, policies aiming at supplying water, protecting the beaches and preventing infectious diseases are the most valued ones.



Table 12. Estimations results: Alternative-specific constant logistic regression & Willingness-to-pay for climate policies at destination.

	(1)	(2)	(3)	(4)	WTP
Heat waves amelioration	0.28*** (0.03)	0.29*** (0.03)	0.28*** (0.03)	0.29*** (0.03)	2.23€
Infectious diseases prevention	0.28*** (0.04)	0.32*** (0.04)	0.29*** (0.04)	0.33*** (0.04)	2.54€
Beaches protection	0.31*** (0.03)	0.33*** (0.03)	0.32*** (0.03)	0.34*** (0.03)	2.62€
Water supply	0.52*** (0.04)	0.53*** (0.04)	0.52*** (0.04)	0.53*** (0.04)	4.08€
Forest fires prevention	0.13*** (0.05)	0.20*** (0.05)	0.15*** (0.05)	0.21*** (0.05)	1.62€
Land habitats restoration	0.12** (0.05)	0.18*** (0.05)	0.14*** (0.05)	0.19*** (0.05)	1.46€
Marine habitats restoration	0.52*** (0.04)	0.57*** (0.04)	0.55*** (0.04)	0.58*** (0.04)	4.46€
Coastal infrastructures protection	0.31*** (0.04)	0.31*** (0.04)	0.31*** (0.04)	0.31*** (0.04)	2.38€
Cultural heritage protection	0.19*** (0.05)	0.20*** (0.05)	0.19*** (0.05)	0.21*** (0.05)	1.62€
Price	-0.13*** (0.01)	-0.13*** (0.01)	-0.13*** (0.01)	-0.13*** (0.01)	-
N. cases	40872	40872	40725	40725	
Chi2	1139.34	2914.10	1626.84	2928.00	
p-val	0.00	0.00	0.00	0.00	
Island Fixed Effect	No	Yes	No	Yes	
Socioeconomic variables	No	No	Yes	Yes	

5. Conclusions

The main objective of the Work Package (WP) 5 is to estimate the economic values of changes in the Environmental Services of the marine and coastal ecosystems (inputs for the Coastal Tourism sector). due to climate change impacts and related policies.

This deliverable presents the results of interest, obtained from the surveys at the countries of origin (still at the pre-testing phase) and at the island destinations. It can be concluded that tourists would change the destination choice if infectious diseases become more widespread (the lack of infectious diseases is one of the highest valued attributes), but also if fires occur more often at destination or if water is scarce. Some of these results are corroborated with the Discrete Choice Experiments. Results show that tourists



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attribute the highest willingness to pay to policies dedicated to marine habitats restoration, followed by policies aiming at supplying water, protecting the beaches and preventing infectious diseases are the most valued ones.

The results presented will be refined in the prospective update of this deliverable.

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Annex 1 – Survey at Destination



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 (PER PERSON)?

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
---------------------	---------------	---------------------



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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 state of conservation of the natural environment 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 environmental attributes, how would you rate their importance for your travelling decisions in general?

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



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implemented by the local authorities, and there is the need to know how valuable they are to you as tourists.

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.



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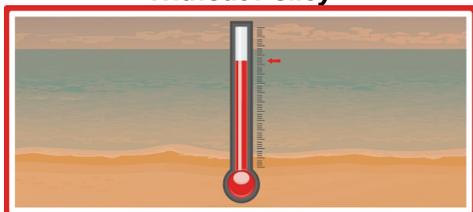
IMPACT

POLICY

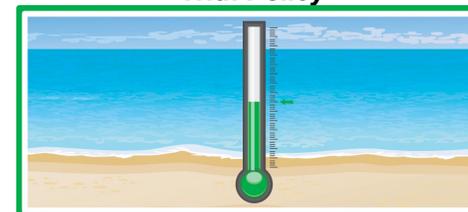
Thermal Comfort: Climate Change increases the frequency and severity of heat waves, which are periods of several days or weeks of excessive hot weather, including warmer nights and hotter days.

HEAT WAVES AMELIORATION: This policy consists of early warning, proper information for 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.

Without Policy



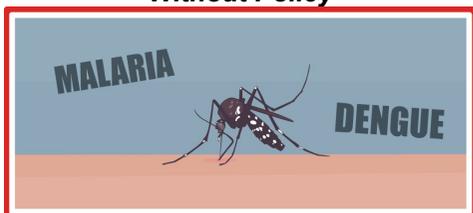
With Policy



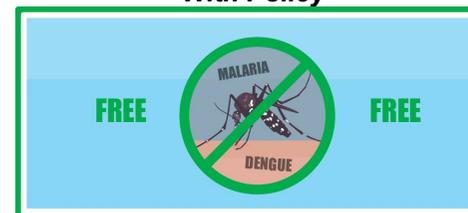
Infectious Diseases: Climate change is likely to increase the occurrence of infectious diseases such as malaria and dengue, which are transported by some species of mosquitos that manage to survive under the new climatic conditions.

INFECTIOUS DISEASES PREVENTION: This policy consists of proper information and advisement to face outbreaks, fumigation of mosquitos' 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.



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





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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.

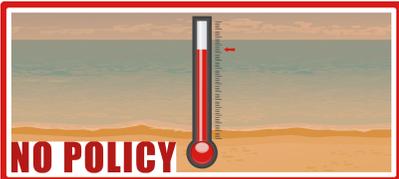
Model A.1

Option A

Option B

Neither Option

Heat Waves Amelioration



Infectious Diseases Prevention



Beaches Protection



Water Supply



Forest Fires Prevention



NO POLICY

Price (per day per person)

3€

5€

0€

Mark your choice

Model A.2

Option A

Option B

Neither Option

Heat Waves Amelioration



Infectious Diseases Prevention



Beaches Protection



Water Supply



Forest Fires Prevention



NO POLICY

Price (per day per person)

7€

1€

0€

Mark your choice

Model A.3

Option A

Option B

Neither Option

Heat Waves Amelioration



Infectious Diseases Prevention



Beaches Protection



Water Supply



Forest Fires Prevention



NO POLICY

Price (per day per person)

3€

5€

0€

Mark your choice

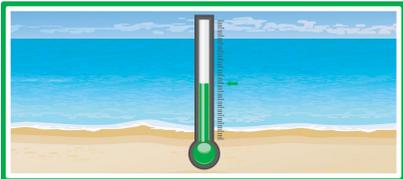
Model A.4

Option A

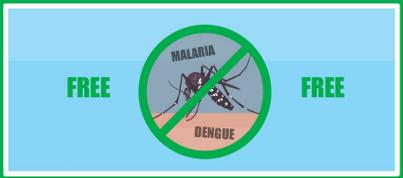
Option B

Neither Option

Heat Waves Amelioration



Infectious Diseases Prevention



Beaches Protection



Water Supply



Forest Fires Prevention



NO POLICY

Price (per day per person)

3€

5€

0€

Mark your choice

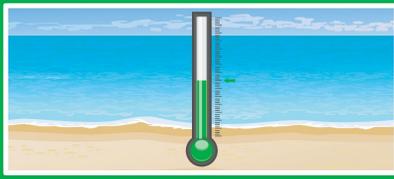
Model A.5

Option A

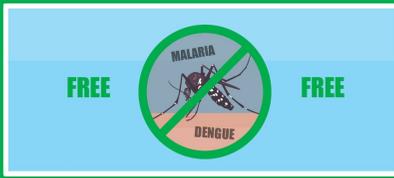
Option B

Neither Option

Heat Waves Amelioration



Infectious Diseases Prevention



Beaches Protection



Water Supply



Forest Fires Prevention



NO POLICY

Price (per day per person)

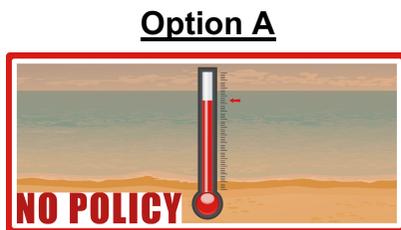
5€

3€

0€

Mark your choice

Heat Waves Amelioration



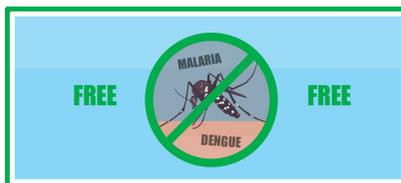
Model A.6

Option B



Neither Option

Infectious Diseases Prevention



NO POLICY

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 status:

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.- Net monthly income:

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: _____



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Annex 2 – Survey for Pre- Testing 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

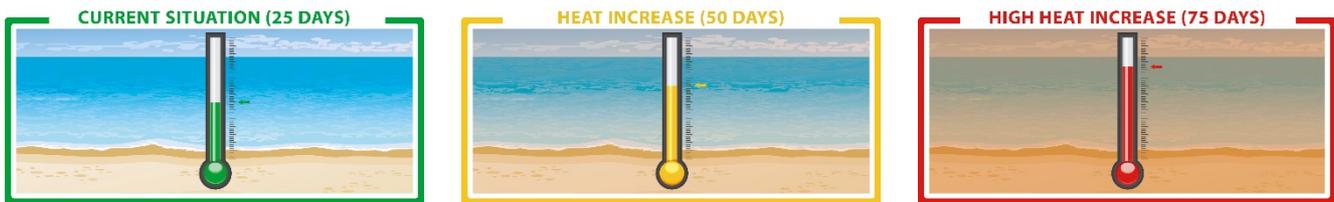
Let me briefly inform you about Climate Change:

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.

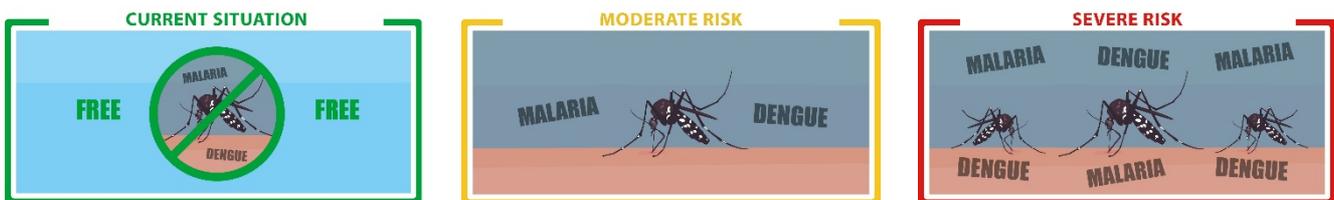
The impacts of climate change can vary across islands and tourist destinations because of the variability of climate and the local policies that can be undertaken to avoid or ameliorate these impacts.

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**).



3. – 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

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

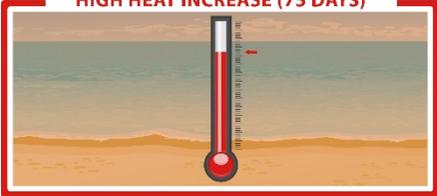
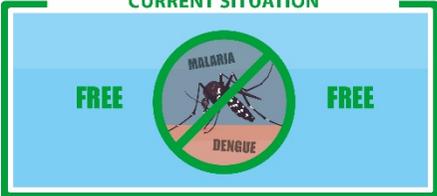
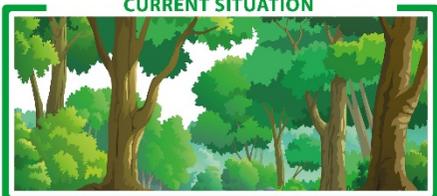
Consider you are planning your next holidays in some European island. Next, you are going to be posed with alternative destinations facing different impacts of climate change. In the next questions, you are asked to choose between two alternative destinations, or staying at home. Please, choose as if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

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

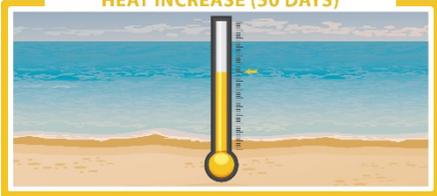
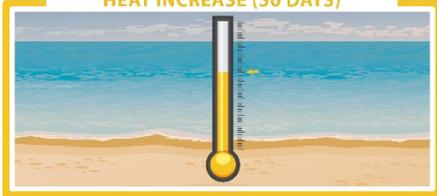
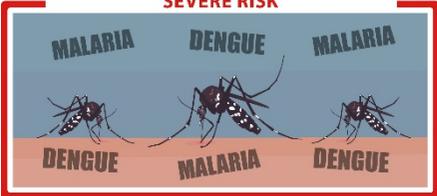
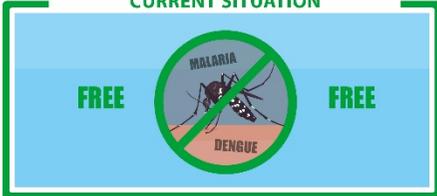
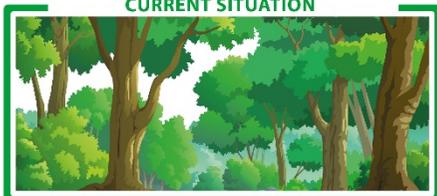
1. The transportation cost to the island tourist destination.
2. The cost of lodging of a four stars hotel accommodation or equivalent.

For the following alternatives, which one would you choose?

Model A.1

	<u>Corsica</u>	<u>Martinique/Guadeloupe (Antilles)</u>	<u>Neither Option</u>
Thermal Comfort			
Infectious Diseases			
Beaches Availability			Stay at home
Water Shortages			
Forest Fire			
Price	100 €	120 €	0 €
Mark your choice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Model A.2

	<u>Cyprus</u>	<u>Martinique/Guadeloupe (Antilles)</u>	<u>Neither Option</u>
Thermal Comfort			
Infectious Diseases			
Beaches Availability			Stay at home
Water Shortages			
Forest Fire			
Price	140 €	80 €	0 €
Mark your choice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

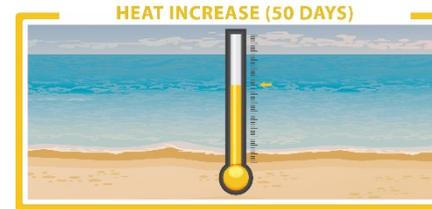
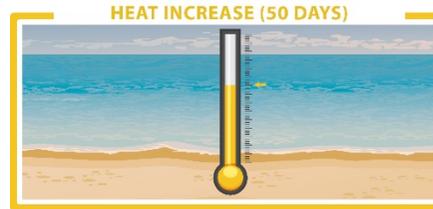
Model A.3

Martinique/Guadeloupe (Antilles)

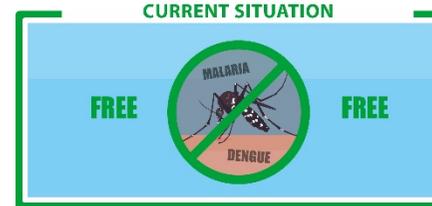
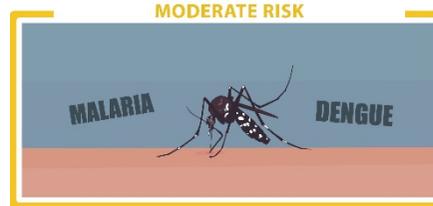
Sardinia

Neither Option

Thermal Comfort



Infectious Diseases



Beaches Availability



Stay at home

Water Shortages



Forest Fire



Price

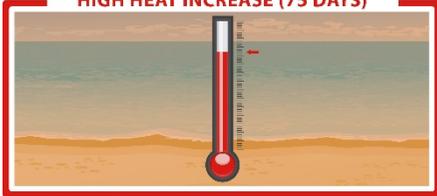
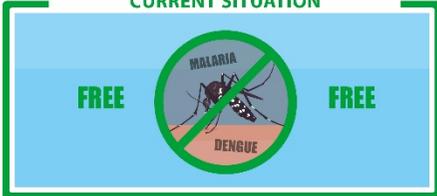
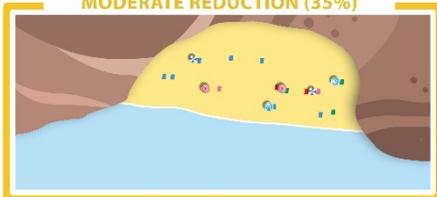
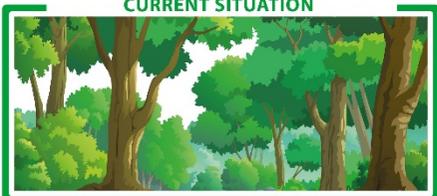
80 €

140 €

0 €

Mark your choice

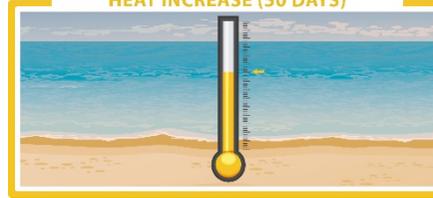
Model A.4

	<u>Canary Islands</u>	<u>Balearic Islands</u>	<u>Neither Option</u>
Thermal Comfort			
Infectious Diseases			
Beaches Availability			
Water Shortages			
Forest Fire			
Price	120 €	100 €	0 €
Mark your choice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

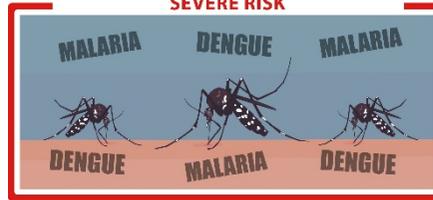
Model A.5

Balearic Islands

HEAT INCREASE (50 DAYS)



SEVERE RISK



STRONG REDUCTION (70%)



CURRENT SITUATION - NO RESTRICTION

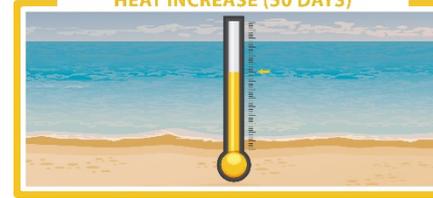


CURRENT SITUATION



Corsica

HEAT INCREASE (50 DAYS)



MODERATE RISK



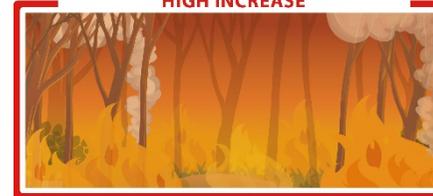
CURRENT SITUATION - NO REDUCTION



SEVERE RESTRICTION (9H)



HIGH INCREASE



Neither Option

Stay at home

Thermal Comfort

Infectious Diseases

Beaches Availability

Water Shortages

Forest Fire

Price

Mark your choice

120 €

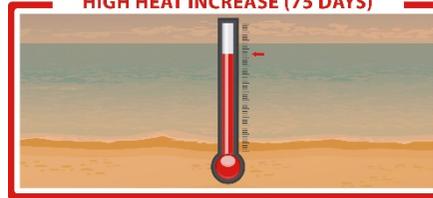
100 €

0 €

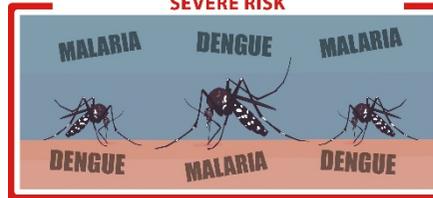
Model A.6

Canary Islands

HIGH HEAT INCREASE (75 DAYS)



SEVERE RISK



MODERATE REDUCTION (35%)



SEVERE RESTRICTION (9H)



HIGH INCREASE



Cyprus

CURRENT SITUATION (25 DAYS)



CURRENT SITUATION



MODERATE REDUCTION (35%)



CURRENT SITUATION - NO RESTRICTION



CURRENT SITUATION



Neither Option

Stay at home

Thermal Comfort

Infectious Diseases

Beaches Availability

Water Shortages

Forest Fire

Price

Mark your choice

100 €

120 €

0 €

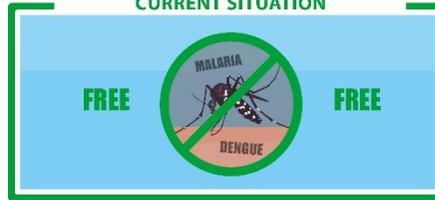
Model A.7

Balearic Islands

CURRENT SITUATION (25 DAYS)



CURRENT SITUATION



CURRENT SITUATION - NO REDUCTION



SEVERE RESTRICTION (9H)

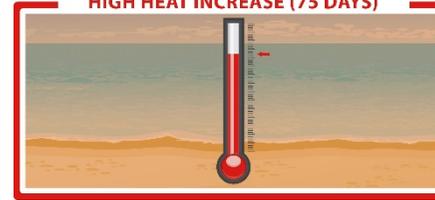


MODERATE INCREASE



Sardinia

HIGH HEAT INCREASE (75 DAYS)



SEVERE RISK



MODERATE REDUCTION (35%)



CURRENT SITUATION - NO RESTRICTION



CURRENT SITUATION



Neither Option

Stay at home

Thermal Comfort

Infectious Diseases

Beaches Availability

Water Shortages

Forest Fire

Price

Mark your choice

80 €

140 €

0 €

Model A.8

Balearic Islands

CURRENT SITUATION (25 DAYS)



MODERATE RISK



STRONG REDUCTION (70%)



MODERATE RESTRICTION (3H)

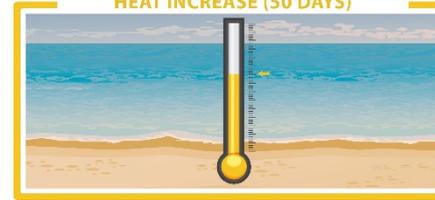


CURRENT SITUATION

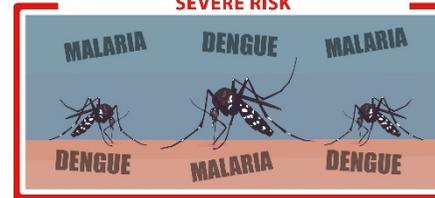


Martinique/Guadeloupe (Antilles)

HEAT INCREASE (50 DAYS)



SEVERE RISK



CURRENT SITUATION - NO REDUCTION



CURRENT SITUATION - NO RESTRICTION



MODERATE INCREASE



Neither Option

Stay at home

Thermal Comfort

Infectious Diseases

Beaches Availability

Water Shortages

Forest Fire

Price

Mark your choice

100 €

120 €

0 €

5.- 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			
Balearic Islands	1	2	3	4	5	6	7
Canary Islands	1	2	3	4	5	6	7
Cyprus	1	2	3	4	5	6	7
Martinique/Guadeloupe (Antilles)	1	2	3	4	5	6	7
Corsica	1	2	3	4	5	6	7
Sardinia	1	2	3	4	5	6	7

6.- 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			
Balearic Islands	1	2	3	4	5	6	7
Canary Islands	1	2	3	4	5	6	7
Cyprus	1	2	3	4	5	6	7
Martinique/Guadeloupe (Antilles)	1	2	3	4	5	6	7
Corsica	1	2	3	4	5	6	7
Sardinia	1	2	3	4	5	6	7

Island	Exciting Destination						
	Very gloomy			Very exciting			
Balearic Islands	1	2	3	4	5	6	7
Canary Islands	1	2	3	4	5	6	7
Cyprus	1	2	3	4	5	6	7
Martinique/Guadeloupe (Antilles)	1	2	3	4	5	6	7
Corsica	1	2	3	4	5	6	7
Sardinia	1	2	3	4	5	6	7

7.- 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 ...					
	Balearic Islands	Canary Islands	Cyprus	Martinique/Guadeloupe (Antilles)	Corsica	Sardinia
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	*	*	*	*	*	*

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
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9.- 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.)
	1. Azores	
	2. Balearic Islands	
	3. Canary Islands	
	4. Corsica	
	5. Crete	
	6. Cyprus	
	7. Madeira	
	8. Malta	
	9. Sardinia	
	10. Sicily	
	11. Martinique/Guadeloupe	
	12. Fhemarn (Baltic Islands)	

10.- Country of Residence: _____ Province: _____

11.- Gender: 1. Male 2. Female 3. Other

12.- Age: _____

13.- 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

14.- Employment status:

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

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

16.- Net monthly income:

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

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

17.- Would you like to add any comment?

THANK YOU very much for your participation!

