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CONSERVATION

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**Candidate**

Dott. Onofrio Fabiola

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**Supervisor**

Prof. Gilli Marianna

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# **Climate change perception: influences and effects. A literature reviews.**

## **Abstract**

The aim of this research is to investigate the factors influencing the perception of climate change. The literature explored presents an interdisciplinary approach and studies from psychology to economics are explored. This choice has its grassroots in the need to deeply understand the networks between idea, interpretation and action. Starting point is the definition of perception as “the purpose of individuals, psychological state and emotions, embracing the related goals to the opportunities and costs of acting in the environment”. This definition is strictly interlinked to the concept of climate change with the purpose to deeply understand which are the direct and indirect factors influencing the way in which the climate change is interpreted and evaluated by individual and society. To achieve this goal a deeply review of the literature is conducted using Web of Science, focusing the attention on the interdisciplinary studies, above all, the interest was on the economical and psychological perspective, fields of study that are best able to synthesize the purposes of the research. 60 peer reviews articles were selected. At this point, the main factors identified in the literature were outlined: socio-demographic determinants, ethnicity, value and beliefs, political ideology, mass media, scientific community agreement and psychological biases. From this it was concluded that the role of perception is fundamental in understanding climate change consequences and the role of these determinants will contribute to proceed to policy implementation. The cognitive biases - psychological distance - identified in the literature highlight the need to integrate social perspectives of climate change into policies and shape them accordingly. The dimensions of psychological distance influence levels of concern and policy commitment, so policy makers need to address how climate change is perceived in each dimension of psychological distance in order to increase concern and support for adaptation, because support depends on individuals' perceptions of policy effectiveness. From this, it was concluded that the role of perception is crucial in understanding the consequences of climate change and that the role of these determinants will contribute to the implementation of economic and social policies

## **1. Introduction**

Any change in the climate system represents the most challenging issue of our decade and century. As pointed out in the report issued by the Intergovernmental Panel on Climate Change (IPCC) the effects of the climate crisis will be catastrophic and irreversible (IPCC, 2021). Understanding the perception of climate change will be crucial in more than one step. First above all, the perception of climate change as an effect on people behaviour, the perception of the imminent risks will lead people to have a pro-environmental behaviour; on the other hand, a less risky perception brings people to underestimate the problem and the consequences of their actions or the impact of pro-environmental policies. The need to understand what influences the “perception” of a phenomenon can lead not only to policy implementation with more effective strategies and programs but also a better understanding of what brings individuals to act.

Part of this analysis involves multidisciplinary studies, psychology and economics are both taken into account because the economic sector alone is not sufficient to understand the relationship between people's engagement in climate change action and pro-environmental behaviour. The interrelationship between these two disciplines is able to offer a more complete framework for understanding the reasons behind economic behaviour and how it is possible to take advantage of that in policy implementation throughout a more efficient and effective application of regulations in order to mitigate the effects of anthropogenic activities.

The aim of this research is to understand the *state-of-art* of the literature. The main goal is to understand which direct and indirect factors are implied in the phenomenon of “perception of climate change” and its implication on the economical and policy framework.

The paper is structured as follows: Section 2 is dedicated to the methodology; Section 3 describes what is “perception” and the reason why it is important to focus on it. Section 4 explores the literature, the factors influencing perception of climate change are analysed and a focus on the way in which it impacts on socio-economics characteristics. Finally, Section 5 focuses on conclusions and limitations of the study.

## **2. Methodology**

Analysis of the literature helps to understand the evolution in opinions, beliefs, concern and awareness among different shares of the public. The approach to this research is based on the aim to understand the state of art of the literature about climate change perception, so studying the factors influencing it and the socio-economic consequences of them.

The analysis of the literature was conducted using, in particular, Web of Science, a search engine that allows for more accurate research of academic papers for topics, journals and macro areas of study. The first research was based on the use of “perception of climate change” and “climate change perception”, here the aim was the study of the general topic, understanding which factors are involved in the process and in which way were analysed by previous researchers. The research conducted from 1991 to 2021 shows 4193 articles from different branches of knowledge. The major percentage of articles are related to environmental sciences, environmental studies, meteorology atmospheric science, green sustainable science, water resources, geography, public environmental occupational health, ecology, geosciences and then economics. From these categories were excluded all the non-interdisciplinary studies, focusing in particular on the economic field, environmental studies and psychology, that are able to better summarise the field of interest for the purpose of this research.

This review is based on 60 peer reviewed papers relevant to individual perception of climate change on global scale. The following factors are common in the main part of the literature under exam: age, gender ethnicity, values and beliefs, political ideology, media, geographical disparity and scientific community agreement.

From the understanding of the general framework of “perception of climate change” topic, additional and more specific literature is investigated. The extrapolation of the general factors from the main and more general literature, the phenomenon was investigated dividing the main topic in subtopics.

Here, the keywords used “climate change perception”, “gender and climate change”, “global perception”, “ethnicity and climate change”, “risk perception of climate change”, “beliefs and climate change perception”, “political ideology and climate change perception”, “media and climate change perception”; the articles chosen present the keywords both in the title and in the abstract.

The research for the economic part followed the same scheme. Keywords were used as “implication of perception “, “climate change and political participation”, “climate change and voters”, “economic implication of climate change”, “climate change engagement and policy” - in different order - to explore the vast literature, analysing and focusing on the articles related to economic implication of perception. The Table 1 below reports the summary of the article by main topics and the number of times the topic is cited in the literature.

Table 1: Summary of the papers used in this chapter

Topic	Authors	Title	Papers number
Perception of climate change	Efron, R. (1969).	What is Perception? In: Cohen R.S., Wartofsky M. W. (eds) <i>Proceedings of the Boston Colloquium for the Philosophy of Science</i>	5
	Moser, S. C. (2016).	Reflections on climate change communication research and practice in the second decade of the 21st century: What more is there to say? <i>Wiley Interdisciplinary Reviews: Climate Change</i>	
	Shi, J. et al., (2015).	Public perceptions of climate change: the importance of knowledge and cultural worldviews. <i>Risk Analysis</i>	
	Whitmarsh, L. & Capstick, S. (2018); Whitmarsh, L.; Seyfang, G. & O'Neill, S. (2011)	Perceptions of climate change. In: <i>Psychology and Climate Change</i> Public engagement with carbon and climate change: To what extent is the public "carbon capable"? <i>Global Environmental Change</i>	
Socio-demographic characteristics	Bessah et al., 2021	Gender-based variations in the perception of climate change impact, vulnerability and adaptation strategies in the Pra River Basin of Ghana. <i>International Journal of Climate Change Strategies and Management</i> .	17
	O'Connor et al., 2006	Risk perceptions, general environmental beliefs, and willingness to address climate change. <i>Risk analysis</i>	
	Feldman, 2017	Do hostile media perceptions lead to actions? The role of hostile political efficacy and ideology in prediction climate change activism. Published online <i>Sage Journals</i> .	
	Haq et al., 2015	Does the perception of climate change vary with the socio-demographic dimensions? A study on vulnerable populations in Bangladesh. <i>Natural Hazards</i>	
	Hoffman, 2012	Climate science as culture war.	
	IUCN, 2017	IUCN ISSUES BRIEF	
	Krkoška et al., 2019	Perception of climate change risk and adaptation in the Czech Republic. <i>Climate</i>	
	McCright, 2010	The effects of gender on climate change knowledge and concern in the American public. <i>Population and Environment</i>	
	McCright, et al. 2013	Perceived scientific agreement and support for government action on climate change in the USA. <i>Climate Change</i>	
	Menny et al. 2011	<i>General knowledge about climate change, factor influencing risk perception and willingness to insure</i>	
	Mishra et al., 2017	Perception of climate change and adaptation strategies in Vietnam: are there intra-household gender differences? <i>International Journal of Climate Change Strategies and Management</i> .	
	Mosers, 2016	Reflections on climate change communication research and practice in the second decade of the 21st century: What more is there to say? <i>Wiley Interdisciplinary Reviews: Climate Change</i>	
	Poortinga et al., 2019	Climate change perception and their individual-level determinants: A cross-European analysis. <i>Global Environmental Change</i>	
	Stedman, 2004	Risk and climate change: Perceptions of key policy actors in Canada. <i>Risk Analysis: An International Journal</i>	
Sun & Han, 2018	Climate Change Risk Perception in Taiwan: Correlation with Individual and Societal Factors. <i>International Journal of Environmental Research and Public Health</i>		
Swai et al., 2018	Gender and perception on climate change in Bahi and Kondo Districts, Dodoma Region, Tanzania. <i>Journal of African Studies and Development</i>		
Thomas et al., 2019	Explaining differential vulnerability to climate change: A social science review. <i>Wiley Interdisciplinary Reviews: Climate Change</i>		
Experience	Akerlof K, 2012	Do people "personally experience" global warming, and if so how, and does it matter? <i>Glob Environ Chang</i>	11
	Johnston et al., 1999	Volcanic hazard perceptions: comparative shifts in knowledge and risk. <i>Disaster Prevention and Management: An International Journal</i> .	
	Krkoška et al., 2019	Perception of climate change risk and adaptation in the Czech Republic. <i>Climate</i>	

	<p>Lujala et al., 2015</p> <p>Marlon et al., 2019</p> <p>Spence et al., 2011</p> <p>Trope et al., 2007</p> <p>Trumbo et al., 2014</p> <p>van der Linden, 2015</p> <p>Schuldt, 2016</p> <p>Spittal et al., 2015</p>	<p>Climate change, natural hazards and risk perception: the role of proximity and personal experience. <i>Local Environment: The International Journal of Justice and Sustainability</i></p> <p>Detecting local environmental change: The role of experience in shaping risk judgments about global warming. <i>Journal of Risk Research</i></p> <p>The Psychological Distance of Climate Change. <i>Risk Analysis</i></p> <p>Construal levels and psychological distance: Effects on representation, prediction, evaluation, and behavior. <i>Journal of consumer psychology</i></p> <p>An assessment of change in risk perception and optimistic bias for hurricanes among Gulf Coast residents. <i>Risk analysis</i></p> <p>The socio-psychological determinants of climate change risk perceptions: Towards a comprehensive mode. <i>Journal of Environmental Psychology</i></p> <p>The role of race and ethnicity in climate change polarization: evidence from a US national survey experiment. <i>Climatic change</i></p> <p>Optimistic bias in relation to preparedness for earthquakes. <i>Australasian Journal of Disaster and Trauma Studies</i></p>	
Ethnic minorities perception	<p>Bolin, 2006</p> <p>Li et al., 2019</p> <p>Pearson et al., 2017</p> <p>Satterfield et al., 2004</p> <p>Schuldt, 2016</p> <p>Whittaker et al., 2005</p> <p>Yin et al., 2020</p> <p>Thomas et al., 2019</p>	<p>Race, class, and disaster vulnerability. In E.L. Quarantelli &amp; R. Dynes (Eds.), <i>Handbook of disaster research</i></p> <p>A survey of rural residents' perception and response to health risks from hot weather in ethnic minority areas in southwest China. <i>International journal of environmental research and public health</i></p> <p><i>Race, Class, Gender and Climate Change Communication</i>. Oxford research encyclopaedia of climate science</p> <p>Discrimination, vulnerability, and justice in the face of risk. <i>Risk Analysis</i></p> <p>The role of race and ethnicity in climate change polarization: evidence from a US national survey experiment. <i>Climatic change</i></p> <p>Racial/ethnic group attitudes toward environmental protection in California: Is "environmentalism" still a white phenomenon? <i>Political Research Quarterly</i></p> <p>The impacts of climate change on the traditional agriculture of ethnic minority in China. <i>Journal of Environmental Science and Engineering A</i></p> <p>Explaining differential vulnerability to climate change: A social science review. <i>Wiley Interdisciplinary Reviews: Climate Change</i></p>	8
Media	<p>Feldman et al., 2015</p> <p>Newing, 2011</p> <p>Pasquaré and Oppizzi, 2012</p> <p>Rebetez, 1996</p> <p>Weingart et al., 2000</p> <p>Whitmarsh &amp; Capstick, 2018</p>	<p>Do hostile media perceptions lead to actions? The role of hostile political efficacy and ideology in prediction climate change activism. <i>Sage Journals</i></p> <p>Climate Change as an Element of Sustainability Communication</p> <p>How do the media affect public perception of climate change and geohazards? An Italian case study. <i>Global and Planetary Change</i></p> <p>Public expectation as an element of human perception of climate change. <i>Climate Change</i></p> <p>Risks of communication: Discourses on climate change in science, politics, and the mass media. <i>Public Understanding of Science</i></p> <p>Perceptions of climate change. In: <i>Psychology and Climate Change</i></p>	7
Values and beliefs	<p>Ecklund et al., 2016</p> <p>Kilbourne &amp; Pickett, 2008</p> <p>Leiserowitz, 2006</p> <p>McCright et al., 2016</p> <p>Rokeach, 1973</p> <p>Schwartz &amp; Bislsky, 1987</p> <p>Whitmarsh &amp; Capstick, 2018</p>	<p>Examining links between religion, evolution views and climate change skepticism. <i>Environmental Behaviour</i></p> <p>How materialism affects environmental beliefs, concern, and environmentally responsible behavior. <i>Journal of Business Research</i></p> <p>Climate change risk perception and policy preferences: the role of affect, imagery and values. <i>Climatic Change</i></p> <p>Ideology, capitalism, and climate: Explaining public views about climate change in the United States. <i>Energy Resource &amp; Social Science</i></p> <p><i>The nature of human values</i>. Free press.</p> <p>Toward a universal psychological structure of human values. <i>Journal of personality and social psychology</i></p> <p>Perceptions of climate change. In: <i>Psychology and Climate Change</i></p>	8



	Zhous, 2015	Public environmental skepticism: A cross-national and multilevel analysis. <i>International Sociology</i>	
Political ideology	Capstic et al., 2015	International trends in public perceptions of climate change over the past quarter century. <i>WIREs Climate Change</i>	5
	Hamilton, 2011	Education, politics and opinion about climate change: evidence for interaction effects. <i>Climatic Change</i>	
	McCright et al., 2015	Perceived scientific agreement and support for government action on climate change in the USA. <i>Climate Change</i>	
	Poortinga et al., 2019	Climate change perception and their individual-level determinants: A cross-European analysis. <i>Global Environmental Change</i>	
	Wang & Kim 2018	Analysis of the impact of values and perception on climate change skepticism and its implication for public policy. <i>Climate</i>	
Scientific community agreement	Clayton et al., 2015	Psychological research and global climate change. <i>Nature climate change</i>	5
	Ding et al., 2011	Support for climate policy and societal action are linked to perceptions about scientific agreement. <i>Nature Climate Change</i>	
	Gifford, 2011	The dragons of inaction: Psychological barriers that limit climate change mitigation and adaptation. <i>American Psychological Association</i>	
	Lewandosky et al., 2013	The pivotal role of perceived scientific consensus in acceptance of science. <i>Nature climate change</i>	
	McCright et al., 2013	Perceived scientific agreement and support for government action on climate change in the USA	

Note: The listed papers are in alphabetical order per topic; the number of citations for each topic is also provided. The total number of papers presented in the Table 1 is 66 because some papers are presented in more than one topic categories, see for example McCright et al., 2013.

### 3. Perception of climate change

Understanding the factors related to the perception of climate change is fundamental in order to build effective strategies related, not only to widespread awareness about the topic, but also to implement the action, public engagement and develop effective political strategies. The strategies adopted by policy-makers to respond to climate change are consequences of the perception of climate change and environmental issues. In fact, being aware about what leads people to act pro-environment or in the opposite way, is fundamental to understanding the efficiency of adaptation and mitigation strategies.

Referring to the “perception” concept is not simple, because it is influenced by different direct and indirect factors. As interaction among multilevel aspects of humanity, understanding and analysing what influences the perception of climate change and its effects on human behaviour - in socio-economic terms - is a difficult task that literature is going to explore and analyse deeply. The implications are not only related to individualistic behaviour, but also, at macro level of policy government nationally and internationally. One of the purposes here is to highlight the dynamics beyond the perception and their impact in the general scenario of policy engagement, focusing on the state of art of the literature in order to better understand the context in which we are operating.

The focus on the perception will be a framework to understand the individuals’ behaviour and their attitudes towards climate change action. Action that could be expressed in terms of political engagement, community awareness, volunteer or willingness to pay in pro-environmental projects and/or programs. The role of the perception, represents, in this way, the tool to have a closer look to the individuals’ behaviour. At this point, the first step is to understand what perception means. The term “perception” has been used to denote a various range of psychological constructs, knowledge, beliefs, attitudes, concern, affects and risks (Whitmarsh & Capstick, 2018). According to Shi, Visshcer, and Michael (2015), knowledge is also strictly related with people’s concern about climate change; different approaches to knowledge and the learning process have different impacts on the level of perception and

awareness. The authors outline as the knowledge and the awareness are related and the two aspects influence each other in a virtuous circle.

To understand “perception” is fundamental to taking under consideration a series of cultural aspects, affect, symbols, image and theories that influence the idea of risk related to climate change. It defines, in fact, the whole schemes of cognitive, affective and evaluative dimensions of representations of the issue (Whitmarsh *et al.*, 2011). Perception is also defined as the primary form of cognitive contact with the world around, denoting a form of awareness, a reaction of an organism or a part of an organism to a physical or psychological stimulus (Efron, 1969).

Before going further, it is fundamental to highlight briefly some aspects of the terminology used in climate change debate, focusing, in particular, on the differences among the concepts of understanding, perception, engagement. As Moser (2016) shows, different shades of meaning are associated with the most used word in this context. First above all, “understanding” is part of a process; it is, also, the action and the capability to acquire and use accurate knowledge and information about the topic. The term “perception” refers to a subjective experience and interpretation of other’s beliefs and understandings of them. In the end “engagement” is defined as a distinct but complementary way toward which individuals respond to climate change. The terminology used in this research will follow the definition of Moser (2016) referring to the term “perception” that embodies the purpose of individuals, psychological state and emotions, embracing the related goals to the opportunities and costs of acting in the environment.

### ***3.1 Factors influencing perception of climate change***

The extended literature has investigated the phenomenon of factors that influence perception of climate change, relating it to action and behaviour.

In this part we are going to explore the factors influencing the perception of climate change. Before going further, it is important to remember that those factors are not disconnected among them, all are interlinked and interdependent, but to better understand the phenomenon they are presented in separate sections.

#### ***3.1.1 Socio-demographic characteristics***

The academic literature shows that perception is influenced by personal beliefs, cultural value, pre-existing knowledge (Hoffman, 2012; Mosers, 2016; McCright, *et al.* 2013; Feldman, 2017). Several studies have demonstrated that perception of climate change is related to different aspects and factors that impact on individual knowledge and behaviour. Sociodemographic characteristics such as gender, age and education are highlighted as first direct factors used as lenses to perceive a phenomenon.

First above all, different studies (Menny *et al.* 2011; McCright, 2010; Thomas *et al.*, 2019) have pointed out the relationship between the level of awareness and risk perception and gender. Women and men are experiencing climate change differently as gender inequalities persist around the world affecting the ability of individuals and communities to adapt (IUCN, 2017). Evidence highlights that women’s empowerment and advancing gender equality can deliver results across a variety of sectors, leading, at the same time, to more environmentally friendly decision making at household and national level. Gender differences in perception of climate change and climate change adaptation are analysed in several studies across different regions (Bessah *et al.*, 2021; Haq *et al.*, 2015; Swai *et al.*, 2018; Mishra *et al.*, 2017). Those studies have pointed out that gender differences have a positive influence in the way in which climate change is perceived. Moreover, it is shown that the sociodemographic characteristics are positively correlated to adaptation strategies at the local level depending on the different roles’ individuals play in society. Gender differences in climate change concerns are more

similar to the rather modest gender differences on attitudes toward general environmental issues (McCright, 2010), in the same study, the author shows the existence of modest gender differences in climate change perception among American population even if women underestimate the quality of their knowledge more than men do.

All the studies conducted have analysed the impact of sociodemographic characteristics as first factors of impact. Considering the variable “age” has an impact on the perception of risk. In particular, research shows a constant pattern across groups of individuals. Men with lower education and older age have more doubts about the anthropogenic nature of climate change and they are less concerned about the impacts of climate change on their future. (Poortinga *et al.*, 2019). On the other hand, more educated people and younger generations have a higher concern about climate consequences (Sun & Han, 2018; O’Connor *et al.*, 2006; Krkoška *et al.*, 2019; Stedman, 2004).

### 3.1.2 Experience

The first source of information is experience. Individuals can construct their ideas about the effects and the impact of climate change through their own experiences. Communities that have experienced extreme events have a higher perception of risk rather than individuals that have not (van der Linden, 2015; Lujala *et al.*, 2015; Lorencová *et al.*, 2019). Moreover, Akerlof and colleagues (2012) explored the effects of climate change perception and risks exposure through a survey of residents of Alger country (Michigan). The sample includes those residents who declared to have directly experienced climate change effects. The results show who directly experienced hazardous events have a higher perception of future risks related to climate change and global warming. A different study conducted by Marlon and team (2017) analysed a representative state-wide survey of Floridians and compare their risk perception of five-year trends in climate change with local weather station data from the five years preceding the survey. The results shows that respondents were unable to detect the direction of climate change consequences as for example variation in temperatures. Nevertheless, the risk perceptions of climate change were more strongly predicted by subjective and individual experiences of environmental changes, beliefs about climate change and political ideology. A research conducted on a representative sample in Norway shows as personal and direct experience is one of the main factors of perception of climate change. The results show that personal experience of hazardous events and damages strongly influence the awareness about climate change effects and consequences (Lujala *et al.*, 2014).

The first differences studied, in this framework, are differences led by optimistic bias, psychological distance in space and time, racial segregation and disparity.

It is shown that people can be influenced by “optimistic bias”. Optimistic bias is defined as a circumstance in which individuals believe themselves to be less likely to be harmed by negative events as compared to others or, conversely, that they will be more likely than others to achieve some goals or status (Trumbo *et al.*, 2014). In other words, it affects groups of people who are classified as “at risk”, but they do not consider themselves as a vulnerable category, individuals can underestimate the impact of the environmental risks if they do not experience negative events. Studies on risk related to hazard events (Trumbo *et al.*, 2014, Spittal *et al.*, 2015; Johnston *et al.*, 1999) have shown that people's risk perception is associated with a lower or higher level of optimistic bias.

Similar to the optimistic bias, the “psychological distance” perceived between themselves and the area affected by consequences of climate change impacts negatively on the perception of climate change in the way in which people do not perceive themselves as a risky group (Trope *et al.*, 2007, Schuldt, 2016). The distance could be both in terms of time, so the climate change will affect future generations; or in terms of physical distance, the consequences are experienced only by people who live in the most remote areas of the planet. The

unconscious use of these two lenses, optimistic bias and psychological distance, lead people to underestimate the magnitude of effects and consequences of climate change. Experience affects psychological distance in the way in which it is reduced, producing a positive response in the case in which adaptation policies are adopted (Spence *et al.*, 2011).

### 3.1.3 Ethnical minorities perception

In the limits offered by white lens in a non-totally white society, the disparity between major groups of people and minority groups are not always considered. Focusing on the white-western countries it is possible to notice a lack of diversity in representation in all positions. The relationship between belonging to an ethnical minority and the risk perception related to climate change is highlighted several times in academia. In western and white society, the structural racism that involves the reinforcement of white privilege through the perpreit relationships based on racial stereotypes contributes to increase the vulnerability of the non-white population. Vulnerability refers to the capacities of different people affected by climate change to respond efficiently in economic - institutional and political terms. Many groups suffer because of a combination of lack of economic, institutional and political capacity (Thomas *et al.*, 2019). In particular it is highlighted as there is a positive and strong correlation between the socio-economic vulnerability of minorities and the risk perception, in particular related to environmental hazards (Satterfield, 2004; Pearson *et al.*, 2017). The environmental deprivation theory points out as the exposure to environmental hazards and harm leads to greater concern about the environment and increased support for protective behaviours (Pearson *et al.*, 2017; Whittaker *et al.*, 2005). This awareness is reflected in the racial segregation and discrimination in White society, where minorities are more likely to live near hazardous industrial sites with highest rate of negative externalities than Whites (Bolin, 2006). In addition, the research conducted by Schuldt (2016) found that there is a higher level of environmental risks among US-born race and ethnic minorities compared to Whites.

Similar studies conducted in China (Yin Zachary *et al.*, 2020; Li *et al.*, 2019) highlight as the factors influencing perception of climate change are correlated with personal and direct experience, where lack of scientific knowledge is substituted by observation of natural phenomena and wisdom to adapt to climate change throughout copying behaviour.

### 3.1.4 Media

One of the main secondary sources of information about climate change is the media. Mass media have a fundamental role in the construction of climate change narratives (Whitmarsh & Capstick, 2018). A critical role is treated by the language used by communicators. The role of media is different, it can be an informative role (e.g., the narrative of catastrophic events can be represented with scepticism or focusing on the adaptation techniques); it can have a political scope as governmental communication where the goal is to create engagement - in this case the meta problem is reconstructed into a problem of political regulation and routine (Weingart, Engels & Pansegrau 2000; Newing, 2011). One of the main common mistakes is to correctly represent the phenomena; difficulties in communication are related to the different sources of information and how the news is re-elaborated by individuals. One particular case, for example, as identified by Rebetz (1996), is the difficulties differentiate between the concept of weather and climate. This is a common mistake, for example, frequently repeated by Italian journalism, as pointed out by Pasquaré and Oppizzi (2012) who confuse weather with climate, blaming climate change for extreme rainfalls causing landslides and floods.

As NASA defines, the difference between weather and climate is a measure of time. Weather is what conditions of the atmosphere are over a short period of time, and climate is how the atmosphere “behaves” over relatively long periods of time. Weather is also an effect

upon human life and activities. Talking about climate change is referring to the changes in long-term averages of daily weather patterns. Climate refers to the long-term pattern of weather in a particular area. Some scientists define climate as the average weather for a particular region and time period, usually taken over 30-years. So, talking about climate change is talking about the change in average pattern of precipitation, temperature, humidity, wind velocity, phenomena such as fog, frost, hail storms and other measures of the weather that occurs over a long period of time in a particular place, area or region.

This difference could not be so clear to non-specialists, additionally, communication of climate change has to consider local and short-term events in order to be communicated effectively, so this increases the chance to misunderstand. Misunderstanding of the difference between climate change and environmental issues: environmental issues refer to all the phenomena such as ozone depletion, air pollution and rising temperature. Because of this, people may act two different behaviours: believe in irrelevant solutions or feel disempowered (Wolf & Moser, 2011).

Moreover, a study conducted in the US about media trust demonstrated that lack of trust in American media is associated with a use of a distorted lens to analyse the news in the case there is a high personal involvement. This kind of incongruence between what is perceived and what is told by media generate a higher level of involvement and willingness to engage in activism aimed to amplifying individuals' own view in public sphere (Feldman *et al.*, 2017).

From this, it is possible to understand how complicated climate change storytelling is, but basing on the way in which the narrative is constructed individuals create their own interpretation reinforced by pre-existing frameworks and mental patterns.

In the following paragraphs are synthesised the additional indirect factors that influence the perception of climate change.

### 3.1.5 Values and Beliefs

In the complicated process of understanding which factors have an influence on climate change perception, value and beliefs are one of the first indirect factors who need attention. It is argued that values precede beliefs and attitudes guiding their formation (Rokeach, 1973; Schwartz & Bislsky, 1987; Kilbourne & Pickett, 2008). Values transcend situations and are enduring, for Stern, Kalof, Dietz, and Guagnano (1995), value orientations are general predispositions influencing environmental beliefs held by individuals (Kilbourne & Pickett, 2008).

Values and beliefs are one of the first filters to interpret reality (Whitmarsh & Capstick, 2018). The asymmetric information - called by Kundra (1990) "Motivated reasoning" - leads people to use information in order to confirm what they already believe, tending to ignore the information which are in contradiction with their frame of reference.

A set of cultural theories framed the attitudes related to perception in hierarchists, individualists, egalitarian and fatalists and each identity is related to a different risk attitude, revealing, at the same time, a different policy response in case of environmental disaster (Leiserowitz, 2006). Cultural theories are a set of theories in which social values and worldviews play a fundamental role in risk perception and behaviour. Different groups of individuals interpret the world differently, using macro patterned ways: social, cultural, political attitudes towards the world and "orienting dispositions" are a set of presuppositions about the ideal nature of society which leads groups to perceive different risks and prefer policy response (Douglas, 1966; Douglas, 1970; Douglas *et al.*, 1998.; Douglas & Wildavsky, 1982; Leiserowitz, 2006). According to the "cultural theorists", hierarchists fear social deviance, they call for the active management of risk by experts. Individualists fear restrictions on their autonomy and promote market-based strategies that maintain their autonomy providing, at the same time, opportunities for personal gains. Egalitarians are concerned about injustice in the

distribution of the risk cost and benefits, tolerate or celebrate social diversity. Fatalists base their consensus on the decision-making process (McCright *et al.*, 2016). These cultural worldviews and biases are related to individual's concern about climate change and environmental awareness. Individualistic cultures seem to register a higher level of scepticism among their population, while egalitarian cultures can positively influence beliefs and knowledge about climate change and its effects (Leiserowitz, 2006).

Stern, Kalof, Dietz, and Guagnano (1995) propose a model in which values are the grassroots of beliefs, in particular this subsequence is visible in how it is perceived in the relationship between human-environment. In particular, environmental beliefs are a consequence to whatever the individual values activate norms (Kilbourne & Pickett, 2008)

Values and beliefs are representative of attitudes toward different economic tools. For example, in the contingent valuation method, they are predictors of willingness to pay and they are useful to analyse, in particular, negative and positive answers helping researchers to better understand the characteristics of groups of people (Meyerhoff & Liebe, 2005).

The sphere of value also includes "religiosity". Some studies have investigated the relationship between religiosity and pro-environmental attitude and/or climate change scepticism. Different authors (Zhou 2015; Ecklund *et al.*, 2016) show that a higher level of religiosity is associated with a higher level of environmental scepticism, especially among Evangelical Protestants. On the other hand, McCright Marquart-Pyatt, Shwom, Brechin, Allen (2016) research focused on the effect of religiosity in the US and outside US, showing as this is irrelevant outside and it has a negative impact within the US.

### 3.1.6 Political ideology

Relating to value and beliefs, an additional interpretation lens is given by political ideology. Several studies have demonstrated that political affiliation and voting patterns have an influence on the way in which environmental issues are perceived. Research conducted in The United States highlighted the interaction between the concern about climate change and the vote expressed. The awareness is higher among highly educated individuals of the Democrats party, and decreases with education among Republicans (Hamilton, 2011). A conservative, in fact, is more likely to be sceptical of climate change rather than democrats or liberals not only in US or European countries, but also in Korea (Wang & Kim 2018). McCright, Dunlap and Marquart-Pyatt (2015) conducted a similar study for European countries. They found that left-wing voters strongly believed that there is an urgent need to act in order to preserve the environment. This ideological division is not applicable in Communist areas because of the different meaning of "left-right" identification in these countries. Political ideology is also linked to the level of education and it is shown that a lower level of education is positively correlated to right-wing vote and a lower level of awareness of climate change risks even if this division is weaker in Eastern countries as compared to Western countries. This is explained because after the collapse of the communist regime, governments have prioritised the economic sphere despite the environmental protection (Poortinga *et al.*, 2019). Other regions, as for example, Latin America and sub-Saharan Africa, show growing levels of awareness at the expense of scepticism or ideological polarisation (Capstick *et al.*, 2015).

### 3.1.7 Scientific community agreement

Some studies also focus on the role of scientific community agreement as an indirect factor on interpretation of phenomena. McCright, Dunlap and Xiao (2013), for example, demonstrate that different levels of agreement to the scientific community lead to different levels of climate change policy support. Moreover, people's misperception of scientific agreement among climate scientists is associated with different levels of support in environmental programs and policies (Ding *et al.*, 2011). The role of perceived consensus, in

fact, shapes the public opinion determining people's beliefs, so the acceptance of scientific consensus is related to the increase of awareness and consensus among individuals (Lewandosky *et al.*, 2013). The rejection of scientific consensus can be interpreted as a threat to one's own habits and behaviour, a personal attack derived from climate change policies (Gifford, 2011; Clayton *et al.*, 2015).

#### **4. Economic/Policy implication of perception**

The discourse around perception of climate change and the factors affected it is fundamental in order to understand who this can be used in socio-economic scenarios. A negative or a positive idea about the risks related to climate change and its impact on biodiversity and well-being, is related to the community behaviour in response to policy-makers decisions. The barriers to climate change perception as for example, scepticism, psychological distance or optimistic bias, lack of trust in media or scientific community led people to interpret it as no immediate problem, not an irreparable damage caused by human action. The perception as an event distant in time and space or consider the risk as a low-level priority is reflected in low level political engagement (Lorenzoni, Nicholson-Cole, Whitmarsh, 2007); therefore, information about people's response to environmental programs can contribute to design and implement effective policies (Drews & Van de Bergh, 2016). In other words, the societal perspectives of climate change need to be integrated within the policy process on an on-going basis, to explore the understanding of climate change by a heterogeneous public through time, and shape policies accordingly (Lorenzoni *et al.*, 2007). As found by Singh and colleagues (2017) dimensions of psychological distance influence levels of concern and political engagement, so policy makers need to address how climate change is perceived on each dimension of psychological distance in order to increase concern and support for adaptations, because the support depends upon individuals' perceived efficacy of policy (Singh *et al.*, 2017). Moreover, people with direct experiences of hazard events related to climate change, are those who also have a perception of climate change as a factor of risk in the short-midterm and as a consequence they have the tendency to not underestimate the way in which climate change can affect their life and life of future generations. On the other hand, people without direct and personal experience, and individuals who deny climate change as a factor of risk, need to base their understanding of the risky events on external sources of information, creating and re-interpret reality based on pre-existing knowledge and beliefs. Taking under consideration the sceptics, part of the literature focused on the socio-economic critical areas of impact. The literature explores different examples, some studies focused on scepticism in low carbon policy adoption, in particular, it is highlighted as scepticism is a growing phenomenon in Anglo-American culture rather than a worldwide trend (Engels *et al.*, 2013). Interesting results derived from a study conducted in Germany. Here, Engels, Huther, Schafer, and Held (2013) shows as scepticism is associated with less enthusiasm for renewable energy sources and less critical stance on nuclear energy. Those who do not believe in climate change are likely to assess nuclear energy in favour of renewable energy. Moreover, the authors pointed out a correlation between scepticism of climate change and lower political participation as a consequence of the perception that pro-environmentalism has become part of the German mainstream. German polls, in fact, show a strong support for green energy transition and the willingness to achieve more ecological goals, as a consequence of this green wave there is no space for sceptical parties in the German political arena. Following the field of climate change perception and energy transition policy, Kammermann and Dermont (2017) approached the topic studying the energy transition in Swiss policy. Their model reveals that beliefs and attitudes, and climate change scepticism are a source of information that explains opposition to clean energy policies for both political elite and citizenry. Political elite beliefs that renewable energy transition is not a priority because climate change is not the main

priority. The analysis of the citizen group suggests that the political elite has a strong influence on climate-change scepticism, which in turn, influences the public's support for environmental policy (Kammermann & Dermont, 2017). They conclude that climate change perception is a proxy influenced by political ideology, beliefs and attitude, not only for populist and right-wing voters, but also for pro-environmentalist citizens.

A second macro-area of investigation is the relationship between climate change scepticism and vote participation is extensive and they agreed on the fact that public support for climate policies is associated with climate change scepticism in the electorate (Jenkins, 2011); but, at the same time, it is still possible to notice as the causal direction of this relationship is still unclear and vary across countries and election cycles. Studies conducted by Zahran, Brody, Vedlitz, Grover and Millen (2008) have shown the relationship between U.S. Democrats and the enrolment of their localities in the Cities for Climate Protection (CCP) program. Zahran and colleagues (2008) argue about the existence of correlation between the Democrats voters in presidential elections and the portion of households in the U.S. using solar energy systems and technologies for house heating.

Interesting results derived from the study conducted by McCrea, Leviston and Walker (2015) where is argued as the behaviour of climate change scepticism is manifested one year after an election at both the individual and electoral levels. More specifically, voting for a political conservative party leads to higher levels of climate change scepticism, whereas voting for more liberal parties leads to lower levels of scepticism. According to the authors, these results are consistent with cognitive dissonance and social identity theory. Individuals who vote for conservative parties become more consistent with the party they voted for, this process reduces any cognitive dissonance aroused by voting behaviour, which may be inconsistent with their previous attitude toward climate change. In synthesis, left-wing and green political orientation can strongly influence policy support. Environmental values also tend to lead to policy support as do egalitarian worldviews. Moreover, people with beliefs toward climate change as a reality, anthropogenic factor, harmful, are more propense to support climate policies. Hierarchists and individualists tend to have adverse attitudes, as do groups of people of right-wing, scepticism and biased believers (Drews & Van der Bergh, 2015).

Summarising, these brief examples show two cases in which perception of climate change and political engagement are strictly related. Obviously, they are not sufficient to create an economic and cognitive path but they are the starting point of a deeper future analysis. It is possible to affirm that a relationship exists and it is vastly analysed by academia under different lenses. Here it was tried to highlight the macro areas and the macro aspects of such a complex and expansive multidisciplinary phenomenon.

## **5. Conclusion**

Exploring the vast literature about the perception of climate change, the factors influencing it and the socio-economic implications of this phenomenon is not a simple task. The literature is extremely extended and it considers the subject from several and multiple perspectives. The aim of this study is to try to create a concrete synthesis and framework of the topic, highlighting the fundamental aspects and the key points in order to have a general picture of it. Obviously, for reasons related to the need to synthesise some aspects should need an in-depth analysis. Moreover, the linkage between all factors extrapolated should be investigated more, with a precise focus on the role of communication and the impact of it on the different generations and subgroups of people. In the end, communication is an essential step also in policy communication, because as it was described before, support is linked not only to climate change awareness, but also to policy efficacy itself.

Factors influencing perception of climate change are multiple and they are strictly interconnected and their network has effects on the way in which people interpret and engage



with climate change information. Socio-demographic characteristics, experience of optimistic bias and psychological distance, mass media, values and beliefs, political ideology, perception on scientific community agreement and geographical disparity work together to the reinforcement of pre-existing factors creating reactions and behaviours - positive or negative actions - that are the reflection of them. The reflection on the impact of these factors on the perception of climate change leads to the fact that merely categorises them as having positive or negative impacts on how climate change is interpreted. In other words, the superficial interpretation of the factors as only positive or negative can lead to a misinterpretation of the impact these factors have on how reality is perceived. For example, considering the link between socio-demographic characteristics, values and political ideology, there is a higher probability to believe in the consequences of climate change on the future if the individual is part of the Millennial or Gen Z and has an anti-speciesist view of the world, if it votes for green parties or more general left-wing or if he/she has a positive attitude toward the scientific community. On the other side, being part of the right-wing and being sceptical of the scientific community, especially in the elder, lead to a higher probability to have a lower level of belief regarding the impact of climate change on the future and a lower probability to take concrete actions. Moreover, being part of the ethnical majority of the population lead to facing fewer risks, especially if it is part of the upper-class; on the other hand, being part of a marginalised community, and being part of the lower-class can lead to a significant difference in the way the climate change is perceived.

Furthermore, to understand how to better reinforce people's engagement in pro-environmental discourse or, on the other hand, how to attract their attention and interest. The perception of climate change could represent a source of information to evaluate the impact and the engagement of a policy on citizens.

For future, it could be interesting to implement the analysis of the literature throughout a network analysis with the purpose to deeply explore the connection among the identify factors influencing climate change perception and adding more information to have an expanse framework of such a complex topic.

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# **Estimation of willingness to pay for *Ursus arctos* conservation. Italian case studies.**

## **Abstract**

Individuals play a central role in climate change mitigation actions. Their participation, combined with local strategies, can significantly impact on environmental preservation. This research investigates people's willingness to pay for *Ursus arctos* conservation in Italy. *Ursus arctos* (brown bear) lives principally in the Alps and central Apennine, where it is threatened by human presence (e.g., illegal hunting, random encounter with locals, car accidents). We used the contingent valuation method (CVM) to investigate how much residents in the area of Trento and Marsica were willing to pay (WTP) for brown bears conservation. Local governments and natural parks have a key role in wildlife management and conservation. We found a common interest in bear protection, even if there are slight differences in WTP. The amount varied between 4 euro for Trento and 17 euro per person. We found that young woman who have a strong awareness about environmental protection and have a high park frequency have the highest WTP.

## **1. Introduction**

The rapid deterioration of global environment is highlighting the importance of biodiversity in terms of environmental safety. In particular, conservation of large carnivores is one of the hot issues in terms of environmental conservation. Globally speaking, the relationship between local communities and large carnivores has an history of conflicts that policies makers are constantly facing. The main reasons of conflict are, for example, the perception of carnivores as direct threat to human communities; carnivores also enter in fashion or medical market in an unsustainable way; humans and carnivores are constantly competitors for resources (Sillero-Zubiri *et al.*, 2013). In such framework, the survival of large carnivores derives from the capability of policy makers to invest in programmes that considers the needs of local communities and wildlife, combining measures to guarantee peaceful coexistence and species conservation and preservation (Harihar *et al.*, 2014).

A central role in this perspective is given by individual's attitude. The literature has revealed that personal values and beliefs, and emotional aspects play a fundamental role in human-wildlife interaction (Manfredo *et al.*, 2021). A strong fear or the perception of economic damages to their properties leads to negative attitudes toward carnivores (Røskaft *et al.*, 2007). Moreover, people with mutualist orientation shown a more positive attitude towards large carnivores' repopulation, conservation, and preservation programs (Grilli *et al.*, 2018; Kansky *et al.*, 2016).

On the other hand, large carnivores have positive impact: economic area, health and well-being and social-cultural area (see, for example, Rode *et al.*, 2021). Moreover, the presence of large carnivores on the territories has a positive impact in terms of: benefits from tourism and commercial activities, benefits from population control, regional products and marketing, cultural heritage and identity, educational and research benefits, and social cohesion (Rode, 2021).

Attitudes and preferences are reflected in participation and contribution to implement protection programmes. In particular, the interest of local communities can be interpreted throughout the usage of monetary valuation and economic interest in large carnivores. Academia is interested in investigating people willingness to pay for species conservation. Literature has deeply explored the relationship between human and large carnivores, and they were identified as charismatic species or "flagship species" (Kontoleon & Swanson, 2002). Animals as giant panda, lions, tiger, elephant, and whales, for example, are immediately identifiable by name or commonly associated with a particular geographical location. Those

species are able to attract donations and contribution to habitat protection more than other species of animals like salamanders, insects, bats, or more generally speaking uncommon and uncharismatic species (Richardson & Loomis, 2009, Loomis & White, 1996). In their analysis Kontoleon, & Swanson (2002) show as “flagship species” influence positively donations and, as in the case of Giant Panda, donations that can be invested in more general and efficient programmes for the environmental and habitat protection. In other words, a single species is able to catch the attention and the interest of individuals leading them to donate and these can be reinvested in programmes that can be benefits for other species in need.

On contrary, people’s animal fear could be negatively influences donations and interest in species conservation. In a study conducted in Sweden, Johansson *et al.*, (2021) demonstrated as people who fear an encounter with large carnivores are less likely to willing to pay for species or were likely to pay a lower amount of money protection management programmes. Similar research conducted in Greece as highlighted as fear and in general negative emotions towards bats are the most important negative predictor of willingness to pay for bats conservation (Liordos *et al.*, 2021).

Furthermore, interactions among human and wildlife have significant changes among rural and urban areas (König *et al.*, 2020). Study conducted in Sweden on large predators has demonstrated the existence of a significant difference between different strata regarding the support for the predator policy. The support is relatively small in wolf areas and smaller in wolf territories. A misalignment is also highlighted among non-rural areas, rural areas, and big cities; in fact, major cities population as citizens from Stockholm and Malmö are clearly in favour of protection of predators, while citizens of rural areas are lower likely to pay (Broberg & Brännlund, 2007).

In this paper, we explore the perceived public benefits associated with bear protection by asking local people their WTP in the only two Italian areas where the bear is present: the Trentino area (Northern Italy) and the Marsica area (Central Italy). This research aims to understand the factors affecting WTP in two contexts where bears and humans live in close contact, but with a very different histories of coexistence: continuous over time in Marsica, or recent after many years of absence or almost absence in Trentino. This study will provide information to policy makers about the citizen engagement with autochthone wildlife having, favouring implementation and integration of environmental protection policies and programmes. The paper is structured as follow: Section 2 explores the study areas, reporting the differences in bears’ background and focusing on the morphological characteristics and differences between the two species. It is also presented the econometric methodology applied in the study and the resources used. Section 3 presents the results of the survey. Section 4 reports discussion and conclusion.

## **2. Methodology**

### **2.1 Study area: Trento**

*Ursus arctos* is a specie of bear living in the area of Trento and Marsica. Trento is a province of Northern Italy near Alpes and in its territory is situated The Adamello Brenta Nature Park.

The Adamello Brenta Nature Park is situated in the western area of Trentino, with its 620.51 sqkm is the largest protected area in Trentino. Established in 1967 it includes the Adamello and Brenta mountain ranges; it is crossed by the Val Rendena and surrounded by the valleys of Non, di Sole and Giudicarie. The altitudine ranges from 477m to 3558m<sup>1</sup>.

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<sup>1</sup> <https://www.pnab.it/il-parco/il-parco-naturale/>

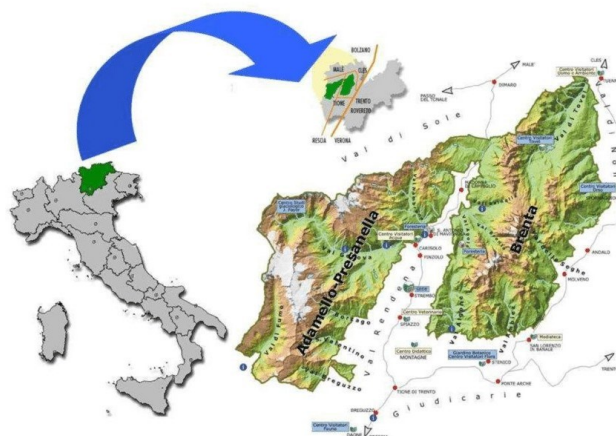


Figure 1: The Adamello Brenta Natural Park

### *Life Ursus*

The progressive extinction on Italian Alps of *Ursus arctos* has its grassroots between the XVI and the XIX century, because of human persecution and the increasing reduction of its natural habitat. Increasing number of wooded areas where, deforested to create pastures and land for agriculture. The widespread agricultural and zootechnical exploitation of mountain environment has significantly contributed to exacerbate the bear-human relationship creating, in this way, a more effective network for persecution, also encouraged by a system of bounties for the killed bears. The data demonstrate that in this period there were killed 192 bears. The massacre stopped in Lombardia, in the 1910, in Trentino-Alto Adige in the 1915 and in the Brenta area only in 1925. The *Ursus arctos* was declared protected species in the Testo Unico sulla Caccia n.1016 – 1939<sup>2</sup>.

*Life Ursus* is a project started in 1996 with the aim to reintroduce the *Ursus arctos* in Trentino. The project was created thanks the cooperation among The Adamello Brenta Nature Park, Autonomous Province of Trento, Istituto Nazionale della Fauna Selvatica (ISPRA) and European Union. The project was divided into two steps: feasibility study and operative phase. During the feasibility phase was decided to reintroduce 9 specimens: three males and six females between three and six years old. They were chosen to recreate in 20-40 years a bear population of 40-50 individuals. The area indicated for the release were the western area of Trentino and provinces of Bolzano, Brescia, Sondrio, and Verona – total area of 1700kmq. Networks and partnership were created in this phase, in particular partnership were established with the four bordering provinces, the Associazione Cacciatori Trentini, the WWF and several local and national agencies. After the creation of the network, was conducted a survey among population, 1500 citizen were involved and the 70% declared a positive attitude toward the reintroduction of bears in the region. In the 1999 started the operative phase. The first two bears were released: Masun e Kirka. Between 2000 and 2002 additional 8 bears were released. All the bears, originated from Slovenia, had radio collars and ear tags to monitor their movements during the post-release period. Brown bears were translocated from Slovenia because there were a population genetically similar to that of Trentino (Randi *et al.*, 1994).

The results demonstrate that the project facilitated the spontaneous reappearance of the bears in the Italian territory contributing to the strengthening of the ursine population and the expanding in the centra-eastern Alps. The *Life Ursus* project was completed in 2004.

<sup>2</sup> [https://grandicarnivori.provincia.tn.it/L-orso/Storia-sull-arco-alpino/Cause-di-recessione#:~:text=Il%20grosso%20degli%20abbattimenti%20cessa,1016%20del%201939\).](https://grandicarnivori.provincia.tn.it/L-orso/Storia-sull-arco-alpino/Cause-di-recessione#:~:text=Il%20grosso%20degli%20abbattimenti%20cessa,1016%20del%201939).)



At the end of 2019 the number of bears is estimated around 82-93 individuals, with an average age is around – cub excluded – 4.8 years – 4.6 years for males and 5.0 for females<sup>3</sup>. The population is accurately monitored, and refund are allocated in case of damages to humans or property. In the presence of problematic bears special protocols are applied for their management (Ufficio Faunistico del Parco Naturale Adamello Brenta, 2010)<sup>4</sup>. In cases of damages, financial compensation is allocated to population. In 2019, 274 damages caused by large carnivores were reported, 228 caused by bears, 46 by wolfs. 190.083,81 euro of financial compensation were settled – 152.689,68 euro destined to compensate damages caused by bears. At the same time, damages prevention programs were implemented, they include the distribution of guard dogs, in particular Maremma Shepherd were acquired to certified companies and distributed to farmers who asked for them. These strategic measures have the aim to guarantee the pacific coexistence between large carnivores and mountain animal husbandry<sup>5</sup>.

### *Ursus arctos arctos*

*Ursus arctos arctos* is a large mammal of robust structure. The head is wide and massive, with short and rounded ears, small eyes, stocky back, a short tail, and powerful legs. It belongs to the order of the Carnivores, but it is called “opportunistic omnivore” because only occasionally eats meat, preferring a vegetarian diet, adaption to the most abundant and accessible type of food.

Like humans, bears are plantigrade, this means that bears rest on the ground the whole plant of foot. Adult bears generally move on the pass, while when they take off, they gallop, reaching 45 km/h. In alpine environment the males may exceed the weight of 200 kg, whereas females usually weigh just over half<sup>6</sup>.

Females can have from 1 to 3 cubs; upon birth their weight is less than 500 grams, and they are totally dependent from their mother. Cubs remain with their mother and siblings more than one year<sup>7</sup>. Except for the period of love, during which female and male remain together, bear is a solitary animal that avoids the encounters with other conspecifics. It could happen that siblings may remain together for a while after detachment from the mother. In most European territories human activities has induced in the bears a crepuscular and nocturnal behaviour<sup>8</sup>. Life expectation is around 35-40 years.

Ursine population is monitored by Autonomous Province of Trento since 1970 through: fieldwork, radio-tracking, camera-trap, and genetic monitoring. Genetic monitoring, in particular, allows to create database thanks the collection of organic samples as hair, excrement, urine, saliva, tissues. Olfactory traps allow to collect hair by barbed wire or while other samples are collected on the territory during the ordinary service activities and near the control of scratches and/or where damages are detected and reported.

The presence of the *Ursus arctos* was detected in 18 sites on 60. The Figure 2 below shows the maps of the events of camera-trapping in the area of Trentino between 2015-2019<sup>9</sup>. “Eventi orso” represents the density of bears sighting in a given area, from 1 event to 11 events.

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<sup>3</sup> <https://grandicarnivori.provincia.tn.it/L-orso#>

<sup>4</sup> <https://www.pnab.it/il-parco/ricerca-e-biodiversita/progetti-faunistici/orso/life-ursus/>

<sup>5</sup> [Rapporto Grandi Carnivori, pp.31-40](#)

<sup>6</sup> <https://grandicarnivori.provincia.tn.it/L-orso#>

<sup>7</sup> <http://www.parcoabruzzo.it/scheda-orso.php>

<sup>8</sup> <https://grandicarnivori.provincia.tn.it/L-orso#>

<sup>9</sup> [Rapporto Grandi Carnivori, pp.5-8](#)

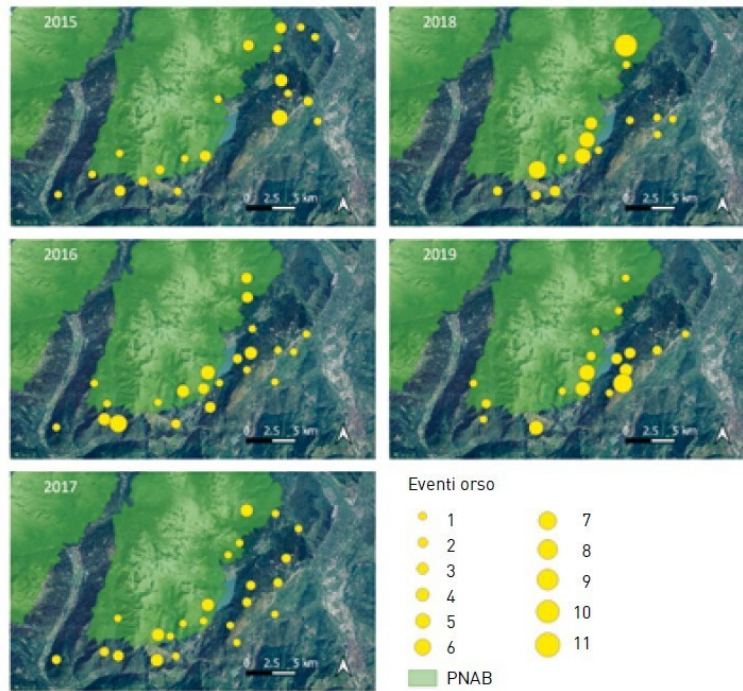


Figure 2: Presence of bears 2015-2019

The data collected are analysed and processed on annual basis and they refer calendar year (1/1 - 31/12) that is also the “biological year” of the bears. During 2019 it was forecasting 9-12 broods, and the bear M35 was founded – it was genetically revealed last time in 2016. Moreover, no deaths were detected in 2019. Since 2003, deaths recorded are 34. Causes are linked to natural deaths (29%), anthropic causes (44%) and unknown causes (27%). 15 of 25 known deaths are caused by humans: 4 poaching/illegal kill, 7 accidental deaths and 4 authorised haunting (one in Germany, one in Trentino and the last two in Switzerland)<sup>10</sup>.

Ursine population is distributed in Trentino and outside the region. Three bears were detected outside the province, M29 and M46 were located in Switzerland (M29 was founded in Piemonte too) and M4 in Friuli Venezia Giulia. 6 bears had cubs, not only in Trentino, but also in the area of Bolzano – M7, M66 and M52; in the province of Sondrio were found M19 and M38 and M57 crossed the area of Brescia. Basing the distribution forecasters on these data it is possible to assume that the male young population of the central Alps cover a theoretical area of 45.327 sqkm. On the other side, females occupied a territory of 1.516 sqkm<sup>11</sup>.

## 2.2 Study area: Marsica

Marsica is an area in the central Italy comprehensive of three regions: Abruzzo, Lazio, and Molise, also where the Abruzzo Lazio and Molise National Park is located.

Abruzzo Lazio and Molise National Park was founded in the 1921, 25<sup>th</sup> November. The majority percentage of area is located in Abruzzo, while smaller parts of the park cross toward Lazio and Molise. The area is 496.80 sqkm. It is crossed by Monti della Meta (maximum altitude 2249 meters) and the Sangro River rises near Pescasseroli and runs through the artificial Lago di Barrea. Several lakes and rivers characterised the geography of the park<sup>12</sup>.

### *Ursus arctos marsicanus*

<sup>10</sup> [Rapporto Grandi Carnivori, pp.12](#)

<sup>11</sup> [Ivi, pp.19](#)

<sup>12</sup> <http://www.parcoabruzzo.it/>

*Ursus arctos marsicanus* is an endemic subspecies of *Ursus arctos* (Ciucci & Boitani, 2008; Colangelo *et al.*, 2012). The Apennine bear shows some morphological, genetic, and behavioural differences with the *Ursus arctos arctos* (Loy *et al.*, 2008; Ciucci & Boitani 2008; Colangelo *et al.*, 2012). Local selective pressures have influenced the reduction in body size and a change in feeding behaviours with a reduction in meat consumption (Loy *et al.*, 2008; Colangelo *et al.*, 2012), leading to an evolution toward to herbivory diet (Colangelo *et al.*, 2012, Benazzo *et al.*, 2017). Moreover, the development of less aggressive behaviour towards humans allowed the survival to endangered population in human-dominated landscapes and the coexistence with the inhabitants of the Apennine mountains (Marino *et al.*, 2021)

This ursine species has found its habitat only in the middle-western area of Apennines, principally in the Natural Park of Abruzzo Lazio and Molise, even if some individuals have colonised the near parks of Sirent-Velino, Della Majella and the natural reserve of Monte Genzana e Alto Gizio<sup>13</sup>.

The monitoring programmes has led to forecast a population of 45-69 individuals in the area of the park and in the nearby areas<sup>14</sup>. Currently, bear range has been estimated to 5422 sqkm across the central Apennines (Ciucci *et al.*, 2017).

Some definition of bear behaviour before going further:

- Confident bear is an individual that has lost its natural mistrust against human as consequence of repeated exposure to contact without negative effects. According to studies, this phenomenon is caused by several factors as age, sex, temperament of the bear, social hierarchy, seasonal fluctuations, and accessibility of anthropogenic food sources<sup>15</sup>.
- Problematic bears are, on the other side, animals that have conflictual behaviour in the human-bear relationship, creating frequent social and economic damages<sup>16</sup>.
- Conditioned bear is an animal that has associated the human presence to the presence of accessible food source<sup>17</sup>.

The Park is carrying out a continuous monitoring process of bears behaviour, in particular problematic and confiding bears are under observation. According to the Parco Nazionale D'Abruzzo Lazio e Molise, 2020 -Natura Protetta (2020), in the last 5 years, four individuals have manifested problematic and/or confiding behaviour: females FP01 (Gemma), F17(Amarena), F18(Giacomina) and the male M19 (Mario). Females F19 (Liberata) and F21 (Bambina) even if have not shown a total confiding behaviour have still visited sometimes urbanised areas or nearest areas.

In all the three cases bears are monitored and several measures are applied in order to avoid conflicts between humans and wildlife. As in Trentino, *Ursus arctos marsicanus* is monitored with radio-collars, camera traps and genetic monitoring. The purpose is to create behaviour patterns and understanding the frequencies on which bears frequent urbanised areas. In the Figures 3,4,5 and 6 below – from the Parco Nazionale d'Abruzzo Lazio e Molise Report (2020) shows respectively the area of four different bears: F18-Giacomina, F21-Bambina, F22-Barbara and M17-Daniele. In these examples the areas are restricted, the territory occupied for each individual is from 58 sqkm (M17) to 350 sqkm (F12).

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<sup>13</sup> <https://www.fondazioneuna.org/news/dove-sono-gli-orso-in-italia-conosciamoli-meglio/>

<sup>14</sup> <http://www.parcoabruzzo.it/scheda-orso.php>

<sup>15</sup> Parco Nazionale D'Abruzzo Lazio e Molise, (2020), pp. 8

<sup>16</sup> *Ibid.*

<sup>17</sup> *Ibid.*



Figure 3: F18



Figure 4: F21

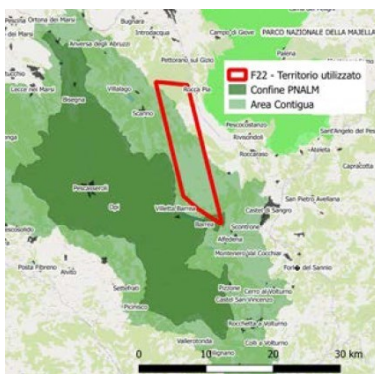


Figure 5: F22

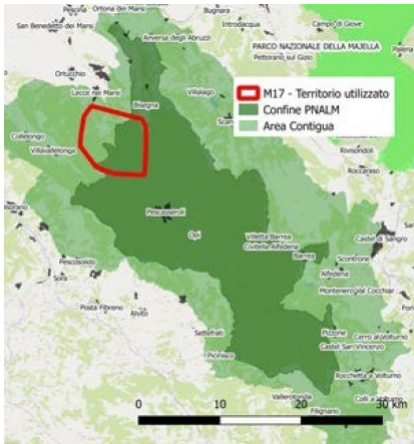


Figure 6: M17

Data from 2020 highlights no death among bear population. Trends from 1970 to 2020 shows as the majority of death are caused by: 41% by unknow causes, 22% by firearms, 12% by car accidents; other causes are poisoning, train accidents, poaching, disease<sup>18</sup>.

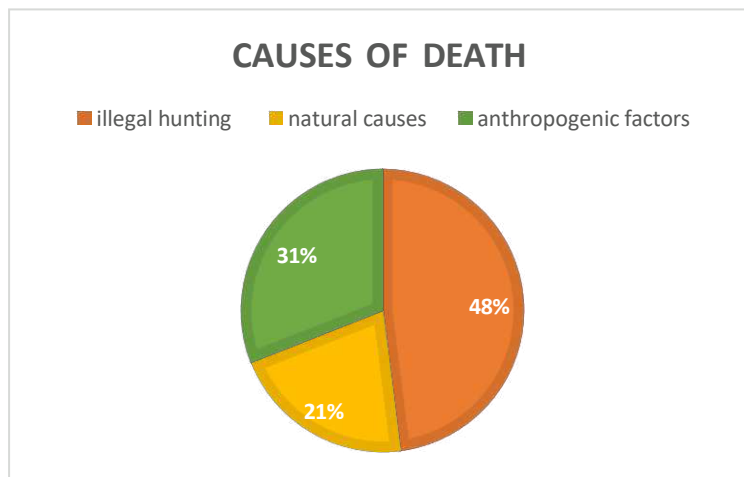


Figure 7: Causes of death

### *Life Arctos Project*

*Life Arctos Project* had the aim protect and preserve on the long-term *Ursus arctos* in Italy. Sponsored by European Union, the project - from 2010 to 2014 - had identified and implemented tools and measures to protect the ursine population both on Alpes and Apennines. In particular, in the Marsican geographical area, it was articulated in several phases: analysis and implementation of bear-friendly livestock management systems; increase of trophic availability bears in the area of the park through the planting of ramno plants; free loan of electrified fences to protect livestock, apiaries, and crops; management of “problem bears”; education and awareness actions on bear presence, addressed both to visitors and population<sup>19</sup>. Comparing the size of ursine population at the beginning and the end of the project it was possible to observe that the population in its central range is not in a regression phase ( $0.85 \leq \lambda \leq 1.14$ ) neither it is growing. Data demonstrates demographic stability, although there has been an annal productivity – at least 31 cubs born from 2011 and 2014. During the *Life Arctos Project*, 12 bears were recovered dead as a result of unknown cases or directly or indirectly caused by humans (poaching, impacts with vehicles, diseases). Marsicanus ursine population

<sup>18</sup> Ivi, pp.16-25.

<sup>19</sup> Progetto *Life Arctos* <http://www.parcoabruzzo.it/pagina.php?id=201>

has also shown the reduction of the mean heterozygosity and number of alleles observed in the new genotypes sampled in 2014, indicating high rates of genetic erosion due to a particularly small effective population. These highlights the urgency of aggressive and effective actions to facilitate the rapid numerical and range expansion of the Marsican brown bear population (Parco Nazionale D'Abruzzo Lazio e Molise, 2015).

#### *P.A.T.O.M.*

Simultaneously the application of *Life Arctos Project* several measures are taken into action to preserve the ursine population. Because of the fragmentation among administrations, it is more than difficult to plan and implement management solutions, especially in the area outside the park it is complicated to obtain and coordinate the support of administrators in absence of laws and regulations. To tackle these problems the Abruzzo Region, jointly with Ministry of the Environment, Land and Sea, launched the P.A.T.O.M. (Action Plan for the Protection of the Marsican Brown Bear) initiative in 2006, involving regions, provinces parks, universities, and other bodies in the area. The aim is to facilitate the planning, the approval and implementation of protocols and management tools on a large scale. The protocols PATOM is currently working on are those that concern direct threats to bears – surveillance and control of the territory, harmful substances) or management activities (hunting, infrastructures, zootechnics) that can directly interfere with bear conservation on both local and large scale<sup>20</sup>.

### **2.3 Contingent valuation method**

The contingent valuation method (CVM) is commonly used by economists to estimate the WTP for maintaining and improving the quality of the environment and wildlife preservation and conservation (Haefele *et al.*, 2019; Notaro & Gilli, 2021; Broberg & Brännlund, 2008; Kontoleon & Swanson, 2003; Loureiro & Ojea, 2008; Lew *et al.*, 2010; Diffendorfer *et al.*, 2014). CVM is a direct method in that it involves asking a sample of the relevant population questions about their WTP (Wang, 1992); the main characteristic of CVM is that the method refers to stated preferences (Boyle, 2003, Haefele, 2019) required when the economic benefit is related to non-use or passive-use of the good. There are four major types of techniques available in the literature: the bidding game, the payment card (PC) approach, the open-ended (OE) – questions that provides respondents a blank space in which to construct their response - and the dichotomous choice (DC) approach (Boyle, 2003). To achieve the purpose of the research, the payment card approach is used. The payment card approach was introduced by Mitchell and Carson (1989) and involves question about individual WTP chosen by a range of pre-fixed value, this choice represents the true value located above the indicated value and below the next higher one (Hu, 2006). The advantages of the PC method can be found in the usage of primary data, respondents, in fact, state WTP values they are confident about and there is no starting point bias (Mitchell & Carson, 1989).

Literature is deeply investigating the willingness to pay (WTP) related to endangered species. In particular, the attention is focused on the large carnivores and mammals that as flagship species are able to capture the interest of people, not only of the potential public of donors but also of researchers that use them to investigate the participation in conservation programmes. Studies conducted in Sweden, for example, focus their attention on the conservation and preservation of wolves, wolverine and lynx (Ericsson, 2007; Ekstrand, 2018; Broberg & Brännlund, 2008) they have estimated that individuals' WTP is from 28 euro (290SEK) and 121 euro. Perceived differences in WTP are visible, especially between residents of rural area; the difference is given by the coexistence in the same territory (Broberg & Brännlund, 2008). Looking at the research dedicated to bear protection, interesting evaluation

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<sup>20</sup> Conservazione e contesto istituzionale <http://www.parcoabruzzo.it/pagina.php?id=116>

research was conducted by Han and Lee (2008), the focus was on the protection of the Manchurian black bear - South Korea. Two experiments were created and the data shows as for the hypothetical scenario the WTP estimated is around US \$10.49, while at only US \$4.99 per household in the real-world setting. Moreover, Ma *et al.* (2016) investigated the public support and willingness to pay for the Giant Panda Reintroduction Project (GPRP) in Sichuan, China. The results showed that local people strongly support this project and their WTP is equal to ESD31, per year; the WTP is strongly influenced by the perception of panda as part of the cultural heritage. Similar results are reported by Watkins *et al.* (2021), in their study it is highlighted as the residents of a 5-country area surrounding the elf restoration zone in East Tennessee have a range between 45 to 54 dollars per household for elk reintroduction. The WTP is strongly influenced by the level of confidence and trust in the managing wildlife agency.

#### **2.4 Protest bidders**

Protest responses and analysis of the answer 0 as misleading answer (Boyle, 2003). The academia explains that there are three different approaches to treat the zero of a data set, the first of them proposes to discard zero responses from the sample. However, discarding zeros from the analysis may lead to an upward bias in WTP estimations (Meyerhoff & Liebe, 2006). The second approach considers the zeros as legitimate value of WTP, so they are included in the analysis and separately analysed. Finally, it is proposed to assign to the zeros the average value of the WTP sample based on the socio-demographic characteristics of the non-protestor group (Rankin & Robinson, 2008; Halstead, *et al.*, 1992; Chen, & Qi, 2018; Dziegielewska, D. & Mendelsohn, 2007).

Individuals may be unwilling to pay for different reasons. For example, Martin-López (2007) identifies as the emotional responds and utility have a high impact of WTP choices. Individuals are affected by their predisposition to be attracted by some species rather than others. Past and present interactions can influence the responds and social factors such recreational use or property relationship. Respondents may also act strategically, protesting against some component of the CV survey or refusing to play the game of economy (Meyerhoff & Liebe, 2005; Choi & Felding 2013). Other factors that influence the answer, are the perceived control, the attitude towards the behaviour and the intention to perform a behaviour. As identified by Meyerhoff (2006) those attitudes not only provide predictors of specific behaviour related to WTP but have also an influence their answer and their WTP choice.

Following this framework, we structured some questions in order to analyse the zero values and categorise them as true or protest zeros. Protestors are identified as individuals who have a high interest in natural park frequency, biodiversity protection and perception of high quality of life-related to living in a biodiverse environment –they have stated interest and awareness in environmental protection or concern about biodiversity loss - but they are a WTP equal to 0. Furthermore, a follow-up question is included to better understand the reasons behind WTP equal to 0 euro. The main focus was about prior information possessed by individuals, budget constraints or trust in the institutions; so, for example, “I do not have enough information to make an appropriate choice”, “I think I already contribute enough”, “I would like to contribute but my budget does not allow it”, “Biodiversity protection is already the responsibility of the state/region” (the option “other” is allowed). To ensure the comprehensive interpretation of the results, following the methodology applied by Diffendorfer and colleagues (2014) by when estimating the mean value of the donations, we calculated and reported the analysis both with and without protestors; also, the ordered probit analysis is conducted both including and excluding the protestors. The reason behind this is to use the data to explore the regional differences between donation patterns in the most efficient and extensive way.

## 2.5 Survey format and sample size and description

CV method involves the development of a survey that describes: the good to be valued, the program of maintaining or improving the good, a means of paying for the program and a means to elicit respondents' WTP (Haefele, 2019). The public good we are focusing on is the population of bears in Trento area (Northern Italy) and in Marsica area (Italian region of Lazio – Abruzzo and Molise; Central Italy). We provide information about the bears history and living conditions. As suggested by Reaves (1999) we pre-tested surveys in order to avoid the biases described in the previous paragraph. The pre-test was conducted on a sample of 66 observations divided by 23 in Marsica area and 43 in Trento area, the purpose was to understand the efficiency of the questionnaire and percentage of response to the survey and the rate of protest bidders. After the implementation phase we moved on to the administration of the survey on the random population in the two Italian regions. It is important to underline that in contrast with most of the paper on the topic, this paper we do not focusing on a particular program, but we want to investigate the local people involvement in preservation and conservation of natural habits for an endangered species throughout WTP valuation, so the question is structured in order to highlight the importance of the local community commitment and support to the local management to implementing a peaceful coexistence.

The survey was carried out by means of personal interviews conducted telephonically by a specialist third party – Demetra opinion.net - on a sample of 500 residents in the Province of Trento (Trentino Alto-Adige Region) and 505 the cities in the Provinces of L'Aquila, Isernia, and Frosinone (respectively Abruzzo, Molise and Lazio regions – so called “Marsica area”) during the summer and the autumn 2020 – the administration of the survey was postponed because of SARS-Covid19 global situation. To achieve the purpose of the research respondents were randomly selected in the pre-selected area; the total sample is composed of 1005 observations. The survey was composed of 17 questions, and it presents some differences between the two areas because of the divergences in bears' background history. The questionnaire developed for Trento focused on: background information about the bears living conditions, the project *Life Ursus* and the management of “dangerous” bears. The second section focuses on respondents' general environmental attitudes and behaviour (e.g., environmental awareness, perception of environmental issues, membership of environmental protection organisations and monetary donation). There are also questions to understand the level of respondents' knowledge about endangered species awareness (familiarity with the *Life Ursus* project, biodiversity issues) and then WTP questions where it is asked to indicate the maximum amount of money, they are willing to pay in order to protect and conserve the species; in case of WTP equal to 0 it is presented a question about the motives behind this choice. The third section includes questions about the respondents' demographic and socio-economic characteristics.

The survey designed for cities in the area of National Park of Abruzzo, Lazio and Molise is structured as the previous one, with the same number of questions and the same division among sections, but the background information focuses on the history of *Ursus arctos marsicanus* and their actual living condition<sup>21</sup>.

Considering the WTP questions, the amounts are presented in increasing order, and it includes a 0-euro amount and a blank space that can be filled with the specific amount chosen by the respondents if their WTP diverge from the monetary value presented in the payment card. The amount is based on actual levels of donations provided by environmental protection organisations (e.g., WWF – Save the children) and it is listed amounts “0 – 5 - 10 – 20 – 50 – 100 – other”, was provided to respondents to state the highest amount that they would be

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<sup>21</sup> Full survey is presented in the Appendix



willing to pay for bears preservation and conservation. The choice is also supported by Rowe (1996) who stated that there are no differences in the range and centre values across different payment card versions. The WTP questions are stated as follow: “Having the chance to make a one-off donation to contribute to the study and protection of *ursus arctos arctos* (*ursus arctos marsicanus*) in order to promote peaceful coexistence between bear and community, what amount would be willing to pay”. And a second question “Considering the study and the protection of *ursus arctos arctos* (*ursus arctos marsicanus*) and its management to promote a peaceful coexistence between bears and community, what amount would be willing to pay an annual share of...?”. In both cases, to respondents were presented six discrete categories of monetary donations (€0, €5, €10, €20, €30, €50, €other). Payment card is considered consistent with how actual (voluntary) donations are usually implemented (Champ & Bishop, 2006; Brouwer, *et al.*, 2008).

## 2.6 The econometric model

The dataset constructed is analysed using the ordered probit model (OPM). OPM analysed the impact of explanatory ordered outcomes (Ting & Cheng, 2017), in particular the usage of OPM is useful when the dependent variable is expressed in categorical order, as in the case of payment card approach. The set of dependent variables is created taking into account the expressed value of respondents; in this way, the OPM result is more statistically efficient rather than the binary logit or probit models (Jekanowki *et al.*, 2000). Moreover, the dependent variables are constructed taking into account the presence or the exclusion of protestors. The first step was to identify the bid value for Marsica or Trento and if those bids are into the categories expressed by the payment card (€0, €5, €10, €20, €30, €50, €other) and if the amount expressed refers to una tantum contribution or annual contribution. At this point, the preliminary sets of variables were created: bid Marsica una tantum; bid Marsica annual contribution; bid Trento una tantum contribution and bid Trento annual contribution. Hence, a new set of dependent variables are created taking into account the presence of protestors. In other words, protestors are identified as individuals who have expressed €0 as WTP but they stated that they derive some kind of benefit from the presence of bears within the territory. Once the protest votes had been identified, it was possible to create the dependent variables - for Marsica and Trento (both for una tantum and annual contribution) - including and excluding protest bidders. We decide to include or exclude protest bidders because of the impact of the zero on the final results. As previously mentioned, the impact of the zeros can affect the final result; in this way, a comparison and a more efficient analysis can be conducted. As previously stated, an OPM was used to analyse the response to the WTP question, where:

$$y_i^* = x_i' \beta + u_i \quad \text{Eq.1}$$

$y_i^*$  represents the dependent variables and  $x_i'$  the set of independent variables considered in the analysis.  $\beta$  is the constant term, while  $u_i$  is the error term. The independent variables included in the analysis are:

- The dummy variable “gender” assumes a value equal to 1 if the respondent is female or 0 if it is male (the survey gave the possibility to express a non-binary gender but we do not have any feedback about this).
- The categorical variable “age” from 1921 to 2006.
- The variable “Educational level” investigates the maximum level of education acquired by the respondents.
- The variable “park frequency” includes values from 0 (never) to 4 (frequently) that express how many times in a year respondents decide to visit a natural park.

- The variable “biodiversity loss” expresses from a scale of 0(very low) to 5(very high) the degree of perceived risk related to the extinction of the local flora and fauna.
- The variable “monthly income level”, where the categories of income are constructed from 0-1000 euro to income higher than 5001 euro per month.
- The dummy variable “acquaintance of Marsican bear” has a value equal to 0 if respondents do not know anything about the Marsican bear and 1 otherwise.
- The dummy variable “acquaintance of Trento bear” has a value equal to 0 if respondents do not know anything about the Trento bear and 1 otherwise.

Additionally, it was decided to provide results including and excluding the monthly income level variable. Two reasons behind this choice: first above all, one of our hypotheses is that monthly income level is not the principal driver of WTP because of the strict relationship between humans and wildlife. Secondly, after some pre-test, it was noticed that when income is included in the analysis there was a variation in the significance of some variables, this implies a correlation between monthly income level variables and other independent variables.

Going further, the model is regressed not only for each individual region but also for the aggregate data; in other words, there were constructed additional dependent variables “TOTbidMT\_ut\_PROT\_SENZAOUT” – total sample, una tantum donation, without outliers, with protestors; “TOTbidMT\_ca\_PROT\_SENZAOUT”- total sample, annual contribution, with protestors, without outliers; “TOTbidMT\_ut\_NOPROT\_NOOUT” – total sample, una tantum donation, without protestors and outliers; “TOTbidMT\_ca\_NOPROT\_NOOUT” – total sample, annual contribution, without protestors and outliers. At this point, the OPM uses the same socio-demographic variables but considers the aggregate data, in particular:

- The dummy variable “acquaintance of bear” is equal to 0 if the respondents do not have any knowledge about bears, 1 otherwise.
- The dummy variable “region” has value 0 if the respondent is from Trento, 1 if the respondent is from Marsica.

To compute the analysis the outliers are excluded because it is not possible to identify the real meaning of those values; outliers include only 4 observations and include the value from 1000 euro to 5000 euro.

### **3. Survey Results**

In this section survey results are presented. The first paragraph focuses on the role of storytelling. To better understand the motivation behind WTP, it is conducted a preliminary analysis on the role of media in the construction of bears’ reputation. This analysis has the aim to create an additional framework for the analysis of the willingness to pay. This paragraph has the purpose to provide the basis for future research and more extensive investigation. The second part is dedicated to descriptive analysis of the sample.

#### ***3.1 The importance of storytelling***

The purpose of this research is to understand population WTP to contribute to bears’ preservation and conservation, but it is also interesting to notice how bears’ storytelling is reported in newspapers. In particular the topic might be the trigger for future research in order to better understand the impact of narratives on WTP. The role of storytelling, in fact, as suggested by Chi-I Lin and Yuh-Yuh Li (2018) influences attitudes toward wildlife. They demonstrated as a well-developed storytelling session can change students’ attitude toward wild animals.

Media and in particular newspapers and news have a strong influence on public perception on hot topics (Mikami *et al.*, 1995; Markowitz & Guckian, 2018). The approach, the style, and the tone of the narration used to report news about bears defines the way in which wild animals are perceived by local population. In this paragraph I want, as a preliminary

analysis, to report the two different approaches used by media to recount bears-human co-existence in order to better understand the differences in WTP between Marsica and Trento.

It is interesting to notice how bears stories are reported in different way across Italy. In particular, in the area of Marsica and Trentino the approach to bears' story has highlighted a different storytelling. In Marsica, bears are the local symbol and is has a positive status among local population. The opposite situation is shown in Trentino, where bears are not so positively perceived. A brief analysis of headlines it is possible to notice as on regional and national journals the most common words used are words with positive meaning for Marsican bears and negative for Trentino bears. During 2020, 39 headlines (17 Trento - 22 Marsica) were took under consideration. The articles considered are in the main national newspapers: Repubblica, Corriere della Sera, Sole24ore and Messaggero. Here, the qualitative analysis shows as the main words used are synthetised as follow:

Repubblica has only 3 articles in its online catalogue. Articles refer to problematic bears, bears that were killed in a car crash and bear saved. Main words used are: exiled bear – invested by car – saved.

Corriere della Sera articles focused on problematic bears, problematic relationship between humans and ursine population and only in one case we have news about saved cubs. Most used words in headlines are: bears to be killed – problematic bear – cub saved – damages – raiding bear – Province is worried.

Only one article could be found in Sole24ore online catalogue. In this case the main topic was the will to exile a problematic bear in the Abruzzo Lazio and Molise Natural Park.

Messaggero as several articles about bears in Trentino. Main articles focus on problematic bears, causes of death, damages to humans or/and human properties. Most of the headlines reported words as: aggression – death – exile – problematic bears – escape – captured – car accident.

Referring to Marsican bears, journals have a more positive attitude towards those animals.

Repubblica focuses more on saved bears, the need of more space, habitat preservations and the need to protect the bears from illegal hunting. The main words used are: save – more space – habitat – bear hunting biscuits – animal to save – free.

Corriere della Sera focuses, as the previous journal, on the positive aspects or funny behaviours as for example bears walking in the city centre without forgetting the causes of their deaths. The keywords are: social star – bear cub – invested by car – no security – freedom – bear/car accidents alert.

Sole24Ore has only 2 articles in its online catalogue. The focus here is on the stamp dedicated to bears and the car accidents. Key words: stamp dedicated to bear – car accident.

Messaggero focuses on chronical events as for example what to do in case of meeting with a bear in the woods, ursine in the city, births and causes of death. The main words used in their headlines are: what to do in case of meeting – bears stole honey – bear in city centre – bear in the fountain – cubs' birth– death bear – save – baby boom.

This brief analysis of headlines underlines as different words and storytelling is used to describe similar situations. The narration regarding Trentino shows more negative attitude towards bears. In particular, the focus in on the damages caused by problematic bears, the negative impact on human activities and obstructionist policy against bears repopulation. The opposite situation occurs referring to Marsican ursine population. Here, the focus is on the new births, the need to save them and the odds and sometimes funny behaviour of bears. Only secondarily the topic focuses on the damages to the population.

These two narratives will be focus of future research, here has the aim to set a framework to contextualise the relationship between humans and bears in two different Italian regions, but it does not want to be an extensive content and sentiment analysis of the Italian bears.

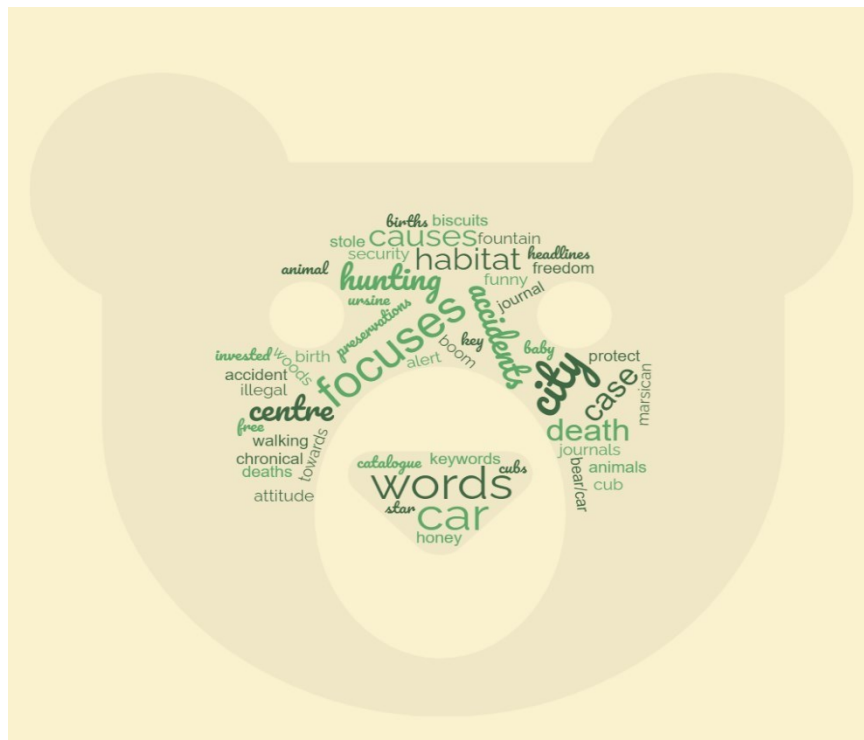


Figure 8: The word cloud with the main words used in the Italian newspaper

### 3.2 WTP descriptive results

We analysed the willingness to pay data from a survey commissioned by the University of Ferrara and conducted by Demetra opinioni.net Srl, a pooling company. The questionnaire presents similar questions for Marsican and Trento areas, with some slight differences especially in Part 1 - the context and background information. It also included twelve profiling questions where the focus is on knowledge and attitude toward the natural park and local bears focusing also on the perceived benefits and risks related to living in a territory where there is a strong presence of wildlife species, three questions about WTP where the last one dedicated to exploring the reason behind WTP equal to zero. The last six questions focus on the socio-demographic characteristics of the sample. The survey was sent to a random selection of households of the cities in the area of National Park of Lazio Abruzzo and Molise, and in the Western area, Eastern area and Urban area of Trento province. The survey was conducted during the period May - preliminary data collection and October 2021, immediately after the lockdown due to the global pandemic situation. The survey was designed to provide a stratified random sample that was demographically and economically representative of individuals by age, gender, educational level, income and effects of Sars-Covid 19 on their income.

Table 2 synthesises information about respondents' knowledge regarding *Ursus* and their interaction. The majority of respondents are aware of bears' existence – in both the samples – and the major percentage of them have at least once visited the bear's habitat to have the chance to view it. The sample from Marsica has a slightly higher percentage of positive answers (95.44%) compared to the 93.78% positive answers of the Trento sample. Some differences are also pointed out by the percentage of individuals who have ever visited the park to have the opportunity to see the bear – 71.03% of positive answers for the Marsican sample and 62.60% for the Trento sample. This positive attitude toward bears can be interpreted as

they receive benefits from use value. Some differences are reported between Marsica and Trento, the percentage of Marsican respondents of individuals interested in visiting the National Park to spot bears is higher compared with Trentino’s respondents.

Table 2: Marsica and Trento respondents’ engagement with the local bears

	<b>%“YES”</b>
<b>TOTAL SAMPLE</b>	
Existence of the Ursus arctos	94.63
Visiting the natural park with the aim to watch Ursus	37.40
<b>MARSICA</b>	
Do you know about the existence of Ursus arctos marsicanus?	95.44
Have you ever visited Abruzzo National Park with the aim to watch Ursus arctos marsicanus?	71.03
<b>TRENTO</b>	
Do you know about the existence of Ursus arctos arctos and its reintroduction projects?	93.78
Have you ever visited Trento with the aim to watch Ursus arctos arctos?	62.60

Table 3 reports information about respondents’ attitudes toward ONGs and voluntary work and donations. The Total Sample – the sample created by aggregating data from Marcia and Trento –stated that the only a small percentage of respondents have ever done voluntary work or donation for ONGs. Moreover, there is a minimum and significant percentage between those who answered “yes” for donations rather than volunteering; in other words, money donations are preferred to direct commitment/involvement.

Table 3: Total sample share of individuals’ engagement in environmental association - membership and donations

	<b>% “YES”</b>
Have you ever done voluntary work for environmental protection ONGs?	10.37
Have you ever done donations for environmental protection ONGs?	23.41

Table 4 focuses on the perceived benefits to live in a biodiverse place and the perception of the damages caused by bears in Marsica. The first column expresses that the majority of respondents do not perceive any benefits (e.g., personal, economical ...) from living in a high-quality environment. The 21.19% of respondents has stated that they the benefits derived from a high-quality environment has a medium impact on their life. The second column stated perceived damages caused by bears: the majority of Marsican sample states that they are not affected negatively by bears, only a lower percentage was negatively affected by bear’s presence on the territory. It is possible to hypnotise that they have reported damages to crops or livestock.

Table 4: Benefits and damages derived by bears - Marsica

	<b>Benefits to living place biodiverse – Marsica (%)</b>	<b>Perception of damages derived by bears – Marsica (%)</b>
0	43.64	85.54
1	6.57	3.21
2	21.19	4.02
3	13.56	3.61
4	15.04	3.61
Total	100.00	100.00

Regarding Trento area, same information about perceived benefits and damages caused by bears are provided by Table 5. Here, it is possible to see how people are lower affected positively by biodiversity and high-quality environment. The percentage of those perceive of being damaged by bears slightly increase, even if the majority of them have declared they have not been damaged by bears. Comparing the two areas, Marsican respondents perceive that living in a biodiverse place has a positive influence on their quality life at a higher percentage compared to Trento. Moreover, Trento as a higher percentage (+4 percentage points) of individuals who feel that bears have a negative impact on their quality life.

*Table 5: Benefits and damages derived by bears - Trento*

	<b>Benefits to living place biodiverse – Trento (%)</b>	<b>Perception of damages derived by bears – Trento (%)</b>
0	56.43	69.84
1	10.37	6.48
2	18.67	9.51
3	10.37	6.28
4	4.15	7.89
Total	100.00	100.00

Going further, in Table 6 we analysed the effects in the three different areas of Trento: Western Trento – characterised by an intense presence of bears – shows the highest results for those who considers themselves medium damaged by bears and those who perceived to have been highly damaged by bears. In the Easter areas – where there is an intense presence of wolves – it is possible to notice some small differences between this group and the previous one. The third column – urban area – has the lowest percentage of damage perception in quite all the cases. It has the highest rate of respondents who stated of not being affected by bears.

*Table 6: Damages specification for areas - Trento*

	<b>Perception of damages derived by bears – Western Trento (%)</b>	<b>Perception of damages derived by bears – Eastern Trento (%)</b>	<b>Perception of damages derived by bears – Urban area of Trento (%)</b>
0	62.81	73.95	75.29
1	5.03	5.88	8.82
2	15.58	4.20	5.88
3	6.53	8.40	4.12
4	10.05	7.56	5.88
Total	100.00	100.00	100.00

To synthesise, the data collected show that both our samples have a strong awareness of bears' presence on the territories under examination. Some divergences are noticeable if we close up on the perceived benefits to live in such biodiverse territories; there is a slight but significant difference between the two samples. Considering the Marsican sample, biodiversity is considered an incisive factor for the quality of life, and the bears are not perceived as a risk for the population; on the other hand, perceived biodiversity has not had such a strong impact on the Trento sample. The perceived damages caused by the presence of bears are slightly higher than the Marsican sample.

This paragraph aims to present the results of WTP descriptive results. Moreover, this analysis considers the presence of protest bidders as a factor that influences the WTP. As described in the previous paragraph, the protestors are individuals who do not believe in one or more aspects of the survey. In this study, the protestors are identified as an individual who answered positively to questions about environmental engagement - for example, questions

about natural park frequency, and concern about biodiversity loss due to climate change, but her/his WTP is zero. Also, outliers are excluded because their value was so different compared to the mean of the sample that was impossible to determine their true nature. The 4 observations excluded from the total sample expressed values from 1000 euro to 5000 euro.

Firstly, in Table 7 are synthesised the results for WTP including protest votes but outliers are excluded. It is important to notice the WTP mean value of the Total Sample – the sample that includes the stated WTP value for Marsica and Trento – is equal to 8.39 euro for una tantum donation and 7.99 euro in the case of the annual contribution. As it is possible to notice the difference between the two categories is minimal, but una tantum donation seems to be the preferred method to pay.

Marsica has a mean value of more than 11-euro for both una tantum contribution and annual contribution. Trento has a mean value of around 5-euro for both cases, una tantum and annual contribution. Marsica has the highest WTP mean value, the difference between Marsica and Trento is around 6 euro in both the scenarios (una tantum and annual contribution).

Table 7: WTP mean values for Total Sample, Marsica and Trento considering una tantum and annual contribution

WTP	N	Max	Min	Mean	P50
<b>TOTAL SAMPLE</b>					
Bid total sample una tantum	943	200	0	8.39	0
Bid total sample - annual contribution	949	200	0	7.99	0
<b>MARSICA</b>					
Bid Marsica - una tantum	459	200	0	11.93	5
Bid Marsica - annual contribution	465	200	0	11.06	0
<b>TRENTO</b>					
Bid Trento - una tantum	484	100	0	5.29	0
Bid Trento - annual contribution	484	100	0	5.03	0

Note: The Table shows the results from the subsample that includes protest bids and excludes the outliers

Table 8 shows the mean WTP in the case in which protestors and outliers are excluded from the sample. Marsica reports a mean WTP value higher than Trento. In this case, it is underlined the importance of the protestors in this analysis. Protestors have a strong impact both in Marsica and Trento. Marsican WTP increases by about 6 euro in the case of una tantum donation, while decreases by less than 1 euro in the case of una tantum contribution. A similar decrease is shown in the case of mean WTP for Trento – una tantum donation – while, no changes are observed in the case of Trento's annual contribution. Comparing the two geographical areas, the gap between WTP mean values doubled; in fact, in Table 7, the gap between Marsica and Trento for una tantum donation is around 6 euro, and in Table 8, the difference between the same difference is around 12 euro. In the second case, the difference in WTP for annual contribution – Table 7 – is around 6 euro, the same difference, in Table 8 is around 5 euro.

Table 8: Mean WTP for the Total sample, Marsica sample and Trento sample

WTP	N	Max	Min	Mean	P50
<b>TOTAL SAMPLE</b>					
Bid Total sample – una tantum	795	200	0	9.80	5
Bid Total sample – annual contribution	946	100	0	7.70	0
<b>MARSICA</b>					
Bid Marsica una tantum	312	200	0	17.50	10
Bid Marsica annual contribution	462	200	0	10.49	0*

TRENTO					
Bid Trento una tantum	483	100	0	4.83	0**
Bid Trento annual contribution	484	100	0	5.03	0***

Note: WTP results without protest bidders and without outliers. \*55.84% di 0; \*\*72.26% di 0; \*\*\*72.11% di 0.

At this point, t-test is used to compare the means of the Total Sample presented in Tables 7 and 8. A t-test is a type of statistical test used to compare the means of two groups, in particular, our groups are independent of each other, so the independent t-test is used (Kim, 2015). The first test is conducted for Marsica and Trento una tantum contribution without protestors and without outliers, presents a difference of mean equal to -12.66 euro (Trento mean minus Marsica mean), the t-test reports also a p-value equal to 0.00, that confirms the difference between means. The result from the difference of mean between Marsica and Trento annual contribution - without protestors and without outliers, presents a difference of mean equal to -5.46 euro (Trento mean minus Marsica mean), the t-test reports also a p-value equal to 0.00, that confirms the difference between means. The third test compare the mean of Trento and Marsica una tantum contribution with protest bidders and without outliers, the difference between means is equal to -6.90 euro and the p-value is equal to 0.00 confirming the strong difference between means. The fourth control of means confirm the previous results, the difference between Trento and Marsica annual contribution with protest bidders and without outliers is equal to -6.04 euro and also in this case the p-value is equal to 0.00, confirming the difference in the mean values.

The Figures below – Figure 9, 10, 11 and 12 – perfectly synthetise the characteristics of the sample population. As it is possible to notice from Figure 9, both individuals from Marsica and Trento consider biodiversity loss as a high-level risk for the territory. The majority of the two samples declared a concern for biodiversity loss in the future.

Figure 10 reports the monthly income for Marsica (1) and Trento (2). On the x-axis is located the income range where (1) 0-1000 euro; (2) 1001 - 2000 euro; (3) 2001 - 3000 euro; (4) 3001- 4000 euro; (5) 4001 - 5000 euro; (6) >5001 euro. On the y-axis, there is the frequency of the observation for each range. The Figure 10 shows significant income differences between the two areas. In particular, Marsica presents a lower income level compared with Trento, the only expectation where Marsican income level is higher than Trento's income level and it is reported by the two extreme cases, income between 0 and 1000 euro and income higher than 5000 euro. Particularly significant for this study is comparing this data with Figure 11 and Figure 12. These Figures reported the data about the frequency (y-axis) of observations for WTP - Una Tantum donation (Figure 11) and WTP - annual contribution (Figure 12); the x-axis reported the monetary value of the payment card.

The results of the previous qualitative analysis show as the Marsica WTP mean value - una tantum donation - is equal to 11.93 euro and 11.96 euro in the case of the annual contribution. The Trento province WTP mean value is equal to 5.29 euro - una tantum donation and 5.03 euro- annual contribution. Figures (10, 11, 12) stress out the same results; there is no correlation between pro capita income and WTP level; despite the higher pro capita income level, Trento WTP mean value is lower than Marsica WTP level.

Going further, the Figure 13 reports answer to the question “Reason behind WTP equal to 0”; the majority of Marsican respondents stated that “protection is by state” and they do not have “not enough budget” to contribute; the same answers reflect also the reason behind WTP equal to 0 for Trento respondents. Figure 13 is particularly important in this analysis because the two main results show on one side, the importance of role of government (local and national) in wildlife protection. In this perceptive, the perceived strong role of institutional is perceived of paramount importance in environmental conservation and preservation, so individuals could feel less engaged or interested in the process. On the other side, the role of low budget shows the impossibility to participate even if there is the will to actively contribute.



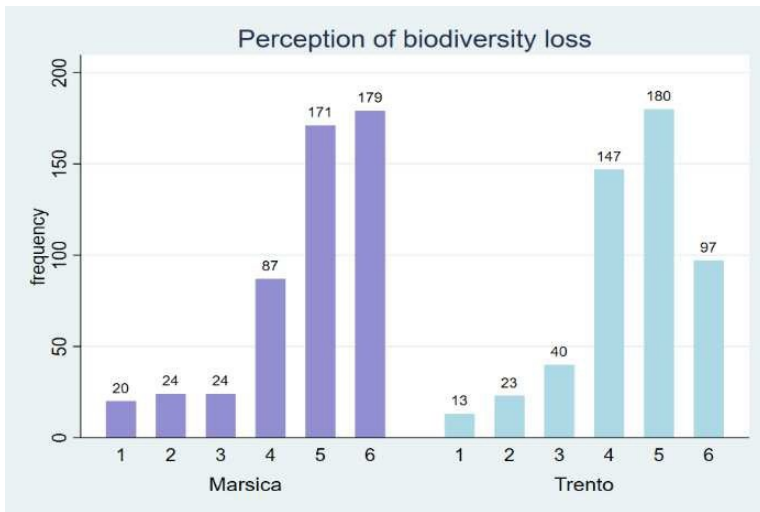


Figure 9: Perception of biodiversity loss

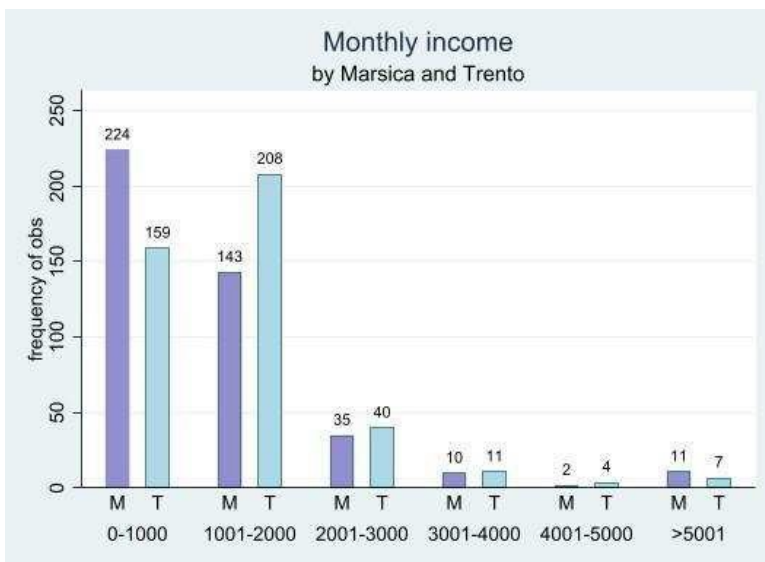


Figure 10: Monthly income M=Marsica T=Trento. Value expressed in euro



Figure 11: WTP - una tantum Marsica and Trento. Value expressed in euro on the x-axis and in percentage on the y-axis

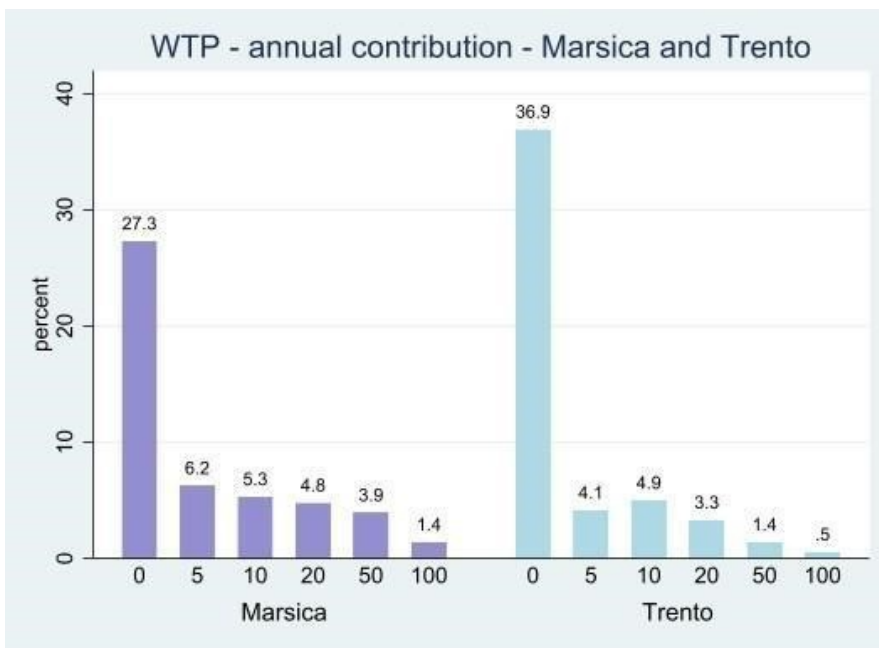


Figure 12: WTP - annual contribution Marsica and Trento - value expressed in euro on the x-axis and in percentage on the y-axis

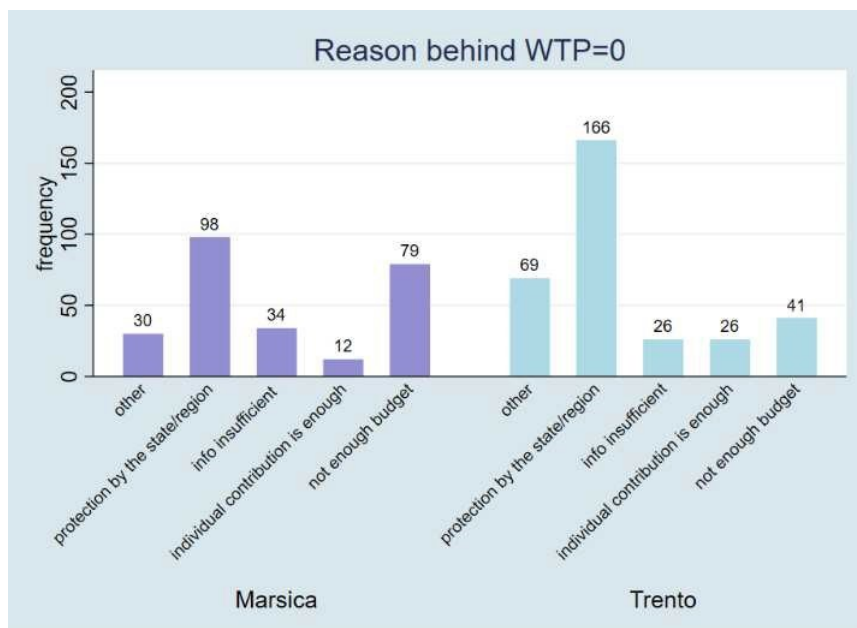


Figure 13: Reason behind WTP=0

Lastly, I would like to stress out the mean WTP value per number of families on the territories under exam.

Table 9 reports the data about WTP mean multiplied the number of families (2019 – the most recent data) in the Italian Provinces of L’Aquila (Abruzzo), Isernia (Molise), Frosinone (Lazio) and Trento (Trentino Alto Adige). In this table, protest bidders are included in the data sample. It is possible to notice that Trento has the highest WTP, followed by L’Aquila. Frosinone is the province with the lowest WTP for number of families.

Table 9: WTP\*number of families

	UNA TANTUM (€)	CONTRIBUTO ANNUO (€)
L’AQUILA	1.520.374,25	1.374.447,19
ISERNIA	421.605,66	381.139,53
FROSINONE	231.474,78	209.257,60
TRENTO	<b>2.744.891,38</b>	<b>2.481.433,94</b>

Note: The values consider the presence of protestors.

Table 10: WTP\* number of families

	UNA TANTUM (€)	CONTRIBUTO ANNUO (€)
L’AQUILA	<b>2.292.274,38</b>	<b>3.158.332,08</b>
ISERNIA	635.656,56	875.817,71
FROSINONE	348.995,46	480.851,49
TRENTO	1.142.874,60	1.190.198,60

Note: The Table excludes the protestors

The Tables 10, presents results calculated on the mean value of bid excluding protest bidders and excluding outliers. L'Aquila is the province with the highest WTP followed by Trento. In both cases, Frosinone (Lazio) is the province with the lowest WTP. From the data presented in Table 9 and Table 10, it is interesting to notice as we include in the calculation protestors, Trento has the highest WTP per number of families; on the other side, if the protestors are excluded L'Aquila has the highest WTP per number of families. In other words, there is a strong impact on the general WTP of those respondents who considered positively their relationship with nature and the biodiversity but answered 0 euro to the WTP question, this implies that in Trento there are more respondents with a strong environmental consciousness but to not want to pay for bears' preservation and conservation compared with Marsica.

#### **4. Discussion**

##### ***WTP Results***

This section focuses on the correlation between WTP and individual characteristics, in particular, it considers socio-demographic characteristics such as gender, age, educational level and monthly income level. In addition, it investigates the effects of environmental engagement and perceived risks related to environmental degradation. The variables considered are: acquaintance with Marsican bears, park frequency, biodiversity loss and acquaintance with Trento bears. The effects of socioeconomic variables on willingness to pay are estimated using an ordered probit model. The dependent variables reflect the stated value of respondents; furthermore, the dependent variables are created considering the exclusion or the inclusion of the protestors. Considering how the dependent variables are constructed, the ordered probit model was chosen because it was statistically more efficient than the binary logit or probit models (Jekanowki *et al.*, 2000). Four observations were excluded from the sample because they expressed a value difficult to interpret. In this case, the stated WTP was from 1000 euro to 5000 euro, compared to the mean WTP of the total sample, those data were impossible to verify because too different compared to the other observations.

Parameter estimates of the ordered probit model are presented in Tables 11, 12, 13, 14, 15, and 16. In all cases, the dependent variable reflects individuals' willingness to pay, respectively for the two different cases: una tantum contribution, and annual contribution. The value of the dependent variable can refer only to WTP for Marsican bear or Trento bear, in the scenarios of una tantum donation and annual contribution. In other words, the dependent variables reflect the WTP for or Marsican bear una tantum donation; or Marsican bear annual contribution; or Trento bear una tantum contribution; or Trento bear annual contribution.

Table 11 shows the results for an ordered probit model where the first two columns report data for Marsica, respectively una tantum (column 1) and annual donation (column 2); the third and the fourth columns report data for Trento, (column 3) una tantum contribution, and annual contribution (column 4). Considering the data for Marsica, positive and statistically significant variables are age, awareness about the presence of bears in the territory, park frequency and biodiversity loss. Trentino, willingness to pay is influenced by: age, gender, awareness about the presence of bears in the territory, park frequency, educational level and biodiversity loss. Some differences are reported between una tantum and annual contribution. Gender, for example, lost its significance as also acquaintance of Trento bear, in the case of the annual contribution (column 4). The negative significance of gender implies that women are more likely to pay rather than men. This result could be validated by the patriarchal system in which the analysis unfolds. People act according to the expects derived from their gender, which can be translated into female inclination to care for other beings, either human or animal, in opposition to male-related individuality. The effects of patriarchy on conservation issues are

exposed by the survey in particular they are shown by the high participation of women and the difference in WTP.

The results are in accordance with economic principal and previous studies. The results point out as the main effects on WTP are given by higher educational level and strong relationship with the environment. Interestingly, it is the case of the significance of park frequency, negative statistically significant for Trento una tantum (column 3). This result could be interpreted as an interest of people to participate in bear protection in the case in which they have not encountered bears in their park experience.

Table 11: Ordered probit regression results for WTP values. Comparison between Marsica and Trento – una tantum and annual contribution

VARIABLES	Marsica una tantum (1)	Marsica annual contribution (2)	Trento una tantum (3)	Trento annual contribution (4)
Gender	-0.0274 (0.106)	0.0534 (0.112)	-0.282** (0.114)	-0.0807 (0.122)
Age	0.0120*** (0.00309)	0.0222*** (0.00337)	0.0157*** (0.00320)	0.0221*** (0.00348)
Educational level	0.0458 (0.0463)	0.0204 (0.0497)	0.0551 (0.0535)	0.0952* (0.0576)
Acquaintance Marsican bear	0.463* (0.264)	0.331 (0.280)		
Park frequency	0.129** (0.0540)	0.155*** (0.0577)	-0.120* (0.0620)	-0.0662 (0.0670)
Biodiversity loss	0.223*** (0.0453)	0.204*** (0.0500)	0.205*** (0.0549)	0.232*** (0.0620)
Acquaintance Trento bear			0.478* (0.261)	0.116 (0.255)
Observations	458	464	486	482

Note: standard error in parentheses. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1. Protestors are included – outliers excluded – income excluded.

Table 12 presents an augmented specification in which also monthly income variable is included. We decide to present the results excluding and including the variable “monthly income level” because the high presence of missing values; in fact, the number of observations without the information about income are 151, the numerosity of missing values has an impact of the significance of the variable. Results are qualitatively unchanged with respect to Table 11, however, unexpectedly the monthly income level is not statistically significant in any of the cases. This means that the variable “monthly income level” it is not the principal driver of WTP; this can be explained with the multitude of cultural and historical values that provide a better explanation of bears’ engagement and consequently the WTP for protection of the bears.

Table 12: Ordered probit regression results, comparison between Marsica and Trento

VARIABLES	Marsica una tantum (1)	Marsica annual contribution (2)	Trento una tantum (3)	Trento annual contribution (4)
Gender	-0.0963 (0.116)	0.0259 (0.122)	-0.357*** (0.126)	-0.0641 (0.134)
Age	0.00986*** (0.00332)	0.0221*** (0.00362)	0.0139*** (0.00343)	0.0220*** (0.00372)
Educational level	0.0579 (0.0520)	0.0191 (0.0559)	0.107* (0.0586)	0.111* (0.0624)
Acquaintance Marsican bear	0.370 (0.291)	0.199 (0.305)		
Park frequency	0.122** (0.0575)	0.139** (0.0613)	-0.143** (0.0665)	-0.0833 (0.0708)

Biodiversity loss	0.207*** (0.0492)	0.189*** (0.0544)	0.181*** (0.0576)	0.227*** (0.0651)
Monthly income level	0.0363 (0.0552)	0.0575 (0.0577)	-0.0257 (0.0690)	0.0565 (0.0718)
Acquaintance Trento bear			0.452* (0.267)	0.125 (0.263)
Observations	387	393	418	414

Note: Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Protestors are included – outliers are excluded – income is included

Table 13 and Table 14 report the results of ordered probit regression for WTP in the cases in which protest bidders are excluded. In particular, Table 13 replicates Table 11, while Table 14 replicates Table 12 (i.e., it includes income level). Table 13 shows that for Marsica the WTP is strongly influenced by age (only column 2), acquaintance with Marsican bears (only column 1), biodiversity loss and park frequency. These results are similar to the results in the previous Tables, confirming that WTP is positively influenced by engagement and participation in the natural environment. WTP for Trento individuals is influenced by age, educational level and biodiversity loss. Interesting to notice, the acquaintance with Trento bear has no impact on the WTP. This could be interpreted as the will of respondents to take care of the environment because of their engagement the nature and not only because the presence of bears.

Table 14 reports results including income level. The results are quite similar, monthly income level acquires significance only in the case of Marsica – una tantum contribution. This last result confirms the hypothesis that “monthly income level” can have a little influence of WTP like in column 1 but it confirms that “monthly income level” variable is not the main driver for WTP.

Table 13: Ordered probit model regression results for WTP values, comparison between Marsica and Trento

VARIABLES	Marsica una tantum (1)	Marsica annual contribution (2)	Trento una tantum (3)	Trento annual contribution (4)
Gender	-0.0150 (0.122)	0.0383 (0.113)	-0.0986 (0.122)	-0.0807 (0.122)
Age	0.00330 (0.00352)	0.0221*** (0.00338)	0.0219*** (0.00348)	0.0221*** (0.00348)
Educational level	-0.00342 (0.0547)	0.0231 (0.0499)	0.103* (0.0577)	0.0952* (0.0576)
Acquaintance Marsican bear	0.516* (0.302)	0.310 (0.279)		
Park frequency	0.289*** (0.0669)	0.152*** (0.0580)	-0.0784 (0.0672)	-0.0662 (0.0670)
Biodiversity loss	0.223*** (0.0542)	0.197*** (0.0500)	0.224*** (0.0620)	0.232*** (0.0620)
Acquaintance Trento bear			0.105 (0.255)	0.116 (0.255)
Observations	311	461	481	482

Note: Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The Table presents the results without protest bidders – without outliers – without income

Table 14: Ordered probit model regression results, comparison between Marsica and Trento

VARIABLES	Marsica una tantum (1)	Marsica annual contribution (2)	Trento una tantum (3)	Trento annual contribution (4)
Gender	-0.0297 (0.130)	0.00481 (0.122)	-0.0812 (0.134)	-0.0641 (0.134)
Age	0.00147 (0.00374)	0.0221*** (0.00364)	0.0218*** (0.00372)	0.0220*** (0.00372)
Educational level	-0.0443 (0.0604)	0.0227 (0.0563)	0.119* (0.0625)	0.111* (0.0624)
Acquaintance Marsican bear	0.384 (0.333)	0.175 (0.305)		
Park frequency	0.262*** (0.0696)	0.138** (0.0616)	-0.0983 (0.0711)	-0.0833 (0.0708)
Biodiversity loss	0.205*** (0.0580)	0.180*** (0.0545)	0.218*** (0.0651)	0.227*** (0.0651)
Monthly income level	0.117* (0.0651)	0.0536 (0.0594)	0.0653 (0.0718)	0.0565 (0.0718)
Acquaintance Trento bear			0.115 (0.263)	0.125 (0.263)
Observations	276	390	413	414

Note: Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The results are calculated without protest bidders – without outliers – with income

The Table 15 and 16 below report the results of the regression in which the observations are considered as aggregate data of the Total Sample. The difference between Marsica and Trento are described by the dummy variable “dummy region” equal to 0 if the respondent is from Trento and equal to 1 if the respondent is from Marsica.

Tables 15 is structured as follow: column 1 refers to una tantum contribution; and column 2 refers to annual contribution; the data excludes protest bidders, outliers and monthly income level. Column 3 and column 4 report the results in the scenario of una tantum contribution (column 3) and annual donation (column 4), these columns include the variable “monthly income level”, protest bidders and outliers are excluded.

The dummy variable “region” is statistically significant in both the two cases and for both una tantum and annual contribution, meaning that, other things being equal, the WTP is higher in Marsica rather than Trento.

Aggregate WTP in the case of una tantum contribution is influenced by age, park frequency, and biodiversity loss. Park frequency is significant only in the case in which we exclude both protestors and income, this implies that there is a slight difference in significance if income level is included or excluded in the analysis. Considering the results in Table 15, higher engagement with parks influences the individuals’ WTP. Significance is lost in the case in which income is included in the analysis (column 3 and column 4). As previous identified, income was partially excluded from the analysis because of the high presence of missing values; here we decide to follow the same logic, also because as the following results will show, adding monthly income level to the regression has an impact also on the other variables, this could imply a correlation between monthly income variable and other variables.

WTP in the case of the annual contribution is influenced by age, biodiversity loss and dummy region. All the variables are positive and statistically significant. In other words, the results here presented confirm the hypotheses that individuals with a strong awareness of the living conditions of bears and an interest in biodiversity, preservation and a strong engagement with the park areas have been more likely to pay compared to others.

Table 16 reports the results of the analysis that includes protest bidders, exclude outliers and exclude monthly income level (column 1 and column 2, respectively: una tantum contribution and annual contribution); while column 3 (una tantum contribution) and column 4 (annual contribution) report the results of the analysis in the case in which protest bidders are included, outliers are excluded and monthly income level is included. The only slight difference between this case and the previous ones is the significance of educational level which is significant only in the case of una tantum contribution. This means that people with higher educational levels have higher levels of engagement with wildlife and because of this they are more likely to pay.

Table 15: Total Sample ordered probit regression results – una tantum and annual contribution

VARIABLES	Marsica – Trento		Marsica – Trento	
	Una tantum (1)	Annual contribution (2)	Una tantum (3)	Annual contribution (4)
Gender	-0.0983 (0.0841)	-0.0243 (0.0823)	-0.0843 (0.0909)	-0.0320 (0.0896)
Age	0.0134*** (0.00240)	0.0216*** (0.00241)	0.0125*** (0.00255)	0.0214*** (0.00258)
Educational level	0.0458 (0.0388)	0.0544 (0.0375)	0.0403 (0.0424)	0.0637 (0.0416)
Bears acquaintance	0.243 (0.193)	0.187 (0.187)	0.189 (0.203)	0.123 (0.197)
Park frequency	0.0897** (0.0457)	0.0649 (0.0434)	0.0737 (0.0479)	0.0511 (0.0460)
Biodiversity loss	0.196*** (0.0394)	0.200*** (0.0385)	0.185*** (0.0417)	0.188*** (0.0413)
Dummy region	1.206*** (0.0907)	0.447*** (0.0861)	1.158*** (0.0956)	0.431*** (0.0912)
Monthly income level			0.0650 (0.0470)	0.0462 (0.0455)
Observations	947	949	808	810

Note: Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The Table presents in column 1 and column 2 results without protest bidders – without outliers – without income; column 3 and column 4 present results without protest bidders – without outliers and with monthly income level



Table 16: WTP aggregate value for Marsica and Trento in the case of both una tantum and annual contribution

VARIABLES	Marsica – Trento	Marsica – Trento	Marsica – Trento	Marsica – Trento
	Una tantum (1)	Annual contribution (2)	Una tantum (3)	Annual contribution (4)
Gender	-0.0718 (0.0791)	-0.0163 (0.0820)	-0.0997 (0.0865)	-0.0205 (0.0894)
Age	0.0163*** (0.00228)	0.0217*** (0.00241)	0.0151*** (0.00243)	0.0214*** (0.00257)
Educational level	0.0622* (0.0358)	0.0527 (0.0375)	0.0764* (0.0396)	0.0612 (0.0414)
Bears acquaintance	0.264 (0.183)	0.196 (0.187)	0.205 (0.193)	0.133 (0.197)
Park frequency	0.0571 (0.0414)	0.0663 (0.0433)	0.0480 (0.0440)	0.0520 (0.0459)
Biodiversity loss	0.211*** (0.0360)	0.204*** (0.0385)	0.199*** (0.0386)	0.193*** (0.0413)
Dummy region	0.694*** (0.0828)	0.460*** (0.0859)	0.689*** (0.0878)	0.446*** (0.0909)
Monthly income level			0.0330 (0.0434)	0.0500 (0.0447)
Observations	459	465	388	394

Note: Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 The Table 15 presents results with protest bidders – without outliers – without income column 1 and column 2. Column 3 and column 4 presents results with protest bidders – without outliers – with income

Synthesising the results, the decision to pay is positively influenced by educational level, and by how much people are engaged in natural parks and wildlife awareness. Finally, in opposition to what is specified by the literature, income has not an important role in the WTP definition. These results could be interpreted as the interlinked nature of different factors. First above all, the two study areas have different monthly income level, Trento province, in the North of Italy has higher levels of income compared to Marsica, but the WTP is lower, this suggests that the monthly income level is not the principal driver for the WTP. Going further it is possible to conclude that in the Italian case is not the income level to explain the WTP results, but the multitude of cultural and historical values that provide a better explanation of bears' engagement and consequently the WTP for protection. The presence of bears on the Italian territory, in fact, especially in the Marsican area is part of the cultural identity of the territory, not only because its rooting in the local history, but also because, according to WWF (2022), the presence of the bears on the Italian territory, in particular in Marsica has an economic value of EUR 9 million. The study demonstrates that the Marsican bear offers a cultural ecosystem service, in terms of indirect publicity, i.e., “commercial” value generated by passages or mentions on the main national and local media channels in which the bars was

written or spoken about, that contributes to create income for above 9 million euro, an amount significantly higher than the incurred in the management of the man-bear conflict in terms of prevention and compensation (WWF, 2022). Moreover, the income level is not statistically significant also because the number of missing values affect the results; in fact, the number of observations without the information about income are 151, the numerosity of missing values has an impact of the significance of the variable.

Table 17 shows the marginal effects for the explanatory variables that are statistically significant from Table 11. The first two blocks report data for Marsica; the third and the fourth blocks report data for Trento. The first interesting data to notice is the change in sign between 0 euro, 1 euro and 5 euro. For each explanatory variable of the four blocks, there is a decrease in probability to pay 0 euro or 1 euro. From the data provided in the previous paragraph it is evident that Marsica has a higher WTP compared to Trento. Having a closer look to Table 17, the comparison between block 1 – Marsica una tantum and block 3 – Trento una tantum, the data confirms, the previous results. The probability to pay for Marsican bear is positive for all the categories of the payment card (except of 0 euro and 1 euro), while the block 3 shows an overall decreasing of probability to contribute especially for the explanatory variables gender and park frequency. In other words, women have a higher probability to pay compared to men; at the same time, individuals who have a strong engagement with parks have a lower probability to contribute for management programmes, this confirms the previous interpretation that individuals who spent more time in natural parks do not want to encounter the bears. In Marsica (block 1), individuals who are aware of the presence of the bears are more likely to pay, for example, being aware of the presence of bears increase the probability to pay 20 euro of the 5.7% compared to individuals who are not aware about bears presence. In Trento (block 3), the probability increases only of 0.9% for individuals who are aware about bears. If we have a look to higher value, for example 100 euro, the probability is only of 1.5% for Marsica and 0,10% for Trento.

Block 2 and block 4 report the data for Marsica and Trento – annual contribution. Overall, also in this case, the probability to contribute for each explanatory variable is higher in Marsica rather than Trento. Considering the explanatory variable “age” the probability is higher in cases of lower amount of money – for example 5 euro or 20 euro – and lower in cases as 100 euro. This implies that youngest respondents have higher probability to pay in case of lower amount, this could be explained by the different economic availability of young people compared to older generation and their lower purchasing power. The explanatory variable “biodiversity loss” is overall higher for Marsica – block 2 – expect for the category 5 euro. Here, the difference between Marsica and Trento is around the -41%, this implies that individuals in Trento are more aware about biodiversity loss consequences and they are more likely to pay for protection in the case of lower amount of money (here, 5 euro). In the case, for example, of 20 euro the difference between Marsica and Trento is around 15%; in other words, Marsica has a higher probability to pay 20 euro compared to Trento.

Table 17: Marginal effects related to Table 11

Variables	WTP=0	WTP=1	WTP=5	WTP=10	WTP=15	WTP=20	WTP=30	WTP=50	WTO=70	WTP=100	WTP=200
<b>Block 1 - MARSICA – UNA TANTUM</b>											
Age	-.005	-.00003	.00011	.001	.00002	.002		.001		.001	.00004
Acquaintance Marsican bear	-.182	-.0002	.023	.051	.0009	.057		.036		.015	.0009
Park frequency	-.05	-.0003	.001	.012	.0002	.018		.013		.006	.0004
Biodiversity loss	-.086	-.0005	.002	.021	.0004	.03		.022		.011	.001
<b>Block 2 - MARSICA – ANNUAL CONTRIBUTION</b>											

Age	-.009		.001	.002		.002	.0000	.002	.0001	.0008	.00006
Acquaintance Marsican bear	-.125		.022	.03		.033	.001	.03	.001	.009	.0006
Biodiversity loss	-.081		.010	.017		.022	.001	.022	.001	.008	.001
<b>Block 3 - TRENTO – UNA TANTUM</b>											
Gender	.025		-.006	-.009		-.007		-.003		-.001	
Park frequency	.021		-.005	-.007		-.006		-.002		.003	
Acquaintance Trento bear	-.035		.008	.012		.009		.004		.001	
<b>Block 4 - TRENTO – ANNUAL CONTRIBUTION</b>											
Age	-.007		.002	.002		.002		.001		.0003	
Educational level	-.03		.007	.010		.009		.003		.001	
Biodiversity loss	-.072		.017	.026		.019		.008		.003	

## 5. Conclusion

Our results suggest that majority of Marsica and Trento households believe bears and their conservation and preservation are important. Besides the differences between the two study areas, the results are positive and encouraging, further suggesting Trento and Marsica households might support specific management programmes for bear conservation. Bears are considered a charismatic species (Ducarme *et al.*, 2013; Skibins & Sharp, 2019), this means that the brown bears have a perceived value higher compared to other species like insects or reptiles (Loomis & White, 1996). Our research suggests that the popularity of bears is a consistent attraction for local communities, in particular, the interest that respondents have demonstrated in environmental protection and wildlife conservation has to be taken into account to create adequate preservation programmes. These funds could support more investment in the bears' habitat areas, in particular in the light of present environmental crises. Moreover, at policy-level the interest in bears could be considered a potential source for innovative conservation practices. Fundings could be used to conserve existing habitats and restore food sources, preventing, at the same time, animals from approaching population centres or cultivated fields and farms. Contingent valuation studies are a fundamental step toward understanding how is perceived the wildlife, providing, at the same time, insights with the aim to align conservation and economic development.

## Appendix

### Section A.1 – TRENTO BEAR QUESTIONNAIRE

#### Part 1. Background information

Until a few centuries ago, the brown bear (*Ursus arctos*) was present throughout the Eurasian continent. Indiscriminate hunting and the loss of suitable habitats led to its extinction in many geographical areas, including the Alps. In 1996, the Adamello Brenta Nature Park, in collaboration with the Autonomous Province of Trento and the National Institute of Wild Fauna, with the contribution of the European Community, and on the basis of a feasibility study and the results of a survey, launched the *Life Ursus project* for the reintroduction of the bear in Trentino. Between 1999 and 2002 three males and six females were introduced in Val di Tovel (a seventh introduced female died after a year due to an avalanche). All the animals came from Slovenia. The project resulted in a spontaneous growth of the population in the central-eastern Alpine area. The number of specimens is currently estimated at between 82 and 93. The population is monitored, damage compensation is provided, and problem animals are specifically managed.

#### Part 2. Questionnaire

**1- How often do you go hiking in wilderness areas?**

- a) Never
- b) Rarely
- c) Often
- d) Regularly

**1a- If you answered "often" or "regularly" can you indicate the frequency?**

- a) Once a year
- b) Once every six months
- c) Once every three months
- d) Once a month
- e) More than once a month

**2- Have you ever volunteered for organisations involved in the preservation of natural resources and protected species?**

- a) Yes
- b) No

**3- Have you ever made donations to organisations involved in the preservation of natural resources and protected species?**

- a) Yes
- b) No

**4- Do you perceive the loss of biodiversity understood as the rarefaction or disappearance of animals and plants as a phenomenon with a risk**

- a) Very high
- b) High
- c) Average
- d) Low
- e) Very low

**5- Have you ever heard of the Trentino bear and the project by which it was introduced?**

- a) Yes
- b) No

**6- Have you ever visited areas in Trentino where bears are present in order to see them?**

- a) Yes
- b) No

**7- What is your perception of the risk that the bear introduction project in Trentino will fail and the bear will be absent again in the province of Trento?**

- a) Very high
- b) High
- c) Medium
- d) Low
- e) Null

**8a- If you have the opportunity to make a UNA TANTUM donation to contribute to the study and protection of the Trentino bear and to promote peaceful coexistence between bear and community, how much would you be willing to pay?**

0 euro	10 euro	20 euro	50 euro	100 euro	other_____
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**8b-Considering that the study and protection of Trentino bears and their management with a view to fostering peaceful coexistence with local communities are activities requiring constant and ANNUAL CONTRIBUTION, would you be willing to pay an annual fee of**

0 euro	10 euro	20 euro	50 euro	100 euro	other_____
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**8c - Please indicate the most relevant factors behind your choice of willingness to donate "0".**

**Please choose only one of the following**

- a) I do not have enough information to make an appropriate choice
- b) I think I already contribute enough
- c) I would like to contribute but my budget does not allow it
- d) Biodiversity protection is already paid for by the state/region
- e) Other

**9a-In a scale from 0 to 4- where 0 corresponds to "none" and 4 to "many"-, how many benefits (economic, linked for example to tourism, or of personal well-being, linked for example to the pleasure of living in a natural, unique, and biodiverse environment) do you think you have obtained from the Trentino bear in your life?**

- a) 0
- b) 1
- c) 2
- d) 3
- e) 4

**9b-In a scale from 0 to 4 - where 0 corresponds to "not at all" and 4 to "many" - how much do you think you have been harmed by the Trentino bear in your life?**

- a) 0
- b) 1
- c) 2
- d) 3
- e) 4

**10a. Indicate, if any, the main advantage for you of the introduction of bears in Trentino**

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**10b. Indicate, if any, the main disadvantage for you of the introduction of bears in Trentino**

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**11- Would you welcome the disappearance of the Trentino bear**

- a) Favourably

b) Not favourably

**12- Do you agree that public institutions in Italy spend taxpayers' money wisely?**

- a) Fully agree
- b) Agree
- c) Neither agree nor disagree
- d) Disagree
- e) Strongly disagree

**13-Gender**

- a) F
- b) M
- c) Other
- d) I prefer not to declare

**14-Age**

- a) 18-24
- b) 25-34
- c) 35-44
- d) 45-54
- e) 55-64
- f) 65-74
- g) >75

**15-Title of study of respondent**

- a) Doctorate
- b) Master's degree or old-school degree
  - i) Specify type of degree (multiple choice: Scientific/Humanities/Social Sciences Social Sciences/Engineering/Medicine or Pharmacy)
- c) Bachelor's degree
  - i) Specify type of degree (multiple choice: Scientific/Humanities/Social Sciences Social Sciences/Social Engineering/Medicine or Pharmacy)
- (d) High school diploma
  - i) Specify type of diploma (multiple choice: High School/Technical Institute/Professional Institute)
- e) Middle school leaving certificate
- f) Primary school leaving certificate
- g) No qualification

**16-How much is your net monthly income (in euro)?**

- a) 0-1000
- b) 1001 - 2000
- c) 2001 - 3000
- d) 3001- 4000
- e) 4001 - 5000
- f) >5001

**17-Did you suffer a loss of income due to the SARS-COVID 19 pandemic?**

- a) Very high
- b) High

- c) Average
- d) Low
- e) Very low
- f) No loss of income

## **Section A.2 – MARSICAN BEAR QUESTIONNAIRE**

### **Part 1. Background**

The Apennine brown bear (*Ursus arctos marsicanus*), also known as the Marsican brown bear, has morphological and genetic characteristics that differ from those possessed by all other bear populations and species in the world. It is the last native Italian bear, surviving the extermination that took place over the past centuries in many parts of Europe. To date, the Marsican bear population is extremely small and is distributed almost exclusively within the Abruzzo, Lazio and Molise National Park and the neighbouring Apennine areas. The current population is estimated at around 50 specimens, and like all small isolated populations is particularly susceptible to processes - such as mating between consanguineous animals or the spread of pathogens - that can lead to its extinction. These risks are compounded by high mortality due to poaching and accidental causes linked to human activities, such as investments.

### **Part 2. Questionnaire**

#### **1- How often do you go hiking in wilderness areas?**

- a) Never
- b) Rarely
- c) Often
- d) Regularly

#### **1a- If you answered "often" or "regularly" can you indicate the frequency?**

- a) Once a year
- b) Once every six months
- c) Once every three months
- d) Once a month
- e) More than once a month
- f) Don't know/do not answer

#### **2- Have you ever volunteered for organisations involved in the protection of natural resources and protected species?**

- a) Yes
- b) No

#### **3- Have you ever made donations to organisations involved in the preservation of natural resources and protected species?**

- a) Yes
- b) No

#### **4- Do you perceive the loss of biodiversity understood as the rarefaction or disappearance of animals and plants as a phenomenon with a risk**

- a) Very high
- b) High
- c) Average

- d) Low
- e) Very low
- f) Don't know/do not answer

**5- Have you ever heard of the Marsican bear?**

- a) Yes
- b) No

**6- Have you ever visited the Abruzzo, Lazio and Molise National Park or neighbouring areas to see the Marsican bear?**

- a) Yes
- b) No

**7- What is your perception of the Marsican bear's risk of extinction?**

- a) Very high
- b) High
- c) Medium
- d) Low
- e) None
- f) Don't know/no answer

**8a- If you have the opportunity to make a UNA TANTUM donation to contribute to the study and protection of the Marsican bear and promote peaceful coexistence between bears and local communities, how much would you be willing to pay?**

0 euro	10 euro	20 euro	50 euro	100 euro	altro_____
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**8b- Considering that the study and protection of the Marsican bear and its management with the aim of fostering peaceful coexistence between bears and local communities are activities that require constant and ongoing commitment, would you be willing to pay an ANNUAL FEE of:**

0 euro	10 euro	20 euro	50 euro	100 euro	altro_____
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**8c - Please indicate the most relevant factors behind your decision to donate "0":**

- a) I do not have enough information to make an appropriate choice
- b) I think I already contribute enough
- c) I would like to contribute but my budget does not allow it
- d) Biodiversity protection is already paid for by the state/region
- e) Other (please specify)

**9a- In a scale from 0 to 4 - where 0 corresponds to "none" and 4 to "many"-, how many benefits (economic, linked for example to tourism, or of personal well-being, linked for example to the pleasure of living in a natural, unique, and biodiverse environment) do you think you have obtained from the Marsican bear in your life?**

- a) 0
- b) 1
- c) 2
- d) 3



e) 4

**9b- On a scale of 0 to 4 - where 0 corresponds to "not at all" and 4 to "very much" - how much do you think you have been harmed by the Marsican bear in your life?**

- a) 0
- b) 1
- c) 2
- d) 3
- e) 4

**10a. Indicate, if any, the main advantage for you of the presence of the Marsican bear**

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**10b. Please indicate the main disadvantage, if any, of the presence of the Marsican bear for you.**

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**11- Would you welcome the disappearance of the Marsican bear**

- a) Favourably
- b) Not favourably

**12- Do you agree that public institutions in Italy spend taxpayers' money wisely?**

- a) Fully agree
- b) Agree
- c) Neither agree nor disagree
- d) Disagree
- e) Strongly disagree
- don't know

**13- Gender**

- a) F
- b) M
- c) Other
- d) I prefer not to declare

**14- Age**

- a) 18-24
- b) 25-34
- c) 35-44
- d) 45-54
- e) 55-64
- f) 65-74
- g) >75

**15- Title of study of respondent**

- a) Doctorate
- b) Master's degree or old-school degree 2
- i) Specify type of degree (multiple choice: Scientific/Humanities/Social Sciences

Social Sciences/Engineering/Medicine or Pharmacy)

c) Bachelor's degree

i) Specify type of degree (multiple choice: Scientific/Humanities/Social Sciences  
Social Sciences/Social Engineering/Medicine or Pharmacy)

(d) High school diploma

i) Specify type of diploma (multiple choice: High School/Technical Institute/Professional  
Institute)

e) Middle school leaving certificate

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**16- How much is your net monthly income (in euro)?**

a) 0-1000

b) 1001 - 2000

c) 2001 - 3000

d) 3001- 4000

e) 4001 - 5000

f) >5001

**17- Did you suffer a loss of income due to the SARS-COVID 19 pandemic?**

a) Very high

b) High

c) Average

d) Low

e) Very low

f) No loss of income

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# Willingness to pay for Italian beaches and littorals: management and environmental implications

## Abstract

In the main framework of environmental protection and climate change issue, part of the interest is focused on beach and littoral protection. The aim of this research is to understand people's willingness to pay for environmental protection and management of Italian beaches and littorals. Italian beaches and littorals are constantly under pressure because of the combination of annual mass tourism, especially during summer season, and climate effects. The analysis is conducted using contingent valuation method (CVM) to investigate how much tourists and residents in the Italian Regions of Marche – Adriatic coastline - and Campania – Tyrrhenian coastline are willing to pay for littoral management and preservation of coastal areas. Four main coastlines are under analysis, San Benedetto del Tronto in Marche and Agropoli, Battipaglia, Capaccio and Eboli in Campania. Generally speaking, the results show that the tourists are more willing to pay for environmental protection and specific management programmes. Moreover, the results report that short-term effects on the environment and beauty of the littoral are more valued than long-term effects. We observe that WTP is lower when including resource depletion as a control variable concerning the same value for, say, cigarettes.

## 1. Introduction

Coastal zone is a dynamic ecosystem where the equilibrium created from the interaction between human activities and several natural processes constantly modify the equilibrium and the morphologic characteristic of the environment. In Italy, coastal zones cover around 8.300 km, albeit 9% of it is completely artificial and only 7500 km are considered totally natural (ISPRA, 2011). Italian coastline is varied and different, it could have rocky and jaggy littorals, or sandy linear seashores or even high rocky stretches enclosed between two headlands (ISPRA, 2011).

Moreover, coastal areas are characterised by complex connections among environmental, social, and economic factors; seashores are at the same time crucial for environmental balance and biodiversity and a resource for the local economy through environmental services and tourism. In this view, coastal areas must be considered as socio-ecological systems (Anderies *et al.*, 2004 and McLachlan *et al.*, 2013), in which the physical beach, its resources, users, managers, services and infrastructures are interrelated elements (Peña-Alonso *et al.*, 2018; Rodella *et al.*, 2019). Coastal areas are increasingly under pressure because of the combination of annual mass tourism that induces environmental impacts and pressure on coastal and marine environments, and climate change effects. In this context, beach management programs could represent a *win-win* solution by offering beach users adequate services and recreational activities during the summer season and preventing environmental degradation due to climate change and tourism itself.

The CVM is a tool that offers a spotlight on beach users' preferences in terms of money allocation for the improvement of beach management. CVM asks directly if individuals are interested in paying a pre-fixed amount of money and which scenario they want to support. In this sense, CVM and willingness to pay (WTP) are used as indicators of beach user engagement in beach management and have been the most applied approaches to assess the economic value of a beach as a non-market good (Logar and van den Bergh, 2012; Pearce *et al.*, 2006; Peng and Oleson, 2017; Rodella *et al.*, 2020).

This study has the aim to understand the WTP of Italian residents and tourists of coastal areas for beaches and littorals management and environmental protection. This paper contributes to the existing literature thanks the focus on the Italian case, highlighting, at the

same time, the implication of tourists and residents' engagement in the implementation of environmental policy. The research is structured as follow: Section 1 presents information about the impact of climate change on coasts, with a particular focus on the implication of climate change on tourism and the impact of tourism on coastal areas. Section 2 describes the study area and the littoral's characteristics of the area under exams. In Section 3 materials and methods are presented, including descriptive data. Section 4 is dedicated to the WTP results and in Section 5 are argued the discussion of the data and the conclusion of the research.

## 2. Literature review

The European Union Environmental Commission calculated that one-third of the European population lives within 50 km of the coast, and their GDP generated an amount of over 30% of the total EU GDP. Data from The EU Blue Economy Report (2021) shows that the EU Coastal tourism in 2018 has generated a GVA slightly more than 80 billion of euro, a 21% rise compared to 2009. And a Gross operating surplus valued at 27.8 billion euro (+44% compared to 2009). The sector has obviously suffered from a contraction during the pandemic period. The Mediterranean is considered one of the main 'climate change hotspots in Europe' (EEA, 2017). Projections suggest substantial warming and increase in heat waves, dry spells and droughts in the region (EEA, 2017), therefore the CC effects will dramatically affect coastal activities.

As shown in the literature, awareness of climate change can affect an individual's WTP. A seminal paper by Berk and Fovell (1999), assesses how different climate change scenarios influence WTP in the Los Angeles area, finding that most of the individual's preoccupation with climate change relates to increasing temperatures and lowering precipitation. While the phenomenon was not on average perceived as irrelevant to the lives of the interviewees, only 40% of them were prepared to pay for its prevention.

Moreover, coastal areas are also affected by several other pressures such as habitat loss and degradation, pollution, and overexploitation of resources. The Mediterranean basin, as well as other touristic destinations, is likely to be extremely affected (Torres-Bagur *et al.*, 2018; Rutty & Scott, 2010; Roson & Sartori, 2014).

In this framework, a large part of the literature on tourism and climate change adaptation focuses on understanding which is the most effective strategies, showing that there is a correlation between the economic side – tourism – and the environmental protection side, that can be exploited.

McCreary *et al.*, (2018) explores factors that may influence tourists' WTP for climate change adaptation in nature-based destinations, including income, age, and climate-related risk perceptions. Results show that tourists' interest in natural areas can be leveraged by local governments in their climate change mitigation strategies, generating a *win-win* situation that benefits both the local ecosystem and the local economy. Similarly, Cetin *et al.*, (2017), which evaluate the effect on tourists' WTP of tourism taxes in the Istanbul area, reports that visitors are willing to pay an additional amount of tax if this is related to improvements in their touristic experience, even though it seemed that the overall sustainability of the destination was less relevant.

Researchers present similar results also about coastal areas. A paper by Enriquez-Acevedo *et al.*, (2018), which investigates WTP for beach ecosystem services in Colombia, points out that beach quality is crucial for the payment amount: while WTP seemed to depend less on economic variables, it was more defined by concerns regarding ecosystem services loss. Schumann and colleagues (2016), investigated visitors' perceptions of environmental quality, preferences for coastal amenities, and WTP for changes in coastal lodging attributes in Barbados, finding that preferences for beach-front lodging and the aversion to beach litter can increase visitor's WTP for beach clean-up services. Halkos and Matsiori (2012) investigate the



motivations behind people's WTP for coastal zones' water quality improvements, finding that the drivers of WTP are mainly related to individuals' expectations for future tourism development, followed by the preoccupation with coastal environment management and coastal zone protection. Both López-Sánchez and Pulido-Fernández (2017) and Duran-Roman *et al.* (2021), investigate tourists' WTP for taxes and fees aimed to improve the sustainability of their destination in Andalusia region, Spain. Besides the relevance of sociodemographic characteristics and budget constraints on the vacation, they find that tourist behaviours such as place of origin, fellow travellers, accommodation, and purpose of the trip are relevant factors related to an increased willingness to pay.

Increasing tourism activities has created many positive effects such as developing new jobs opportunity for local people, new touristic sites, and improving the image of the countries in the eye of tourists. Nevertheless, if not organised properly, it may have major detrimental effects on the physical environment as well as on cultural monuments and values (Kocasoy, 1995). Referring to coastal areas, for example, increasing the number of visitors beyond the sensitive limit of the environment, trigger undesirable variations in the ecosystem – “bearing capacity” effects – and even though these effects differ depending on the environment considered and its environmental condition and pollution, they always create unbalance in the ecosystems with negative effects on flora and fauna (Kacasoy, 1995). Tourism has an undeniable impact on coastal areas: the first is the water – water pollution and water supply scarcity – manifested not only in regions with water-scarcity problems but also where water is abundant (Baoying, Yuanqing, 2007). Other studies conducted on the Mediterranean coasts have demonstrated that the littorals are responding differently to the combined action of climate change and human activities: erosions and flooding are the major threats to the preservation of the coasts and these phenomena are intensified by the presence of mass tourism and human activities and settlements (Rizzetto, 2020; Burak, Dog, Gaziog, 2004; Roca, Gamboa, Tabara, 2008).

Could tourism negatively affect the WTP of residents in a specific area? Thanks to our survey, we can also investigate if WTP for beach services changes for residents when accounting for the perceived damage that is caused by tourism. Following Garcia *et al.* (2015), even though tourism can contribute to raising awareness of protecting and preserving the environment, it can also be a cause of its deployment and destruction, when it is developed in yet too fragile contexts. Indeed, on the one side, residents agree that tourism can help environmental preservation, while on the other they recognise that it also creates more pollution, waste generation, and resource use, together with congestion in public facilities and resources, due to overcrowding in certain times of the year. These are among the more negative impacts perceived along with price increment, closure of local economic activities in favour of more tourist-oriented ones, increased noise, and perceived insecurity (Martin *et al.*, 2018), traffic congestion and parking problems (Lindberg & Johnson, 1997; Sheldon & Abenoja, 2001), serious environmental damage and significant increases in waste and pollution (Andereck *et al.*, 2005; McGehee & Andereck, 2004). This tourism-related inconvenience and collateral damage could cause the local population to form and perpetuate negative attitudes toward tourism (Almeida-García *et al.*, 2016).

In conclusion, the literature agreed with the fact that the population is aware of the risks and challenges posed by climate change and that, albeit with varying degrees of intensity, they are willing to pay for adaptation strategies. With reference to the coastal environment, tourists seem to be the group most willing to pay for the protection of the places they visit; this would seem to depend not so much on the economic or social conditions of the tourists but on the desire to preserve the natural characteristics of the amenities. Thus, tourism can be leveraged as a further channel for resources aimed to support environmental protection policies, highlighting the many benefits of cultivating and improving tourism settings and places. At the

same time, there are context-specific factors related to the attitudes of residents towards tourism that needs to be considered to ensure the success of environmental policies.

### 3. Study area

This research concerns four beaches and littorals along the Italian Regions of Marche – Adriatic coastline - and Campania – Tyrrhenian coastline. Four main coastlines are under analysis, San Benedetto del Tronto in Marche and Agropoli, Battipaglia, Capaccio and Eboli in Campania (Figure 14). These coastlines are characterised by linear low sandy beaches affected by mass tourism pressure during summer seasons. Moreover, San Benedetto del Tronto coastline shows erosion issue due to the presence of upstream structures that retain sediments and dune damages (Chiavazzo *et al.*, 2017), storm surges and tides.

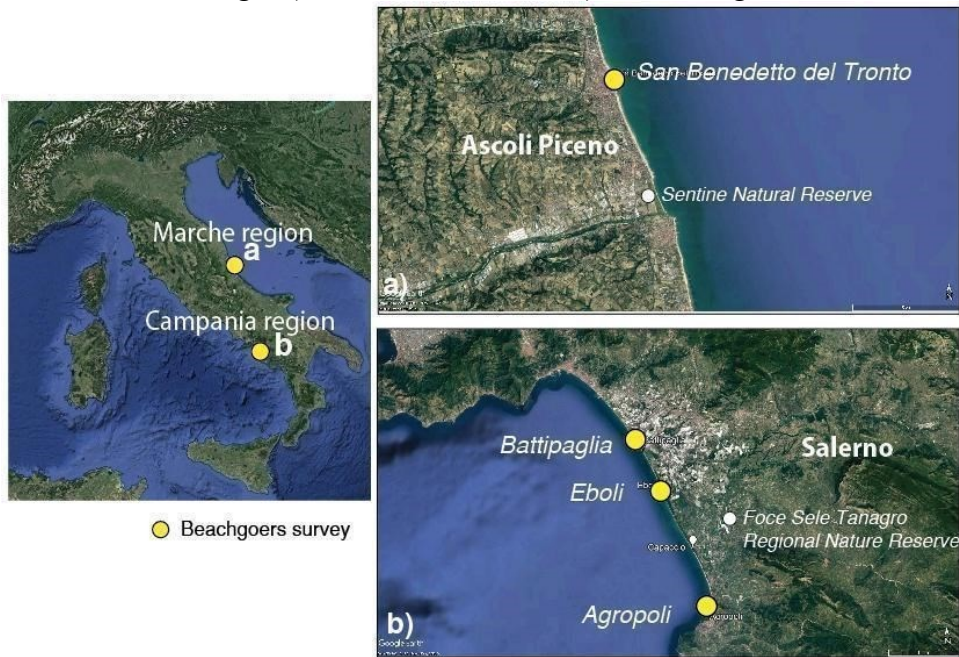


Figure 14. San Benedetto del Tronto (a) and the Salerno Gulf (b) - Italy<sup>22</sup>

<sup>22</sup> The images are from ISPRA WebGis page and they show the morphological characteristics of the territories under exams, as for example the linearity of the coasts <http://sgi2.isprambiente.it/viewersgi2/>

### 3.1 Marche Region - San Benedetto del Tronto



Figure 15: Coast of San Benedetto del Tronto

Marche region is characterised by 180 km of coast – from the headland of Gabicce Mare to the mouth of the Tronto River. Most of the beaches have been recognised by the “Blue Flag”, a voluntary eco-label assigned every year by the Foundation for Environmental Education (FEE) – UNEP (United Nation Environmental Programme) and UNWTO (United Nation World Tourism Organization) to seaside resorts that meet criteria related to sustainable land management. The aim of this award is to direct local management policy of coastal resorts toward a process of environmental sustainability (Programma Bandiera Blu). The coastline – as it is possible to see from Figure 15<sup>23</sup> - alternates gravelly, rocky, and sandy beaches creating the perfect mix for tourists' needs. From Ancona, the capital of the region, it is possible to see the Conero Mountain, a promontory that overlooks the Adriatic Sea. The Conero Mountain is the beginning of the Marche coastline “Conero Riviera”, full of white bays some of them reachable only by boat or through paths in the green Mediterranean scrub (Regione Marche, 2022). Southern area of the Conero is characterised by wide and flat sandy shores until reaching an area rich in pine forests of Porto Recanati, Porto Potenza Picena and Civitanova Marche; the “green Picena Riviera” stretches between Porto Sant’Elpidio to the “palm Riviera” of San Benedetto del Tronto, with its 7000 palm trees that grows on the white beaches (Regione Marche, 2022).

The urbanisation process of '60 and '70 of last century, has led to the built of several infrastructures as, for example, (A14 highway and minor road network) that has significantly affected the natural landscape of the region so it is possible to state that there is a single coastal conurbation extending from the promontory of Conero Mountain as far as San Benedetto del Tronto and beyond, in Abruzzo territory (Acciarri *et al.*, 2017).

Tourism represents around the 3,5% of regional GDP, with more than 9000 hotels, cafés, restaurants, and farmhouses (CdP, 2021). Balneary tourism represents the major share of tourism sector (around 68% of the total), while historical and artistic cities reach only the 16 percent, and mountain areas the 9.6% - other resorts, as for example, religious sites, thermal and hillside sites about the 6% (ISNART, 2015).

This study is focused on San Benedetto del Tronto, a city located in the Marche region (Central Eastern Italy). San Benedetto del Tronto is one of the main holiday resorts of the southern Marche between the Tronto and Tesino rivers. San Benedetto del Tronto is characterised by fine sandy beaches (San Benedetto del Tronto, 2022). Beach has a total extension of 7,970m, 3,290m of them are equipped and managed by 114 beach concessions; 1,700 m encompassed by free access beaches, 1340 m are dedicated to the port area and 1,630 m of Sentina Regional Natural Reserve. The littoral is characterised by fine sand (0,125 – 0,25 mm) and protected by 4,7 km of detached and emerged breakwaters reefs), on the other side, the area of Sentina Regional Natural Reserve has not natural defences (Acciarri *et al.*, 2017). In 2020, San Benedetto del Tronto have been recorded 343 accommodation facilities and 10487 beds.

<sup>23</sup> The image of San Benedetto del Tronto coast is from ISPRA WebGis page

### 3.2 Campania Region - Salerno Gulf: Battipaglia, Eboli and Agropoli

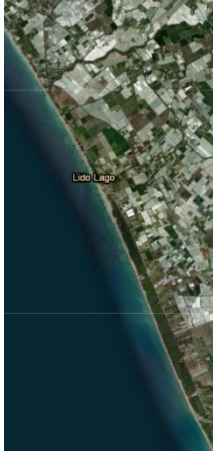


Figure 16:  
Battipaglia coast

Campania region is characterised by 500 km of coast, characterised by four different Gulfs: Gaeta, Naples, Salerno and Policastro. More than 50 beaches in 2021 are awarded with the “Blue Flag”. The coastline alternates gravelly, rocky, and sandy beaches creating. The northern and the southern area of the Salerno Gulf are characterised by rocky coastlines, while the middle area – Sele Plain – presents a low and sandy coastline – Figure 16 shows, for example the coast of Battipaglia, characterised by a linear and sandy littoral<sup>24</sup>, the same characteristics of the littoral of San Benedetto del Tronto. The Cilento Plateau descends to the sea with a high, rocky coastline, jagged with inaccessible inlets. The Sorrento Peninsula has a continuous interval of sheer cliffs overhanging the sea and small sandy pebbly inlets enclosed between rocks. Moreover, the islands of Ischia, Procida and Capri, are characterised by sandy and rocky beaches. In 2021, the impact of the tourist sector in Campania represents the 11,0% of the total productive sectors, with the 64,7% of industries related to restaurants and food service. The 38,2% of tourism was related to cultural cities, 28,4% to gastronomic tourism, 27,8% “beach&sun” tourism, and 6,0% religious tourism (ISNART, 2021). In particular data for this research are collected in the municipalities of Battipaglia, Eboli, Agropoli.

## 4. Materials and methods

### 4.1 Sampling and perception

The data were collected through out a questionnaire<sup>25</sup> developed to elicit visitor preferences on coastal environment, and safety in 2017, with the aim to capture individuals’ interest in services, security, and environmental protection. National Lifeguard Society supported the design of the questionnaire<sup>26</sup> together with relevant beach management specialists. The first step involved the discussion of a focus group held by 10 participants for a pre-test conducted in May 2017, the aim was to detect potential bias, misunderstandings, and wording (Arrow *et al.*, 1993; Huhtala, 2004). The survey is structured in 3 Sections: the first one collected socio-demographic information, the second one focused on eliciting willingness to pay (WTP) for beach cleanliness and safety, the presence of services and facilities and environmental protection. The third section was related to perception, asking respondents to rate the presence of litter and waste, the effect of tourism – such as pollution and resource depletion – and the facilities and services present on the beach.

Data were collected from June to September 2017, in Salerno Gulf and San Benedetto del Tronto. The time for data collection was between 9:30 am and 6:30 pm. In the case of a group visit, one person was interviewed to avoid the risk of doubling a specific answer. The final sample includes 387 observations.

Table 23 also reports the explanatory variables used in the statistical model presented in the next section and in the Tables from 24 to 27. The variables are grouped into categories to better understand the different effects on the WTP. The first group, “Panel A - Socio-demographic variables” collects the socio-demographic characteristics of the sample; the second group, “Panel B - Perception of climate change” reflects the awareness of respondents about the causes of climate change (see for example, the answer “climate change (CC) is caused by human activities”); the third group, “Panel C - Perceived effects of tourism on the environment” collects the information about the perceived impact of tourism on the environment from a value from 0 (low) to 5 (high) - e.g., impact in terms of “pollution”, effects on “natural areas” and

<sup>24</sup> The image of the Battipaglia coast is from ISPRA WebGis page

<sup>25</sup> Full questionnaire available in Section 7 – Appendix

<sup>26</sup> <https://www.salvamento.it/>

impact in terms of “resource depletion”. The fourth group, “Panel D - Perceived presence of waste on the littorals collects information about the perception of residents and tourists about the presence or not of waste on the littorals, from a value from 0 (low) to 5 (high), the main variables included are cigarettes and microplastics. The last group, “Panel E - Perception of beach service and facilities” that includes variables that express residents and tourists’ preferences for beach choices from 0(low) to 5(high), e.g., parking, beach access etc.

Summary statistics for respondent demographics and travel characteristics are presented in Table 18. Users were equally divided between males (47.3%) and females (about 49.2%) having an average age of about 36 years old. Specifically, the users’ sample was prevalently composed of young (30.6% users below 25 years) or mature persons (almost 65% of users from 26 to 65 years), rather than the elders (only 3.2% of users had more than 66 years). Respondents predominantly were not resident in the beach locality (52.7%) but about 40% of them were regular users of that beach. Overall, the 13% of beachgoers evaluated as good the quality of the services offered. The predominant type of user was a family with children (48.5%) that spent more than 15 days (40.3%) in the locality during the vacation. Non-resident beach goers were the 55% of the sample. Two thirds of the surveyed population (66.36%) declared to be interested in environmental and beach protection, and 82% did prefer clean beaches: in fact, among the services offered by the littoral, most of the answers reported the highest rating in cleaning services. This was followed by security services. Overall, beach cleaning was not judged positively since more 60% of the responded declared to be annoyed with litter on the beaches. Specifically, respondents reported viewing a high presence of organic litter and cigarette buds, followed by plastics, papers, mixed litter and other materials like metal and rubber.

Table 18: Descriptive statistic

Variable	Description	N	Mean	Std. Dev.	Min	Max
<b>Panel A – Socio-demographic variables</b>						
Gender	0=male 1=female	376	1.489	0.501	1	2
Age	Age of respondent	382	34.581	15.265	0	75
Resident	0=resident 1=non-resident	387	0.499	0.501	0	1
First time	1=yes 2=usually 3=sometimes	377	2.164	0.772	1	3
Length of vacation	1= today 2= 2 to 7 days 3= 8 to 15 days 4= 15 days +	366	2.792	1.140	1	4
<b>Panel B – Perception of climate change (CC)</b>						
CC caused by human activity	0= No 1= Yes	387	0.357	0.479	0	1
CC is a natural event	0= No 1= Yes	387	0.620	0.486	0	1
CC is a mix of both human activity and nature	0= No 1= Yes	387	0.447	0.498	0	1
<b>Panel C – Perceived effects of tourism on the environment</b>						
Pollution	Perception of pollution as a main effect of tourism from 0 (low perception) to 5 (high perception)	373	3.579	1.329	0	5
Natural areas	Degradation of natural areas as a main effect of tourism from 0 (low perception) to 5 (high perception)	367	2.940	1.371	0	5

Resource depletion	Resource depletion as a main effect of tourism from 0 (low perception) to 5 (high perception)	364	3.118	1.447	0	5
<b>Panel D – Perceived presence of waste on the littoral</b>						
Cigarettes	Presence of cigarettes on the littoral – value from 0 to 5	293	3.239	1.6	0	5
Microplastics	Presence of microplastic– value from 0 to 5	366	0.913	0.283	0	1
<b>Panel E – Perception of beach services and facilities</b>						
Parking	Value assigned to the presence of a parking area from 0 (low) to 5 (high)	379	2.641	1.623	0	5
Beach access	Value assigned to the presence of an access to the beach from 0 (low) to 5 (high)	377	3.39	1.356	0	5
Café/restaurant	Value assigned to the presence of a food court from 0 (low) to 5 (high)	375	3.205	1.591	0	5
Sports Area	Value assigned to the presence of a sport area from 0 (low) to 5 (high)	372	2.567	3	0	5

Note: The table report the control variables used in the descriptive and in the econometric model. It is provided the description of the variable, the corresponding values and the summary of the descriptive statistics (numerosity, mean, standard deviation and minimum value and maximum value).

#### 4.2 Contingent valuation method

The contingent valuation (CV) method is a direct method, an econometric tool used by economists to estimate the WTP for improving the quality of environment through environmental preservation and conservation management programmes. It is based on the identification of representative population sample who is asked to state preferences about a hypothetical market scenario, in which a “price” is associated to the protection of natural areas (Wang, 1992; Boyle, 2017; Haefele, 2019; Loomis & White, 1996; Rankin & Robinson, 2018; Loureiro, & Ojea, 2008). The economic theory has developed different approach to measure non-use or passive-use of the goods: the bidding games, the payment card (PC) approach, the open-ended (OE) questions and the dichotomous choice (DC) approach (Boyle, 2003).

The aim of this paper is to understand respondents’ willingness to pay for beach and littoral management. The tool chosen is the double-bounded DC approach, where two questions about respondent’s WTP is investigated, the first one is a “yes/no” question and in the second one is asked to double or halve their previous stated value (Loureiro, M. & Ojea, E.; 2008; Wang, S. 1992; Hanemann, Loomis & Kagenen, 1991). The WTP question was stated as follow:

*"In case a financial fund is constituted in order to ensure the appropriate beach management, are you willing to pay X € (per person) each season in this territory?"*

Based on the pilot group and the literature, the sets of bids (X) used in this study are: 2 €, 5 €, 10 €, 20 €. It was randomly asked to the sample if they agree or not to one of these bids. Then a follow-up question was asked, where the second offered amount is conditional on the user response to the first question. As reported by Chang and Yoon (2017) double bounded (DC) approach has a higher statistical efficiency than the single-bounded approach – where it is asked to answer only the “yes/no” question. DC approach helps to understand the range of values in which the individuals recognise their willingness to pay for a non-market good or service. The sequence of questions identifies the range of true value of WTP for each respondent.

Specifically, in case of affirmative answer to the first question it was asked if they agree to double their initial amount. In case on negative answer, it was asked if they were willing to pay the halve. In other words, if it was asked to pay 10 euro to the first question and he/she answered affirmatively it was asked to pay 20 euro in the follow-up question. In case of

negative answer – to the 10euro question, it was asked to pay 5 euro. If the answer is “no” to both question the WTP is equal to 0euro.

### 4.3 The econometric model

The dataset is analysed by using the dichotomous choice model and the explanatory variables used are the one explained in the previous paragraph and described in Table 18. The regression is conducted for the main groups: Panel A - Socio-demographic variables; Panel B - Effects of tourism on the environment; Panel C - Climate change perception; Panel D - Presence of waste on the littoral; Panel E - Beach facilities and services. The analysis is conducted using STATA 17 that directly estimates the coefficient throughout the use of maximum likelihood estimation and then it is estimated the mean WTP. The dichotomous choice model allows researchers to ask individual to a follow-up question to the previous one; in other words, if the individual answers “yes” to the first question he/she is asked about his/her WTP for a higher amount. On the other side, if the individual answers “no” to the first question he/she is asked about his/her willingness to pay for a lower amount. Because of the follow up structure of our survey, individuals may fall in one of the following categories: diyn, diyy, diny, dinn, depending on the relevant case for everyone: for example, if one falls in diyn, he or she answered “yes” to the first bid and “no” to the second. This way, everyone contributes to the estimation of the WTP for the part of his/her answer that is closer to their real WTP.

Under the assumption of Lopez-Feldman (2012), we regressed the bid variable as in the following equation:

$$BID_{i(z_i, u_i)} = z_i' \beta + u_i \quad Eq. 1$$

Where  $z_i$  is a vector of explanatory variable,  $u_i$  is the error term and  $\beta$  is the vector of estimates from which WTP is computed as:

$$E(WTP|z, \beta) = z' \begin{bmatrix} \hat{\alpha} \\ \hat{\delta} \end{bmatrix} \quad Eq. 2$$

Where  $z'$  is the vector of values of interest for the explanatory variable,  $\hat{\alpha}$  is a vector of constant of the explanatory variables and  $\hat{\delta}$  the coefficient for each regressors that captures the amount of the bid.

The Tables from 19 to 23 in the next section presents the results of this analysis. We start with a baseline specification with demographic characteristics only, to which we add different sets of covariates to estimate changes in WTP in relation to the perception of specific environmental problems or issues related to the management of the beach.

## 5. Results

The WTP estimation was conducted on the total surveyed population as well as in the resident’s and tourist’s samples respectively, as we want to highlight any existing difference between tourists and residents’ WTP.

Besides our baseline specification, which includes, sociodemographic variables (age, gender, first time on the beach and length of the holiday) we also took into consideration factors like climate change perception, tourism damage perception, perceived presence of litter and presence of beach facilities and services, as potential factors influencing WTP.

We assessed the WTP of the total sample and both residents and tourists towards three possible management areas, namely beach cleanliness, beach security, and environmental protection. *Beach cleanliness* is a variable equal to 1 if respondents are willing to pay for the implementation of beach and littoral cleaning services and 0 otherwise; the variable *security* collects the interest towards the implementation of beach security services (e.g. additional guard towers) if equal to 1 and 0 otherwise; finally, the variable *environmental protection* is

equal to 1 when the preferences expressed is towards the protection of the environment from degradation (e.g. biodiversity preservation) and 0 otherwise.

Results are reported in the Tables below – from Table 19 to Table 23. We carried our analysis on the Total Sample of respondents and on two restricted samples of tourists and resident’s interviewee (Tourists Sample and Residents Sample), to highlight differences in the WTP of these two groups. The results presented in the tables below are expressed in euro and they represent the average value for the explanatory variable.

Table 19: Panel A – Socio-demographic variables; WTP estimation results for total sample (col. 1-3); tourist sample (col. 4-6) and resident sample (col. 7-9)

	Total Sample WTP (€)			Tourists Sample WTP (€)			Residents Sample WTP (€)		
	Beach cleanliness (1)	Security (2)	Environ. protection (3)	Beach cleanliness (4)	Security (5)	Environ. Protection (6)	Beach cleanliness (7)	Security (8)	Environ. Protection (9)
<b>Panel A - Socio- demographic variables</b>									
<i>Socio- demographic variables</i>	6.15	6.35	6.00	6.15	6.68	6.87	5.73	5.90	5.30
Age	11.22	9.70	8.76	11.34	8.08	9.50	11.61	11.42	7.31
Gender	9.87	9.27	7.98	7.28	4.65	5.63	12.83	14.11	10.39
First time on the beach	11.03	9.95	9.23	12.88	10.24	11.38	9.72	9.20	6.55
Length of vacation	11.71	10.39	9.43	11.63	8.85	-	-	-	-

Panel A – Socio-demographic variables of Table 19, presents results for our model considering as covariates *age*, *gender*, if it’s the first time the respondent comes to that beach (*First time on the beach*), and the length of holiday (*Length of vacation*). This is our baseline specification, and we note that first important evidence emerges: the top row shows that tourists are willing to pay a higher amount for environmental protection, while residents would pay more for security services (e.g., implementation of lifeguard’s services). This can be explained as the will to create a more secure environment during the entire year, not only during summer season. Tourists, on the other side, prefer to pay more to maintain the high-quality environment; this is in line with the literature showing that amenities and environmental heritage are considered integral part of the local experience during holidays (see for example, Lohmann & Kaim, 1999).

When considering the age of the respondent, we note that the WTP is higher for beach cleanliness, especially for the Residents Sample. In addition, Table A1 in the appendix shows that age is negatively and significantly related to the bid variable, meaning that younger people are on average willing to pay more.

Interestingly, we notice that the higher WTP regarding security is found in the resident subsample for women (*gender*, in fact is a dummy variable that takes value 1 if female), who would pay up to 14.11€ to increase security of beaches. Moreover, being a female and a resident increase also the WTP for beach cleanliness, with respect to the other displayed in the panel (12.83€). Even though Table A1 in the appendix shows that for the Residents Sample, gender is not a determinant of WTP, this increased value could just reflect a higher WTP for residents in general, reinforcing our initial interpretation that residents would pay a higher amount for security and cleanliness.

When we consider the variable *First time on the beach*, interesting for the Tourists Sample, we notice that tourists have an higher willingness to pay to increase the cleanliness of beaches (12.88€), this implies that tourists are strongly interested in having a clean zone during their holiday and this influences their WTP, in particular, Table A1 in the appendix shows that the variable is positive and statistically significant only for tourists; in other words, investing



in cleanliness services positive influence the perception of tourists about the beach management and they are more willing to pay to contribute to maintain the littorals and the beaches clean.

The last results of the Panel A refer to the variable *Length of vacation*. Obviously, no results are presented for the residents' sample because it is a characteristic of the tourist sample. Inside the subsample tourists it is possible to notice as respondents prefer to pay to have an implementation of cleanliness services, the difference with security services is equal to 2.78€. This result is coherent with the previous one, confirming that tourists are strongly interested in spent their holidays in a clean a well-managed area also because this is part of the experience and may impact on the recreational activities; clean beach implies an increasing of engagement, and a main motivation for returning to that beach again (e.g., Mutuku *et al.*, 2022; Dodds *et al.*, 2009).

Table 20: Panel B- Effects of tourism on the environment; WTP estimation results for total sample (col. 1-3); tourist sample (col. 4-6) and resident sample (col. 7-9)

	Total Sample WTP (€)			Tourists Sample WTP (€)			Residents Sample WTP (€)		
	Beach cleanliness (1)	Security (2)	Environ. protection (3)	Beach cleanliness (4)	Security (5)	Environ. Protection (6)	Beach cleanliness (7)	Security (8)	Environ. Protection (9)
<b>Panel B – Effects of tourism on the environment</b>									
<i>Effects of tourism</i>	4.89	5.00	4.88	5.63	5.26	7.05	4.12	4.53	3.87
Pollution	13.57	12.24	10.97	10.23	8.76	9.20	18.05	17.54	12.44
Natural areas	13.67	12.39	11.27	10.33	10.36	12.82	17.13	15.58	8.59
Resource depletion	8.30	6.35	5.72	5.51	3.79	8.94	12.20	12.16	5.53

Table 20 shows the results of our model considering the variables of Panel B – Effects of tourism on the environment; in particular it shows how the perceived effect of tourism affects WTP in the three samples. These effects are included as externality in terms of *pollution*, that catches the perception of increment of beach pollution as consequence of mass tourism, perceived degradation of *Natural areas*, and *resource depletion*, which captures the perception of the increase in resource use for tourism needs. The highest average WTP – first row of Panel B – would be paid by tourists for environmental protection programmes (7.05€), while residents preferred option is to pay more for security programmes (4.53€).

Interestingly, while the WTP of pollution is the highest across the three domains, people are willing to pay more for pollution when this is connected to beach cleanliness (13.57€, 10.23€ and 18.05€ for the Total Sample, tourists and residents' samples respectively), with residents being willing to pay 4€ more than the average (total sample), and 8€ more than the tourists. The implication is twofold: on the one side, respondents who lives in these touristic areas are more concerned with pollution, especially in relation to a clean environment; on the other side, this suggest that a higher value is placed on short-run effects of a hypothetical program for cleaner littoral and seashores, rather than on the long-run effects of, say, the implementation of a program for local marine flora and fauna preservation.

Similar WTP are found for what concerns natural areas, while WTP drops when turning to resource depletion: on average the total sample as well as both restricted samples, are less interested to pay to compensate for resource depletion from tourism by 5€. This latter result is in line with the results of a few older studies (for example, Biel and Gärling, 1995) that show that perception of and behaviours around resource depletion are influenced mainly by constraints on one's individualistic values, coming from group identification, social pressure

by group members, rewards and penalties. Moreover, uncertainty around how other people act and incomplete knowledge on the degree of resource depletion are other factors affecting this specific environmental domain.

Table 21: Panel C - Climate change perception; WTP estimation results for total sample (col 1-3); tourist sample (col. 1-4); resident sample (col. 7-9)

	Total Sample WTP (€)			Tourists Sample WTP (€)			Residents Sample WTP (€)		
	Beach cleanliness (1)	Security (2)	Environ. protection (3)	Beach cleanliness (4)	Security (5)	Environ. Protection (6)	Beach cleanliness (7)	Security (8)	Environ. Protection (9)
<b>Panel C – Climate change perception</b>									
<i>Climate change perception</i>	6.14	6.38	6.08	5.47	5.74	6.81	6.43	6.67	5.30
CC. Human activity	11.50	10.77	9.00	10.46	8.66	10.13	12.42	11.48	6.87
CC. Natural Event	10.30	8.18	7.83	8.22	4.35	7.54	12.29	11.42	7.60
CC. mix of both	6.09	3.44	3.09	6.93	3.35	5.77	7.98	6.65	1.93

Table 21 reports the data of our model for Panel C – Climate change perception that investigates how perception of climate change influences the WTP. We included three dummy variables in this panel: *human activity*, which takes value 1 if the respondent believes that climate change is due to human activity only; *natural event*, equal to 1 if the interviewee believes it’s only due to natural causes; *mix of both*, where 1 indicates that the individual thinks human activity and natural causes are equally contributing factors. Across all three samples, respondents who believe climate change is a consequence of only human activity are willing to pay a higher amount in all three area of environmental management. For example, in the total sample, these respondents would pay the 13% more that those who believes it is caused by nature and the 65% more than who believes is caused by nature together with human activity. This imply that different levels of awareness of “having power” to influence climate change positively influence WTP. This result is in line with the literature showing that preoccupation towards the environmental situation is not enough to trigger a change in behaviour, since the individual needs to feel responsibility and a sense of efficacy before they change their behaviour (Doherty & Webler, 2016). With regard to the tourist and residents’ sample and similarly to the previous cases, we find that beach cleanliness and security are where residents want to pay more when considering climate change perception while tourists are more concerned with environmental protection; the difference between tourists and residents who have a strong association between climate change and human activities is equal to 3,36 euro.

Table 22: Panel D - Presence of waste on the littoral; WTP estimation results for total sample (col. 1-3); tourist sample (col. 4-6) and resident sample (col. 7-9)

	Total Sample WTP (€)			Tourists Sample WTP (€)			Residents Sample WTP (€)		
	Beach cleanliness (1)	Security (2)	Environ. protection (3)	Beach cleanliness (4)	Security (5)	Environ. Protection (6)	Beach cleanliness (7)	Security (8)	Environ. Protection (9)
<b>Panel D – Presence of waste on the littoral</b>									
<i>Presence of waste on the littoral</i>	12.65	9.05	5.65	9.30	6.70	2.22	6.66	4.63	3.53

Cigarette	11.30	10.75	10.08	8.32	6.86	7.99	11.55	11.23	8.78
Microplastic	12.65	9.05	5.65	9.30	6.70	2.22	6.66	4.63	3.53

Table 22 reports the data of our model for Panel D – Presence of waste on the littoral that describes how the perception of a clean beach impacts individuals’ WTP. The questionnaire asked to state which are the most common sources of waste the respondent see on the frequented beach. Among the variety of litter (organic waste, glasses, paper, to name a few), we found cigarettes and microplastics to be more relevant, especially for residents that presents a higher average WTP than tourists. Even if both residents and locals are, at the same time, contributors or victims of beach litter, the WTP for tourists is higher when it comes to cigarettes (+2.64€) and lowers (-3,32€) in relation to microplastics: in terms of awareness, cigarettes are more visible than microplastics therefore a tourist – that only attend the beach for a few days – may perceive this litter as more annoying than smaller litter like microplastics. We believe that in the case of waste, tourists’ WTP could mostly be driven by the beach’s appearance; indeed, this is the only set of regression where the computed WTP in the environmental protection domain for residents is 0.91€ higher than for tourists.

Table 23: Panel E- Beach facilities and services; WTP estimation results for total sample (col. 1-3); tourist sample (col. 4-6) and resident sample (col. 7-9)

	Total Sample WTP (€)			Tourists Sample WTP (€)			Residents Sample WTP (€)		
	Beach cleanliness (1)	Security (2)	Environ. protection (3)	Beach cleanliness (4)	Security (5)	Environ. Protection (6)	Beach cleanliness (7)	Security (8)	Environ. Protection (9)
<b>Panel E – Beach facilities and services</b>									
<b>Structure/services</b>	9.99	7.80	7.98	9.38	5.65	7.74	10.85	11.11	5.74
Parking	13.18	11.83	11.17	13.95	10.73	11.87	12.69	13.30	8.28
Beach access	8.30	6.36	6.20	7.97	4.10	5.98	8.15	10.10	3.83
Café/restaurant	9.84	7.28	6.52	8.49	4.95	5.64	11.95	10.22	5.46
Sports area	13.92	12.00	12.92	10.08	6.61	9.26	17.50	18.71	13.31

The last part, Table 23 reports the data of the model for Panel E – Beach facilities and services, that tests the impact of the presence of facilities and services such as parking, cafés and sport areas. The WTP mean values in the previous Tables (from 19 to 23) reveals as tourists and residents have two different perspectives. Tourists are willing to pay a lower amount for the environment if the focus is on facilities and services, preferring paying for improving beach cleanliness (7.74€ for the environment vs 9.38€ for cleanliness). On the other side, residents are more likely to pay for environment when they rate beach facilities and services high. In other words, the access to structures and facilities contribute to create a friendly environment for holidays, and by increasing the engagement of both locals and non-locals there is an indirect effect on their will to contribute to improve beach management programmes. Results show that parking and sports area specifically, increases WTP of both tourist and residents of 10€ on average, with respect to the WTP computed with our baseline model.

## 6. Discussion and Conclusion

The purpose of this study was to highlight the existence of differences in WTP between tourists and residents in coastal areas affected by tourism pressure. This paper contributes to the literature that seeks to understand whether and how tourism can be a channel for raising resources to support policies for climate change adaptation and environmental protection. To do so, it is proposed a survey to elicit beach users WTP for beach cleanliness, security and

environmental protection of two main touristic areas in Italy, namely Marche and Campania littorals, that are annually affected by mass tourism during the summer season. This, combined with the effects of climate change is eroding the equilibrium of ecosystems. The analysis of different managerial areas has reported differences among users' WTP explained by a combination of perception and expectation. The decision to include different management areas assumed that people have different interests in the way in which littorals and holiday destinations have to be managed. Moreover, the focus on different areas could lead to a better understanding of people position regarding beach management and environmental protection.

Our results show that there are differences in the perception of the environment and consequently in the willingness to pay tourists and residents. In line with the literature, tourists in our sample are generally willing to pay more for environmental protection than residents, even though this could be related to the willingness to improve their future touristic experience (see for example Dodds *et al.*, 2009; Lindsay, 1992). We believe this result allows room for the introduction of local policies (e.g., an environmental tourism tax) to fund local environmental and climate mitigation actions. Furthermore, the WTP data could be used as input data for future research as, for example, cost-benefit analysis in order to improve local policies. Tourists will revisit the location if the natural environment and the littorals are well-managed both from the cleanliness and the services side and improved to meet their expectation (Lamsal *et al.*, 2016).

Turning to residents, beach cleanliness and safety is a better channel to leverage to involve individuals in seashore management. Our results show that residents are willing to pay a higher amount for keeping order and cleanliness in the place they live and may experience tourism in part as a detriment to the beauty and safety of their nearby littoral.

This study shows that short-term effects on the environment and beauty of the littoral are more valued than long-term effects. We observe that WTP is lower when including resource depletion as a control variable concerning the same value for, say, cigarettes. Because of resource depletion is characterised by incomplete knowledge – namely, the effects are less evident and manifest slower in some cases – individuals may struggle to develop a sense of responsibility and efficacy toward this phenomenon. Indeed, the literature has shown that perception of resource depletion is affected by other factors such as constraints on one's individualistic values, group identification, social pressure by group members, rewards and penalties and uncertainty around how other people act around this matter.

Lastly, focusing on policy implication of this paper, acting on short-term goals is of course the starting point to increased awareness about the main problems related to the territories. Beach cleanliness and environmental protection are interconnected: for example, implementing cleaning services of seashores from cigarettes, plastic bottles and litter implies less waste in the sea and on the beach, contributing to a high-quality environment for tourists and residents during holidays and at the same time to prevent an increase of impact on the marine ecosystem. At the same time, local policy maker could use this opportunity to inform both residents and tourists about other less blatant environmental problems, attempting to educate individuals and increase the awareness of their responsibility. Raising awareness of responsibility could translate from one side into an improvement of citizens' behaviours and on the other an increase in their WTP, thus in a potential increase of environmental policy resources.

In this paper, we were interested also in exploring the beach facilities and services effect, because it is one of the key factors that lead people to choose specific littorals. Results show that access to structures and facilities contributes to creating a friendly environment that engages both locals and non-locals, that exhibit a higher willingness to contribute to improving beach management programmes. Our findings show, for example, that parking and sports area specifically, increases the WTP of both tourists and residents by 10€ on average, with respect

to the WTP computed with our baseline model. Thus, this can be seen as an additional channel for raising resources for environmental policy.

## Appendix

### Section A.1 – Example survey

Municipality of: **QUESTIONNAIRE**  
 .....  
 Beach/resort National Safety Society (SNS), National Research Group for Coastal  
 infrastructure:..... Environment issues (GNRAC) and University of Ferrara promote a  
 ..... national study for a better beach management  
 Date:.....

- 1) Gender  Male  Female 2) Age: .....
- 3)  Resident  Not resident Nationality.....
- 4) Is this your first time in this resort?  
 yes  no, I usually come here  no, I've already been here sometimes
- 5) With whom are you here?  alone  partner  family (with children)  friends  
 someone else

6) Why have you mainly chosen this resort? (just one answer)

<input type="radio"/> sea/beach	<input type="radio"/> good quality of services/facilities (bar, showers, beach huts, etc.)	<input type="radio"/> cultural heritage (handicraft/folklore/cooking)
<input type="radio"/> nature and landscape	<input type="radio"/> relax/quiet	<input type="radio"/> have a holiday home
<input type="radio"/> close to home	<input type="radio"/> parking	<input type="radio"/> safety
<input type="radio"/> (specify).....		<input type="radio"/> other

7) How long will you stay in this resort (locality)?  only today  from 2 to 7  from 8 to 15  more than 15

8) What are climate changes?

<input type="radio"/> polar ice melting
<input type="radio"/> global temperature raising
<input type="radio"/> changes in global weather patterns

9) What causes climate changes?

<input type="radio"/> anthropic activities
<input type="radio"/> natural phenomenon/factors
<input type="radio"/> both anthropic activities and natural phenomenon

10) What are the main effects of climate changes? (only 2 answers)

<input type="radio"/> average global temperature rise	<input type="radio"/> more coastal erosion phenomenon
<input type="radio"/> more frequent storms/floods	<input type="radio"/> pollution
<input type="radio"/> loss of ecosystems / habitat / fauna and flora	<input type="radio"/> flooding / losses of coastal environments
<input type="radio"/> soil/groundwater salinization	<input type="radio"/> increase of fire
<input type="radio"/> economic impacts (tourism, fisheries,...)	<input type="radio"/> migration of autochthone species
<input type="radio"/> sea level rise	<input type="radio"/> other (specify).....

11) In case that a financial fund is constituted in order to ensure the appropriate beach management of,

Are you willing to pay 2 € (per person) each season in this territory? (If yes, please tick the following boxes to express your opinion):

<input type="checkbox"/> sea and beach cleanliness	<input type="checkbox"/> yes <input type="checkbox"/> no
<input type="checkbox"/> safety	<input type="checkbox"/> yes <input type="checkbox"/> no
<input type="checkbox"/> services/facilities	<input type="checkbox"/> yes <input type="checkbox"/> no
<input type="checkbox"/> environmental protection	<input type="checkbox"/> yes <input type="checkbox"/> no

<input type="checkbox"/> coastal protection (coastal defence interventions)	<input type="checkbox"/> yes <input type="checkbox"/> no
<input type="checkbox"/> other (specify)..... ..... .....	<input type="checkbox"/> yes <input type="checkbox"/> no

- **if YES**, would you also pay 4 €?  yes  no
- **if NO**, would you pay instead 1 €?  yes  no

12) **If you agree with the previous question (yes), how would you prefer to pay (just one answer)**

by a local tax	<input type="checkbox"/>
a box to put contributions into	<input type="checkbox"/>
paying a fixed price per visit	<input type="checkbox"/>
a car parking charge	<input type="checkbox"/>
by doing voluntary works	<input type="checkbox"/>
other means	<input type="checkbox"/>

13) **What are the main tourism effects on the environment? (from 0 absent from 5 high value)**

pollution	0	1	2	3	4	5
natural area changes	0	1	2	3	4	5
coastal anthropization and hardening	0	1	2	3	4	5
soil losses	0	1	2	3	4	5
traffic	0	1	2	3	4	5
biodiversity losses	0	1	2	3	4	5
excessive resource consumption (water, energy ...)	0	1	2	3	4	5
coastal dunes degradation	0	1	2	3	4	5
loss of local cultural identities	0	1	2	3	4	5

14) **Are litter or waste present in the beach?**  yes  no

**If YES**, how many are there? (0 absent - 5 high value)

organic litter (algae, wood, shells)	0	1	2	3	4	5
discarded cigarette	0	1	2	3	4	5
glass bottles and cans	0	1	2	3	4	5
plastic	0	1	2	3	4	5
paper	0	1	2	3	4	5
metal	0	1	2	3	4	5
rubber	0	1	2	3	4	5
mixed litter	0	1	2	3	4	5
other	0	1	2	3	4	5

15) **What are the main litter/waste sources? (tick 2 boxes)**

<input type="checkbox"/> sea	<input type="checkbox"/> rivers	<input type="checkbox"/> maritime traffic
<input type="checkbox"/> fisheries and aquaculture	<input type="checkbox"/> uncontrolled wastewater discharge	<input type="checkbox"/> other (specify)..... .....

<input type="checkbox"/> tourism	<input type="checkbox"/> human	
----------------------------------	--------------------------------	--

16) According to your opinion, is the dispersion of small plastic items (microplastics) in the sea harmful for human and environment?  yes  no

17) What are the litter/waste impacts on the littorals?

<input type="checkbox"/> health/diseases	<input type="checkbox"/> poor seawater quality	<input type="checkbox"/> poor beach quality
<input type="checkbox"/> bad smell	<input type="checkbox"/> pollution	<input type="checkbox"/> increase of insects/mice
<input type="checkbox"/> loss of tourists/visitors	<input type="checkbox"/> other (specify).....	

18) How do you rate equipment/facilities for surveillance/safety on the beach? (from 0 absent to 5 excellent).

surveillance	0	1	2	3	4	5
safety	0	1	2	3	4	5
drowning danger	0	1	2	3	4	5
presence of holes on the sea floor	0	1	2	3	4	5
presence of dangerous structures	0	1	2	3	4	5
presence of strong marine currents	0	1	2	3	4	5
presence of lifeguard towers	0	1	2	3	4	5
first aid kits	0	1	2	3	4	5

19) How do you rate services/aspects/structures on the beach? (from 0 absent from 5 excellent).

parking	0	1	2	3	4	5
beach access	0	1	2	3	4	5
beach smell	0	1	2	3	4	5
crowding	0	1	2	3	4	5
bar and restaurant	0	1	2	3	4	5
toilets	0	1	2	3	4	5
sun beds/umbrellas	0	1	2	3	4	5
sport/fun	0	1	2	3	4	5
recreational activities	0	1	2	3	4	5
quality/price	0	1	2	3	4	5
comfort on the beach	0	1	2	3	4	5
separate waste collection	0	1	2	3	4	5

20) What value do you attribute to safety?  high  medium  low

21) Have you ever read a bathing ordinance?  yes  no

22) What are the principal dangers/threats on the beach (in any beach)?

holes  glass/can  deep sea  other \_\_\_\_\_

23) Who should guarantee the beach safety?  lifeguard/Baywatch  beach operator  municipality  traffic wardens  other \_\_\_\_\_

24) Do you know the safety signals?  yes  no

25) How the beach hazards are communicated from baywatch to the users?  flags  acoustic signals (whistle)  alert with loudspeaker  word of mouth  other \_\_\_\_\_

26) Do you know the meaning of the flag? **red**  yes  no **yellow**  yes  no **white**  yes  no

27) What the red / orange buoys delimit in the water?  safety zone for swimming  zone where boats are prohibited  diver's presence  other \_\_\_\_\_

- 28) Should a baywatch service be present in free beaches, like in (private) beach establishments?  
 Y yes Y no
- 29) Do you know some first aid technics? Y yes Y no
- 30) Do you personally know the baywatch of this beach? Y yes Y no
- Is the baywatch only responsible for the safety management of the beach? Y yes Y no
- 31) Do you think the surveillance is important during the bath? Y yes Y no
- 32) What value do you attribute to heart defibrillator machine on the beach? Y high  
 Y medium Y low

Table 24: DB model regression results

Group	Control variables	Total Sample	Resident Sample	Tourist Sample
		Significance (S.E.)	Significance (S.E.)	Significance (S.E.)
<b>Socio-demographic variables</b>	Age	-0.0859*** (0.0238)	-0.0924** (0.0378)	-0.0623** (0.0298)
	Gender	-1.048 (0.718)	1.298 (1.128)	-2.882*** (0.911)
	First time on the beach	0.237 (0.469)	-0.839 (0.773)	1.445** (0.575)
	Length of vacation	0.0993 (0.327)	0.208 (0.484)	0.00975 (0.440)
<b>Perception of the effects of tourism on the environment</b>	Pollution	2.444*** (0.786)	2.510** (1.259)	2.764*** (0.969)
	Impact on natural areas	2.019** (0.946)	0.531 (1.510)	2.870** (1.151)
	Resource depletion	-1.584* (0.818)	-1.534 (1.413)	-1.098 (0.974)
<b>Perception of climate change</b>	CC. Human activity	5.133** (2.525)	3.640 (3.387)	5.059 (3.686)
	CC. Natural Event	3.997 (2.630)	1.484 (3.497)	4.987 (3.855)
	CC. mix of both	0.322 (1.028)	0.437 (1.305)	0.212 (1.556)
<b>Perceived presence of waste on the littoral</b>	Cigarette	-1.957** (0.931)	-4.294*** (1.445)	-1.795 (1.201)
	Microplastics	-0.766 (1.557)	16.01*** (4.425)	-1.941 (1.884)
<b>Perception of the quality of beach facilities and services</b>	Parking	1.873** (0.831)	3.335*** (1.033)	0.392 (1.335)
	Beach access	-2.329*** (0.820)	-1.473 (1.001)	-3.645*** (1.324)
	Cafè and restaurant	-1.703** (0.845)	-1.847* (1.026)	-0.685 (1.429)
	Sports	1.933* (1.103)	0.944 (1.272)	2.061 (1.944)

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