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ITALIAN COASTAL COMMUNITIES' WILLINGNESS TO PAY FOR THE MITIGATION OF CLIMATE CHANGE EFFECTS ON THE FISHING INDUSTRY

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Dedication

I dedicate
this doctoral dissertation
to my family and to my nearest and dearest

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Obviously, I am solely responsible for the content and any errors or omissions that may be contained in this work.

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CHAPTER I

THE PROBLEM AND ITS BACKGROUND

1.1. Background of the research problem

Climate change is a phenomenon that is taking shape at a global level due to increasing CO₂ emissions that are mainly produced by human activities (UNFCCC, 1992), such as atmospheric pollution, fires and deforestation, and intensive farming for meat production (Blanco et al., 2014; Crowley, 2000; Stern and Kaufmann, 2014). As a result of this phenomenon, over the last 140 years the global average temperature has increased by 0.8° C, and approximately two thirds of this global warming has occurred since 1975. This acceleration has been unprecedented throughout history (NASA, 2019). These changes directly affect the planet's ecosystems in every region of the world (IPCC, 2013). The melting of the glaciers, the rise of the sea level and the progress of desertification are the most common effects of climate change (Kumar et al., 2016), the impact of which vary from one region to another (IPCC, 1998). In some regions, precipitation increases in particularly extreme events, whereas in others regions drought becomes more prevalent, with the consequent expansion of desertification to the detriment of agricultural production (Herrero et al., 2010; Ochieng et al., 2016). In fact, as asserted by Wang et al. (2018a), the increase in temperature will reduce the yield and quality of many crops, especially cereals and forage crops. Furthermore, the climatic variability associated with the increase in temperature will cause an increase in frost damage and other extreme adversities, such as strong winds, heat waves, hail and floods (Handmer et al., 2012). This will all seriously damage agriculture both in productive and economic terms, causing a decline in global food production and agriculture-generated GDP (Zhang et al., 2017). This will also have consequences on the food security of the world's populations and on the management of resources. This phenomenon, in fact,

threatens and endangers access to natural resources and habitat conservation in different regions, consequentially affecting local communities' ability to generate income from these resources on which they depend (Szabo et al., 2016). This penalises the bond local communities have with their territory, which is a set of tangible and intangible resources that adds value to those same communities (Ramos and Garrido, 2014).

Among the planet's various ecosystems, coastal areas are particularly vulnerable to climate change due to their position near the sea and the delicate balance of their ecosystems (Fischer, 2018; McGranahan et al., 2007; Moser et al., 2012). In several cases, populations living in these areas are particularly dependent on fisheries and related activities (Berk et al., 2018). Indeed, small-scale fisheries provide a valuable contribution to coastal communities in terms of food, food security and sustainable livelihoods (Malorgio et al., 2017). In addition to the primary food supply function, fishing activities constitute a cultural heritage that is a source of income and employment, capable of ensuring social well being for these communities (Mulazzani et al., 2019). Today, the availability of fish resources is threatened by climate change, as it affects fish stocks' geographical distribution (Cheung et al., 2010, 2013; Tsikliras, 2008), and their bathymetric distribution (Gallo and Levin, 2016) as well as the productivity (Stergiou et al., 2016) and phenology of fish (Edwards and Richardson, 2004; Stenseth et al., 2002), causing repercussions for both capture rate and quality (Crescimanno and Galati, 2012; Gattuso et al., 2015; Teixeira et al., 2014). As several studies have emphasised, there are many different threats to coastal communities ranging from environmental issues to socioeconomic ones (Bell et al., 2016; Childs et al., 1988; Freduah et al., 2017; Galati et al., 2015; Hossain et al., 2018; Koenigstein et al., 2016). However, communities perceive these threats differently, according to several factors, among which are the geographical surroundings. On the one hand, empirical evidence suggests that some fishing communities do not consider climate change a high-risk factor or may even perceive that an increase in sea temperature and a reduction in storms could positively impact the capture of fish (Hasan and

Nursey-Bray, 2018; Martins and Gasalla, 2018). On the other hand, other fishing communities perceive the increase in sea temperatures as the major threat to their fish catches, because, as stated above, variations in the distribution, composition and abundance of fish stocks are also affected by climate variables (Blair and Momtaz, 2018; Seixas et al., 2014). Those who most perceive the negative effects of climate change are willing to take action aimed at limiting its impacts, by changing their lifestyle and/or paying a certain amount of money to limit the damage caused by climate change. This phenomenon is called environmental activism and is the commitment by groups of individuals to face and find solutions to environmental issues (Fielding et al., 2008; Steel, 1996). This activism in the fight against climate change seems to be mainly motivated by citizens' perception of the phenomenon. In fact, according to Marlon et al. (2019), hope and constructive doubts predict greater support and commitment for citizens to actively contribute to mitigating climate change. In particular, the hope that humans will reduce the climate change phenomenon, along with the recognition that the human actions as yet undertaken are insufficient, can in many cases be constructive, motivating citizens to actively contribute to the mitigation of the climate issue (Marlon et al., 2019). In addition, a greater awareness of the environmental and economic risks caused by global warming would contribute to increasing the willingness of citizens to actively contribute to the mitigation of the effects of climate change (Velautham et al., 2019). In line with this, knowing citizens' perception of climate change and their willingness to take action to protect the environment and its natural resources in order to mitigate the negative impacts of the climate on the availability of seafood, is essential to understanding what mitigation policy measures can be implemented and what tools can be shared with the population to counter this global phenomenon.

1.2. Academic motivation of the research

Despite the relevance of this issue, very few studies in the economic literature analyse local populations' Willingness to pay (WTP) for mitigation policies (Duan et al., 2014; Jobstvogt et al., 2014; Joireman and Liu, 2014; Jones et al., 2015; Remoundou et al., 2015; Winden et al., 2018). These studies highlight both the different WTP of citizens and different contribution methods (additional tax, tax for climate change mitigation, carbon tax, donation) for the adoption of mitigation policies in relation to individuals' attitudes and beliefs towards climate change, which also depend, in some cases, on their political affiliation (Duan et al., 2014; Winden et al., 2018). Furthermore, determining factors seem to be an individuals' age (Duan et al., 2014; Remoundou et al., 2015; Winden et al., 2018), gender (Duan et al., 2014; Jobstvogt et al., 2014; Joireman and Liu, 2014) and family income (Duan et al., 2014, Jones et al., 2015; Winden et al., 2018). In addition, it is also clear that this WTP is affected by citizens' trust towards institutions (Jones et al., 2015) and by the desire that future generations can take advantage of currently available environmental assets (Remoundou et al., 2015). Less research has investigated the willingness of the coastal communities to pay to finance mitigation policies in order to protect fish resources and marine and coastal ecosystems, showing how a citizen's WTP is affected by their socioeconomic characteristics and the geographical latitude of where they live, as well as their attitudes and beliefs related to the phenomenon of climate change (Jobstvogt et al., 2014; Remoundou et al., 2015; Tulone et al., 2020).

In line with this body of research, this thesis seeks to deepen the issue in question, closing the current gap in the economic literature and providing a clear and, as far as possible, complete framework of the main factors affecting the willingness of coastal communities to finance mitigation policies to safeguard fish resources from the negative effects of climate change. Thus, this study investigates the willingness of residents in coastal communities to pay for the mitigation of the effects of climate

change on the basis of individuals' perception of the phenomenon and their socioeconomic characteristics, and identifies the main factors affecting this behaviour.

1.3. Practical motivation of the research

The policy on climate change mitigation has recently received a strong boost with the Paris Agreement of December 2015, in which 195 countries committed themselves to '*holding the increase in the global average temperature to well below 2°C above preindustrial levels and pursuing efforts to limit the temperature increase to 1.5°C above preindustrial levels*' (UNFCCC, 2015). According to scientists, a global scenario with an increase in temperature of 2°C would have a disastrous impact on natural ecosystems (Hidalgo et al., 2018; Li et al., 2019; Shi et al., 2018; van Vuuren et al., 2011), and these effects would be even more significant among marine ecosystems and on fish resources (Rosenzweig et al., 2007).

Italy is one of the main countries that benefits from the exploitation of fish resources, in particular from small pelagic species, which are commercialised on national and international markets (Camanzi et al., 2012; Crescimanno et al., 2013; Crescimanno et al., 2014). These species are increasingly endangered by the phenomenon of climate change (Tulone et al., 2019). Although Italy has a National Strategy for Adaptation to Climate Change (MATTM, 2018a), which outlines the potential mitigation and adaptation measures to be implemented to reduce the potential impacts of climate change, including in the fishing industry, very little has been done in this regard. The mitigation measures in the fishing industry, identified by the above-mentioned strategy, concern a decrease in greenhouse gas (GHG) emissions by promoting the use of fishing vessels with low fuel consumption and storage methods with greater energy efficiency, as well as reducing the fishing fleet's overcapacity and the fishing effort (Karmakar et al., 2018; Magawata and Ipinjolu, 2014; MATTM, 2018a). With these aims, in 2014 the European Union approved the

European Maritime and Fisheries Fund (EMFF) 2014-2020, a European financial instrument dedicated to the fishing and aquaculture industry. This Fund introduced financing measures for operators in the fishing industry aimed, among other objectives, at reducing the negative impacts of climate change in the sector (European Union, 2014). These actions, funded by the regional operational programmes of the EMFF, include the reduction of electricity or thermal energy consumption and the improvement of the hydrodynamic and the propulsion system of the vessels, as well as the reduction of fishing effort and the limitation of the impact of fisheries on marine environments and ecosystems (European Union, 2014). However, the resources and means that have been made available so far have been insufficient and have not led to the expected results. This is because, on one hand, there is an inadequate system of control over the actions undertaken and, on the other hand, there is too little communication regarding the possible measures which fishers could undertake to make their activities more sustainable from an environmental and economic perspective (Cataudella and Spagnolo, 2011; European Court of Auditors, 2017). This makes the implementation of more restrictive and effective measures (European Court of Auditors, 2017) necessary in the future. For this reason, considering the large public investments that are necessary for the large-scale implementation of the above mentioned measures in the fishing industry, it is likely that, in the near future, coastal populations will also be asked to contribute to financing a climate change mitigation policy through an increase in taxation, contributions or donations by citizens, in order to make the fishing industry more sustainable and thus preserve the sea's fish resources.

1.4. Research scope

Considering the background and the practical motivations of the research, described above, and in light of several factors that can affect the perception of climate change and the consequent willingness of citizens to pay for mitigation

policies of the climate change phenomenon, the present doctoral dissertation aims to answer the following research questions (RQ):

RQ1. What is the willingness of coastal communities to finance mitigation policy measures in the fishing industry in order to safeguard the fish resources from the negative effects of climate change?

RQ2. How does this willingness to pay differ among coastal communities in relation to their latitude?

RQ3. What are the main factors affecting citizens' willingness to finance these policies in relation to the socioeconomic, attitudinal and cognitive characteristics of the respondents and those linked to their perception of the phenomenon?

To address these questions, this study proposes:

- to investigate the WTP of Italian coastal communities to mitigate the effects of climate change and safeguard the sea's fish resources;
- to verify if the willingness to pay changes in relation to the latitude where each coastal community is located;
- and to determine the main factors affecting citizens' WTP to mitigate the effects of climate change in light of their perception of the phenomenon.

To achieve the purpose of this thesis, a conceptual framework based on the Construal Level Theory (CLT) and the Theory of Reasoned Action (TRA) has been adopted.

1.5. Originality of the dissertation

The originality of this dissertation lies in its contribution in expanding the body of knowledge on citizens' WTP for the protection of fish resources, affected by climate change. This research helps to better understand the factors that push individuals of

coastal communities that are threatened by the effects of climate change to finance mitigation policies. Furthermore, compared to most of the studies that only use a single theoretical lens, this research adopts a conceptual framework based on a twofold theoretical approach, the Construal Level Theory (CLT) and the Theory of Reasoned Action (TRA), to explain the main factors affecting citizens' WTP to mitigate the negative effects of climate change in the fishing industry based on their cognitive perceptions of the phenomenon and their attitudes and beliefs towards climate change. In addition, the research provides a comparison between three coastal communities in order to evaluate differences among their WTP in relation to the geographical location and therefore to the different impacts of the climate change on fish resources. Moreover, this research may be useful for policy makers, as it provides insights and suggestions to define participatory tools that can contribute to the formulation of climate change mitigation policies in the Italian fishing industry.

1.6. Structure of the dissertation

The dissertation is organised into seven chapters. Following the introduction to the thesis, the second chapter addresses the impacts that climate change would have on fish stocks and the related social and economic implications for coastal communities. From this foundation, we can better understand how the effects of climate change on fish resources and the fishing industry can affect the willingness of coastal populations to pay in order to mitigate the impacts of climate change and to preserve the sea's fish resources. The third chapter reviews the economic literature on local and coastal communities' WTP for the mitigation of climate change and presents the study's conceptual framework. The fourth chapter shows the study areas and the methodology adopted. In the fifth chapter, the results are presented and they are then discussed in the sixth chapter. The final chapter presents some concluding remarks, the research implications, the research limitations and suggestions for future research.

CHAPTER II

THE IMPACT OF CLIMATE CHANGE ON FISH RESOURCES AND THE ECONOMY OF COASTAL COMMUNITIES

2.1. Introduction

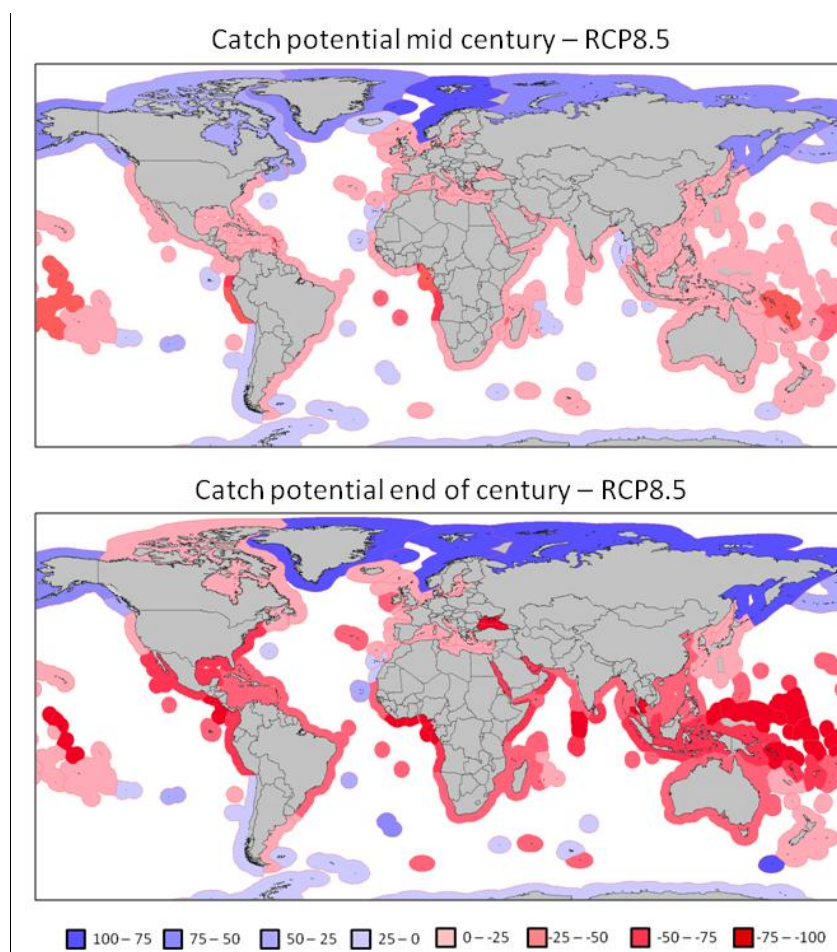
Climate change affects all ecosystems, including the seas and oceans of the world (Bindoff et al., 2007; Hoegh-Guldberg et al., 2014). As emphasised by several scientists (Brander, 2013; Brochier et al., 2013), these are not excluded from climate changes, even though they play an important role in mitigation thanks to their ability to absorb large amounts of atmospheric CO₂ produced by anthropic activities, the combustion of fossil fuels, cellular respiration and natural CO₂ formation processes (Raven et al., 2005; Sabine et al., 2004). This causes a rise in the sea temperature, the melting of glaciers, a rise in the sea level and ocean acidification (Conservation International, 2018; Raven et al., 2005), with significant effects on marine ecosystems and fish resources and with visible impacts on the economies of the coastal communities (Dey et al., 2016a, 2016b, 2016c; Rosegrant et al., 2016; Sumaila et al., 2011; Tull et al., 2016). For this reason, climate change is increasingly becoming a problem that requires the right mitigation strategies in order to counteract its effects. In fact, this chapter aims to identify the effects of climate change on fish resources and the related economic and social impacts on the coastal communities. This is all preliminary to the purpose of better understanding the willingness of these communities' residents to finance policies of mitigation to safeguard fish stocks from the effects of climate change, and in this way protect their economies.

2.2. Impact of climate change on fish resources and coastal communities' economies

Several studies have investigated the effects of climate change on fish resources. They are mainly concerned with effects on fish stocks' geographical distribution (Cheung et al., 2010, 2013; Tsikliras, 2008), their bathymetric distribution (Gallo and Levin, 2016), their abundance (Stergiou et al., 2016) and their size (Sheridan and Bickford, 2011), as well as on the phenology of the fish species (Dasgupta and Puthiyottil, 2015), and their commercial quality (Anacleto et al., 2014; Tate et al., 2017; Valles-Regino et al., 2015).

Regarding the influence of climate change on the geographical distribution of fish stocks, it appears that the large-scale increase in temperature, the variations in sea currents and the circulation of water induced by climate change would push most of marine fish species to seek environments that are more suitable for their growth and development. Because of this, in recent decades there has been a change in the spatial distribution of marine species, with a greater concentration towards high latitudes (Nye et al., 2009; Perry et al., 2005) and a shift of their habitats towards greater depths (Gallo and Levin, 2016; Nye et al., 2009). In the near future, this will cause a decrease of the stocks in the tropical areas and an increase of the marine species in the northern waters of the globe (Cheung et al., 2013) (Figure 1). Similar behaviour has been observed in different fish species. Faillettaz et al. (2019), for example, discovered that the reappearance of bluefin tuna (*Thunnus thynnus*) in the seas of Northern Europe, after more than sixty years of absence, has been shown to be attributable to the increase in the Atlantic Ocean's surface temperature. In particular, the authors discovered that, as ocean temperatures increase, bluefin tuna recede to Greenland, Iceland and Norway, while during periods of lower sea temperatures they prefer the tropical areas of the Atlantic. Hence, the change in sea temperature affects the migration of the fish stock but not its abundance, which remains constant. This has significant consequences, above all for the economies of the Mediterranean coastal communities, which experience a decrease in the

availability of bluefin tuna in periods with high temperatures. A similar case was studied by Montero-Serra et al. (2014), where the distribution of pelagic species of the North and the Baltic Sea was analysed over the last thirty years, and a change was observed in the geographical distribution of traditionally caught fish species. In particular, the authors noticed that under the effect of marine water warming, Atlantic herring (*Clupea harengus*) and European sprats (*Sprattus sprattus*) shifted towards the northern waters, while in the southern and central waters of these seas they observed rapid colonisation by the European pilchard (*Sardina pilchardus*) and the European anchovy (*Engraulis encrasicolus*) (Montero-Serra et al., 2014).



Source: our elaboration on data of Cheung et al. (2013)

Figure 1. Projected changes in maximum catch potential (%) under RCP8.5 by 2050 (A: 2046-55) and 2095 (B:2091-2100)

The warming of the seas would also imply thermal stratification along the water column of seas and oceans (Gittings et al., 2018). This results in less transfer of nutrients from the seabed to the surface waters, which means fewer nutrients for phytoplankton and zooplankton (Gittings et al., 2018). The increase in sea temperature would thus seem to be the main cause of the decline of phytoplankton and zooplankton (Wiafe et al., 2008), which consequently would negatively affect the abundance in biomass of fish stocks (Stergiou et al., 2016; Wiafe et al., 2008).

Furthermore, under the increasing environmental pressures of climate change, a reduction in the size of fish is expected, due to the reduced capacity of warmer waters to retain the dissolved oxygen and nutrients necessary for the survival of marine species (Sheridan and Bickford, 2011). In fact, Sheridan and Bickford (2011) emphasize just how many species have already assumed smaller dimensions due to climate change, and predict that many others will probably reduce their size in response to the continuous stresses that it causes.

The sea warming will also affect the phenology of marine fish in terms of reproductive age, spawning, sex determination, embryonic development and larval survival (Dasgupta and Puthiyottil, 2015). The effects on fish phenology will affect their tissues and consequently the quality of the fish eaten. Regarding this, Tate et al. (2017) observed a reduction in the protein and lipid content and in levels of glycogen, potassium, sulphur, and phosphorus in fish tissues, under the effect of overheating and acidification of marine waters. In some cases, as noted by Anacleto et al. (2014) and Valles-Regino et al. (2015), there has been an alteration in the fatty acid profile of fish in a climate change scenario.

According to the FAO report (2018) and as a consequence of the previous impacts mentioned, the effects of climate change will also be felt in terms of potential catches. In this regard, scientists have elaborated different future global warming scenarios based on the average temperatures recorded for the period 1986–2005, according to different future mitigation policies (Table1).

Table 1. AR5 global warming increase (°C) projections

Scenario	2046-2065	2081-2100
	Mean and likely range	Mean and likely range
RCP2.6 "Strong mitigation"	1.0 (0.4 to 1.6)	1.0 (0.3 to 1.7)
RCP4.5 "Moderate mitigation"	1.4 (0.9 to 2.0)	1.8 (1.1 to 2.6)
RCP6.0 "Low mitigation"	1.3 (0.8 to 1.8)	2.2 (1.4 to 3.1)
RCP8.5 "Business-as-usual"	2.0 (1.4 to 2.6)	3.7 (2.6 to 4.8)

Source: IPCC, 2013

Specifically, considering the projections to 2046–2065 in the world’s exclusive economic zones, data suggest decreases in the maximum catch potential of between 2.8% and 5.3% according to the RCP2.6 greenhouse gas emission scenario, and between 7.0% and 12.1% according to the RCP8.5 greenhouse gas emission scenario, compared to the potential catches of the 1986–2005 period (FAO, 2018).

The effects of climate change on capture levels have been studied by numerous researchers in order to evaluate the potential impacts, both economic and social, on the coastal communities and their economies.

The major studies have focused on countries of the northern seas of the Boreal Hemisphere (Eide, 2008; Eide and Heen, 2002; Lam et al., 2016; Seung and Ianelli, 2016; Thøgersen et al., 2015), and several areas of the Pacific Ocean (Aguilar Ibarra et al., 2012; Dey et al., 2016a, 2016b, 2016c; Rosegrant et al., 2016), as well as the coastal areas of West Africa (Lam et al., 2012).

The northern seas of the Boreal Hemisphere is the area that has received the greatest attention, most likely due to the phenomenon of melting ice and the related ecological, environmental and socio-economic effects. Eide and Heen (2002) simulated different future scenarios in the Barents Sea in relation to sea temperature changes, by using multispecies, multi-fleet, and Input-Output models. They showed how sea warming could have both positive and negative effects on fishing activities, in particular at the level of catches, and thus on the sector’s capability to generate income and ensure jobs in the North-Norwegian economy, where fisheries represent a crucial sector. By narrowing the research field, Eide (2008) estimated the projection of

cod (*Gadus morhua*) catches in the Barents Sea for the next 25 years, according to variations in sea temperature, plankton biomass and different fish management regimes. The analysis showed that the management of fishing activities has a greater impact on the economic performance of the fish stock compared to the phenomenon of sea warming. Possible management scenarios for cod (*Gadus morhua*) fisheries in the Eastern Baltic Sea were also analysed by Thøgersen et al. (2015), along with the stocks of sprats (*Sprattus sprattus*) and herrings (*Clupea harengus*). Through a multispecies and multi-fleet bio-economic model, the authors assessed three different types of fishing management responses for these three fish stocks on the total net present value for the entire fishery. The results revealed that the threats and risks posed by climate change to the economic performance of fish stocks could be mitigated by reducing fish catch rates. The economic impact of rising sea temperature has also been investigated in relation to the Alaskan fisheries. In this case, Seung and Ianelli (2016) calculated the economic effects of the reduction of pollock (*Pollachius virens*) catches in the Eastern Bering Sea on the economy of Alaska due to the increase in sea temperature for the 2009–2050 period. Their results revealed an increase in the price of fish, which may partly offset the lower yield of the stock, also accompanied by an increase in fuel costs and an increase in the demand for fish. Analysing the fishing industry in the Arctic countries, Lam et al. (2016) also forecasted a rise of total fishing costs, with an increase of wages earned by fishers, and therefore a growth in household income in the region's countries. From their model, an increase in the total revenue of the fisheries in the region of 13–58% by 2050 emerged compared to 2000, as a consequence of climate change. However, according to their analysis, these positive effects would be slightly mitigated by the phenomenon of ocean acidification, which would occur concurrently with the increase in sea surface temperature (SST).

In the Pacific Ocean, the analysis of the economic impact of climate change has also been tackled with reference to the four Pacific coral triangle countries (Fiji, Solomon Islands, Timor-Leste and Vanuatu). In this area, Dey et al. (2016a) evaluated the economic effects of climate change on the fishing industry in these four countries,

through a market fish supply-and-demand model. In particular, they hypothesised both low and high annual growth rates of per capita real income and evaluated the effects on the fish market regimes prevailing in the different countries in a medium (2035) and long-term (2050) time frame in a baseline scenario (scenario before climate change). According to their projection, Timor-Leste will continue to be a net fish importer, whereas Vanuatu will remain a net fish exporter. However, the Solomon Islands could become a long-term net fish importer in the event of a high annual growth rate of per capita real income, and the same could happen to the Fiji Islands in the long-term. In a climate change scenario, negative effects are expected for the economies of these countries, which can be partly mitigated by adopting adequate adaptation strategies such as the implementation of aquaculture, changes in fishery management regimes and the adoption of fish aggregation devices (Dey et al., 2016b, 2016c; Rosegrant et al., 2016). A different study was conducted by Aguilar Ibarra et al. (2012) in the North-West Mexican Pacific. The authors estimated the monetary value of the fisheries of shrimp and sardines (*Sardina pilchardus*) by 2030 as influenced by climate change. Their results indicated an increase in sardine catches of approximately 4.0% for each increase of 1% in sea temperature by 2030, with a simultaneous decrease of 1.1% in shrimp catches for every 1% increase in sea temperature, translatable in monetary terms to a loss of 95–444 million US\$ for shrimp fisheries, and a gain of 46–184 million US\$ for sardine fisheries.

The projections related to the economic impact of climate change on fisheries for West African countries, made by Lam et al. (2012), would seem worse. In detail, their study suggested a reduction in catches of 21%, a 50% diminution of jobs related to the sector, and a total annual loss of US\$ 311 million for the entire economy of the 14 West African countries as a consequence of sea warming. According to the authors, this scenario would cause serious repercussions for the economic and social of these countries, thus the effects of climate change on fish stocks would threaten food security as well as socioeconomic resilience (Lam et al., 2012).

2.3. Impact of climate change on the Mediterranean's fish resources and coastal communities' economies

The Mediterranean Sea is a marine basin that is considered to have a strong response to climate change phenomena (Schroeder et al., 2017); it is expected that its waters will be exposed to (i) increased temperatures, (ii) decreased freshwater inflows, (iii) increased evaporative phenomena and (iv) increased anthropic pressure (Maciàs et al., 2014, p. 150). In relation to the relevance of the climate change phenomenon in this area, many scholars have studied the main impact focusing, in particular, on the distribution and the productivity of different commercial marine species, mainly small pelagic fish (Ben-Tuvia, 1960; Fortibuoni et al., 2015; Kacic, 1984; Maynou et al., 2014; Martìn et al., 2012; Sabatés et al., 2006; Tsikliras, 2008). In this regard, Tsikliras (2008) analysed the spatial distribution of round sardinella (*Sardinella aurita*) in the waters of the Aegean Sea (east of the Mediterranean Sea), considering the catches of this fish species for the 1982–2003 period as provided by the National Statistical Service of Greece in relation to the SST. The round sardinella is, in fact, a small pelagic clupeid fish that is typically confined to tropical and subtropical waters and to the warm waters of the Southern Mediterranean (Ben-Tuvia, 1960). However, the study revealed that over the years, and as a consequence of high SST, there has been a growth of this species in the northern waters (Tsikliras, 2008), as well as along the northwest coasts of the Mediterranean (Sabatés et al., 2006) and in the Adriatic Sea (Kacic, 1984). The influence of the SST on the catch rates of fish was further analysed by Martìn et al. (2012), who investigated the link between the landings per unit of effort (LPUE) of sardines (*Sardina pilchardus*) and anchovies (*Engraulis encrasicolus*) and the climatic fluctuations recorded in the year before the catches, such as the Western Mediterranean Oscillation index (WeMOi), the SST and the river runoff. The results showed that, on the one hand, positive WeMOi values are significantly correlated with low SSTs, high river runoff and high LPUE. On the other hand, negative WeMOi values are associated with high SSTs, low river runoff and low LPUE (Martìn et al., 2012). This study showed how the levels of precipitation and sea

temperatures affect the catches of sardines and anchovies. In particular, dry periods characterised by low rainfall and high sea temperatures are associated with low capture levels for these fish species and vice versa (Martín et al., 2012). In addition to fish catches, sea warming also affects the abundance of eggs and larvae in the Mediterranean. This emerged from the study of Maynou et al. (2014), which observed the effect of sea warming on two small pelagic fishes. In particular, it analysed the abundance of eggs and larvae of anchovies (*Engraulis encrasicolus*) and round sardinella (*Sardinella aurita*) in the Catalan Sea in the hot summer of 2003 compared with the summer of 2004 in which the temperatures were near the average of the period 2000–2012. According to their investigation, SST is the main environmental variable that contributes to explaining the abundance of eggs and larvae, although other factors, such as the availability of food sources, have additional roles. The importance of SST was also emphasised by Fortibuoni et al. (2015), who detected a strong link between the average temperature of the catch and SST. In particular, the authors, analysing the climatic impact on Italian fisheries, observed that SST is the most relevant driver that affects the temporal change of the average temperature of the catch, and Stergiou et al. (2016), studying the average temperature of the catch in the Mediterranean Sea during the period 1970–2010, noticed a general increase in this parameter throughout the basin, and particularly in the Central Mediterranean, because of climate change.

In a climate change scenario, fisheries, as previously mentioned, could also undergo significant changes in fish composition and quantity, and alien species of Indo-pacific origin could change the composition of the present fauna in the Mediterranean basin (Stergiou et al., 2016). For this reason, some researchers have investigated the effects of climate change on fisheries in order to evaluate the economic impacts, in productive and income terms, as well as the social repercussions in the sector. In this regard, Macías et al. (2014) estimated, through a bio-economic projection at the end of the century, the economic impact resulting from the landings of anchovies (*Engraulis encrasicolus*) caught in the Alboran basin of the Mediterranean Sea, using a

coupled hydrological-biogeochemical model. Their results showed a reduction in catches per unit effort to 100 kg per fishing trip, representing a 60% decrease in the current catches per unit effort levels, which would cause a similar contraction in revenues in percentage terms since revenues are directly proportional to catches. At the same time, the authors expected a reduction of the fleet to at least half of its size relative to 2005, with a consequent decrease in employment. Recently, Tulone et al. (2019) analysed the impact of sea warming on Italian catches of some species of blue fish in the Mediterranean Sea (*Trachurus spp*). In particular, through a time series regression model, the research examined the productivity trend of target species of blue fish from 1950 to 2016, considering Mediterranean Sea Surface Temperature Anomalies as an indicator of sea warming, and the WeMOi and the North Atlantic Oscillation index as proxies of climatic variability. The results showed an evident link between the reduction of fish availability and sea warming, with potential repercussions on the income of those working in the fishing industry.

2.4. Conclusion

This chapter explored the effects of climate change on fish resources and its impacts on fishing activities of the coastal communities. In particular, the chapter showed the influence of sea warming on fish stocks in terms of the geographical and bathymetric distribution of fish, the abundance and size of the fish, and their phenology and commercial quality. In particular, the available data mainly suggests a decline in fish stocks in marine areas exposed to climate change, primarily due to an increase in seawater temperatures. At the same time, fish are migrating towards colder waters and the northern seas of the globe, with potential negative repercussions in terms of catches at the lower latitudes, which are more exposed to global warming. The changed conditions of marine environments exposed to climate change, therefore, influence the abundance of fish and their spatial distribution. The effects of these changes are consequently affecting the availability of fish for coastal communities and

their fishing activities. A decrease in fish catches would strongly penalise the economies of coastal regions, endangering their food security, reducing the main source of income of the residents of coastal communities, and putting numerous jobs in the fishing industry at risk. These repercussions are appear to occurring in several areas of the globe, with different intensities, and seem to be more evident in seas exposed to increased temperatures, decreased freshwater inflows, increased evaporative phenomena and increased anthropic pressure, such as in the Mediterranean Sea. In this sea, the traditional fish species caught, which have ensured the survival and development of many peoples since the dawn of history, are today heavily threatened by climate change and in particular by the overheating of marine waters, as well as by plastic pollution in the seas and by overfishing. For this reason, the advance of this phenomenon endangers the economies of coastal populations, which benefit in economic and social terms from the exploitation of fish resources. To overcome this problem, it is therefore necessary to take adequate mitigation measures to safeguard fish stocks from the effects of climate change, and thereby protect the economies of the numerous coastal communities that are strongly penalised by the phenomenon of global warming.

CHAPTER III

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

3.1. Introduction

In light of the numerous impacts that climate change would have on fish stocks and on the basis of the related implications for the fishing industry at the economic and social level, it is necessary to establish the WTP for coastal populations, and the related factors affecting this behaviour, in order to mitigate the effects of climate change and preserve the fish resources of the seas.

In the first part of this chapter, I propose a review of the existing economic literature on the willingness of citizens to pay to support climate change mitigation policies, initially considering the local populations in general and then exploring this issue among coastal communities. This review aims to further define the research area and stimulate a discussion within the current and relevant academic literature, to show the need for this research. In the second part of the chapter, I lay out the conceptual framework and the related theories on which the research is based, in order to provide the tools that help to better understand the dynamics of the phenomenon under investigation.

3.2. Literature review

3.2.1. Willingness to pay to mitigate the climate change phenomenon

To provide a review of the existing economic literature on the willingness of citizens, living in local communities, to pay to finance climate change mitigation policies, research was carried out on the main studies published on the topic and available through the main online search engines (Scopus, ScienceDirect, Emerald,

Web of Science). These databases were chosen among others because they provided the greatest coverage for scientific articles. The following keywords were used to select the works: 'WTP' AND 'Climate change' AND 'Mitigation policy' AND 'Local communities' OR 'Local populations'. This initial analysis made it possible to identify 217 works published online from 2000 to the present. Of these, only 18 fully responded to the research topic.

More precisely, these empirical studies that analysed local communities' willingness to contribute in monetary terms to mitigate the effects of climate change were mainly carried out in the Americas, Australia, China, and Europe.

Specifically, in the American area, Lee and Cameron (2008) conducted a survey among randomly selected citizens of the United States (US) to estimate their willingness to bear the costs of an aggressive climate change mitigation programme. They showed that the mean WTP for an increase of the monthly household costs to support climate change mitigation programmes ranges from US\$ 151 to US\$ 338, in relation to the levels of perceived harm to agriculture, water resources and ecosystems, as well as the negative impacts on the population. In fact, in their study, the WTP increased when individuals believed that the harm caused by climate change would be substantial, rather than moderate. Some years later, Joireman and Liu (2014), investigated the link between liberal political orientation and greater WTP higher taxes and higher prices for products and services in order to mitigate the effects of climate change, emphasising the role of gender. In particular, the authors observed the greater WTP of women, associated with a greater concern about the future consequences of climate change, most likely because women *'are raised to value femininity, interdependence, empathy and concern for others, and this leads women to be more environmentally concerned'* (Joireman and Liu, 2014, p. 393). In addition, the authors also noted that women, who share environmental values and believe in global warming and, consequently, are willing to invest resources to tackle the issue, adopt a liberal political orientation, most likely due to their greater

openness to environmental issues (Joireman and Liu, 2014). The greater WTP of women was also observed in a sample of 2,500 individuals, representative of the Brazilian population (Bakaki and Bernauer, 2017). In detail, the authors investigated the willingness to support and pay for mitigation policies aimed at preserving the Amazon forest from the threats of climate change. Findings show a greater WTP among female respondents, younger individuals, those with a higher educational level, and citizens who show a left-wing orientation. Furthermore, the research shows that beliefs on environmental issues positively influence WTP. In fact, those who do not believe that deforestation is a crucial issue in Brazil show a lower WTP, the likelihood being that in a context of economic recession, such as that of Brazil, environmental issues are considered secondary. Moreover, in the same research the authors observe that those who exhibit high levels of trust in the government are more willing to pay for forest conservation.

In Australia, Akter and Bennet (2011) carried out a survey involving 634 households among the Sidney community, and found that on average each household was willing to pay between US\$ 11.15 and US\$ 26.49 every month to reduce their carbon emissions by 5% before 2020 at the individual level, compared to the current level. Furthermore, they noticed that female respondents and individuals with a high income are more likely to act to mitigate the climate change. In contrast, their results showed that citizens with a high education level are less willing to reduce their carbon emissions, most likely because they believe that an individual effort is insignificant within a global context. In the same study, those who expected a strong future change in the earth's temperature were more willing to take action to reduce their carbon emissions, demonstrating greater trust in the causes of climate change and in the future risks and impacts of the phenomenon as explained by experts and scientists. In this regard, in a similar survey Akter et al. (2012) confirmed how beliefs about the causes of climate change and trust in mitigation policies play a decisive role in citizen's support for these policies. Indeed, those who believe that climate change is caused by

human action and who believe in the success of mitigation policies are more likely to finance mitigation measures (Akter et al., 2012).

In Europe, Nistor (2013) used data from two Eurobarometer surveys conducted in Romania in 2008 and 2009 respectively to estimate the additional amounts that Romanian citizens are willing to pay to have energy produced from sources that generate low greenhouse emissions in order to mitigate the effects of climate change. They found that the vast majority of Romanian respondents were willing to pay 6–20% more of their actual energy costs for the year 2008, whereas this propensity decreased in 2009 (between 1–5% more of their actual energy costs) most likely due to the on going economic crisis. Furthermore, the authors identified a general greater willingness to bear additional costs for having climate friendly energy among the youngest, in those who were more educated and in citizens with positive attitudes towards climate change, as the beliefs regarding the phenomenon would affect the financial sacrifice of citizens. A similar investigation was carried out by von Borgstede and co-authors (2013) in Sweden, who asked a sample of 615 citizens for the amount per month they would be willing to pay to mitigate global warming. Only 29.6% of respondents expressed a WTP over €7. Their findings also showed that income has a positive effect on WTP. Likewise, attitudes towards climate change and global warming were positively linked to WTP, showing how this availability depends on the attitudes towards the topic investigated. In contrast, the study revealed how individuals who are careful not to waste electricity are less willing to pay, probably because they believe that their environmentally friendly behaviour is sufficient and that further actions on their part would be superfluous. The WTP for climate change mitigation policies was also estimated by Uehleke (2016) in Germany using two different question formats, the dichotomous choice (DC) referendum and the two-way payment ladder (TWPL) format. In this way, the study found that mean WTP under the referendum format is more than twice the WTP in the payment ladder format. Nevertheless, the median WTP did not differ among these question formats (€86 for the DC format and €84 for TWPL), suggesting that the different characteristics of

individuals do not affect median WTP across formats. Furthermore, the author found that the main determinants of WTP are gender, income, attitudes, personal norms towards climate change, and an acceptance of the Government's energy policy. In particular, support of the mitigation policy is mainly characterised by high personal norms and low climate change scepticism.

In Greece, Nastis and Mattas (2018) estimated the WTP for a national carbon tax for the next ten years in order to reduce the Greek GHG emissions of 17% by 2025, on a sample of 1,393 Greek adults. On average, respondents declared a WTP of €81, with a growing WTP when individuals' income increases, suggesting the considerable importance of this variable on citizens' WTP. The carbon tax was also studied by Rotaris and Danielis (2019) for the Italian population. They found that the median WTP for an annual fixed carbon tax among Italian citizens ranged from €101 to €154, while in the case of a fuel carbon tax, this value was between €0.17 and €0.30. In addition, they observed that citizens who believe in human responsibility for climate change and who actively participate in initiatives aimed at protecting the environment are more likely to pay in order to finance climate change mitigation policies. Furthermore, women, the young, those with a high level of education and higher-income respondents showed higher values of WTP.

In China, in the provinces of Beijing, Shandong and Fujian, men who were part of the Communist Party were more willing to pay an annual sum to reduce greenhouse gas emissions (approximately CN¥ 201.86 annually) (Duan et al., 2014), most likely because of their greater participation in public issues and problems in the country (Shen et al., 2016). Furthermore, in the same study, a greater WTP was also demonstrated by the young, individuals with a high income, respondents with a higher satisfaction with their current life and those who are aware of climate issues (Duan et al., 2014).

So far, we have covered the main research that analyses the WTP of single populations or communities. It is interesting to observe how the willingness of citizens

to finance climate change mitigation policies varies in socioeconomic and attitudinal terms among different countries or communities. This comparison can clarify possible divergences and similarities between populations that live in various geographical areas and those that have a varied history and culture. In fact, several authors have focused on comparing the WTP for climate change mitigation policies within different countries, such as Carlsson et al. (2012), Chang (2017), Schwirplies (2018) and Winden et al. (2018), adding a transnational dimension to this literature. In particular, Carlsson et al. (2012) analysed the WTP for reducing the level of CO₂ emissions in China, the US and Sweden. Their results revealed that the mean WTP was highest for Sweden (from \$21.70 to \$54.24), where there is a high sensitivity to environmental issues, and lowest for China (from \$4.99 to \$11.18), with significant differences in the drivers. In particular, respondents' income is the only socioeconomic variable that is significant (positively) in all three countries. Furthermore, people who believe that temperatures are rising globally and those who have environmental attitudes are more likely to pay for mitigation policies. In China, Chang (2017) investigated the willingness of three Chinese rural counties on the same latitude to pay higher prices for gasoline and diesel oil, coal, electricity, chemical fertilizer and agricultural plastic in order to mitigate the effects of global warming. In particular, respondents declared a greater WTP for higher prices of chemical fertilizer (38.9% of respondents) and electricity (36.9%). This willingness was greater in the higher altitudes, suggesting a different perceived impact of the phenomenon according to the geographical location of the community and therefore a different WTP. Past experiences related to the effects of climate, in fact, would positively influence the beliefs on climate change and therefore the WTP for mitigation policies. Instead, Schwirplies (2018), carried out an investigation on the acceptance of climate change adaptation and mitigation policies among the Chinese, US and German populations. His study showed that an awareness of environmental issues and beliefs related to the environment and climate change are common drivers in all three countries in supporting mitigation policies, whereas the socioeconomic characteristics and political orientation of citizens affects efforts

linked to climate change policies differently within each population. Finally, Winden et al. (2018), comparing only Chinese and US populations and their WTP for policies of mitigation with an increase in their average monthly household expenditures, found that US citizens are more willing to pay (\$46.91 for adults and \$45.85 for students) than Chinese ones (¥104.4 for adults and ¥118.2 for students, respectively equal to \$15.54 and \$17.60). The authors demonstrated that, in both cases, young people with a higher income, who believe that climate change is an on going phenomenon, and with greater awareness about climate change and its negative impacts on environmental quality, have a greater WTP, because beliefs influence individuals' level of concern. In addition, in the case of US respondents, it emerged that liberal and moderate political affiliation was an additional predictor of WTP.

3.2.2. Coastal communities' willingness to pay to mitigate the climate change phenomenon

The review of the existing economic literature on the willingness of citizens, living in coastal communities, to pay to finance climate change mitigation policies has been carried out using the same method used in the previous analysis. In this case, the keywords introduced into the search engines were: 'WTP' AND 'Climate change' AND 'Mitigation policy' AND 'Coastal communities' OR 'Coastal population'. These enabled 75 works published online from the year 2000 to the present to be identified. Of these, only 6 fully responded to the research topic.

Few studies have paid attention to the coastal community's WTP for finance mitigation policies. In particular, these studies can be divided into two categories: on the one hand, some researchers have investigated the willingness of citizens to pay for mitigation policies aimed at protecting the coast from erosion (Jones et al., 2015; Rulleau et al., 2015), and, on the other hand, studies have evaluated the WTP for

mitigation policies aimed at protecting the fish resources and the marine and coastal ecosystems (Jobstvogt et al., 2014; Remoundou et al., 2015; Tulone et al., 2020).

In the first case, the study of Rulleau et al. (2015) showed the importance that people associate with coastal protection whose homes are at risk of flooding in the Hérault department. The mean WTP by respondents for flood protection along the coast was €229.40 per household per year for 20 years. In particular, this willingness was more affected by risk perception rather than by socioeconomic variables. In fact, past experiences related to the risk of flooding would seem to strongly influence the willingness of residents to pay. Jones and co-authors (2015) investigated the WTP of citizens living in the coastal community of Romney Marsh, in southeastern England. They revealed that respondents would be willing to pay a new monthly governmental tax ranging between £3.5 and £4.46 for the protection of the coast from erosion due to climate change. This willingness would be higher among those who have a higher income and individuals with greater concern for global impacts of climate change, probably due to their greater propensity to limit the risks for fear that they will occur. Moreover, it would seem that trust in institutions would increase the WTP of the citizens when the institutions that manage the economic resources allocated to mitigation measures have the confidence of the citizens.

With specific reference to the coastal communities and their WTP to finance mitigation policies in order to preserve the fish resources and the marine and coastal ecosystems, the studies show how individuals' WTP is affected by individuals' attitudes, social capital, socio-demographic characteristics and the latitude in which citizens live. Jobstvogt et al. (2014) found that Scottish citizens would pay an additional annual income tax per household, from £70 to £77, to protect deep-sea biodiversity from the impacts of climate change, through the implementation of marine conservation areas. In particular, the study indicates that the WTP of citizens reflects the importance that they associate with the possible exploitation of the resource, suggesting that the behaviour to actively contribute to counteract the

negative impacts of climate change on fish resources could be linked to the possible uses of the resource for the benefit of the population. In addition, the authors found that males and citizens who habitually consume fish and individuals that are socially active in environmental protection would be more willing to pay to implement measures addressing the mitigation of climate change (Jobstvogt et al., 2014). A study carried out a few years later on the WTP of the inhabitants of the coastal community of Santander, in Northern Spain, revealed that people would be willing to pay a new annual municipal tax on drinking water and waste water, between €18.77 and €41.51, to protect themselves from the risks related to climate change and to defend the coastal and marine ecosystem for the benefit of future generations (Remoundou et al., 2015). Moreover, this propensity is greater among older citizens (Remoundou et al., 2015). In contrast, the study by Tulone et al. (2020) on the WTP of a coastal Sicilian community, Sciacca (Italy), to finance mitigation policies aimed at protecting the fish resources of the seas showed how the young were more willing to pay an additional monthly household expenditure, as they would be more sensitive than adults to environmental issues. In particular, this additional expenditure was €6.81. Furthermore, a similar propensity was identified among high-income individuals, educated citizens, who stated they had a populist political orientation, and women. Moreover, the research suggested that individuals' attitudes towards climate change, their greater involvement in the issue and their greater concern about the impact that this phenomenon could have on the sea's fish resources all have a positive effect on people's WTP to mitigate the climate change phenomenon on fish resources, as they increase the pro-active behaviour of individuals for the protection of natural resources.

3.2.3. Main evidence from the literature

In light of what has been said, it would seem that individuals' attitudes and beliefs towards climate change, and their concerns about the impact of climate change on

natural ecosystems and communities, are the variables that mainly affect positively citizens' WTP for measures of climate change mitigation in all the regions analysed. Similarly, in almost all the research presented, young individuals and citizens with a high income show a greater propensity to support economically policies aimed at mitigating climate change. In most cases, women seem more willing to pay in many of the countries involved in the survey, not likely due to their greater concern about the effects of climate change on the environment, although in some European countries and China there is opposite behaviour. The influence of the level of education and the political orientation of citizens on the willingness to finance climate change mitigation policies also differs based on the geographical area of individuals. In particular, a higher level of education positively affects the WTP among European and South American populations, whereas it has a negative influence on the individual effort of Australian citizens in the fight against global climate change. Along the same lines, with respect to the political orientation of citizens, liberal and moderate orientation is predominant in supporting governmental measures of climate change mitigation in the US, whereas a left-wing orientation seems to mainly affect this support in some European countries and in Latin America. Moreover, Communist Party membership increases the WTP among Chinese citizens. Furthermore, another significant variable in the financing of mitigation policies by individuals is the citizens' trust in institutions and in the success of their policies linked to climate change, as found in several European countries, South America and Australia. Finally, it appears that in the communities where the resources threatened by climate change are of considerable importance, individuals are more willing to pay for the protection of this resource threatened by the negative effects of the climate change, and the WTP changes according to the perceived impact in relation to the effects of climate change and the geographical location of the community / population investigated.

3.3. Conceptual framework

As made apparent by the previous review, a communities' WTP to lessen the effects of climate change is strictly related to people's perception of the phenomenon and to the socioeconomic characteristics of individuals. Individuals' perceptions regarding a specific phenomenon, on which the WTP depends, have been studied using different theoretical approaches. In particular, this study attempted to analyse individuals' behaviour and their WTP by developing a conceptual framework based on two different theoretical lenses, the Construal Level Theory (CLT) and the Theory of Reasoned Action (TRA), each of which can contribute to explaining the propensity of people to reduce the negative effects of climate change. In particular, on the one hand, the CLT allows the willingness of individuals to pay to be assessed in relation to their level of involvement with the phenomenon investigated. On the other hand, the TRA provides a better knowledge about the influence of the individuals' attitudes and their social capital on their WTP. Furthermore, the use of a conceptual framework based on these two theoretical approaches allows for a better understanding of the behaviour of people, integrating the level of perception of the phenomenon by individuals, their attitudinal factors and those linked to social capital on the WTP by citizens in a single framework.

3.3.1. Construal Level Theory

The CLT is used mainly in psychological studies to understand how individuals perceive a phenomenon as a function of their perceived psychological distance (Trope and Liberman, 2010). According to this theory, formulated by Liberman and Trope (1998) to tie individuals' psychological distance from a phenomenon or an event with the way in which they perceive this phenomenon, when a phenomenon is perceived as near or proximal, the individual will tend to approach it in a concrete way, and vice versa. In the event that the phenomenon is perceived as distant, the individual will

think about it in an abstract way (Liberman and Trope, 1998). In other words, phenomena perceived as proximal will have a greater influence on an individual's level of concern and his/her behavioural intentions (Spence et al., 2012). The psychological distance of a given phenomenon or event has been broken down by Bar-Anan et al. (2006, p. 609) into four dimensions:

- *'Spatial — how distal in space is the target from the perceiver;*
- *Temporal — how much time (past or future) separates between the perceiver's present time and the target event;*
- *Social — how distinct is the social target from the perceiver's self (e.g., self vs. others, friend vs. stranger); and*
- *Hypothetically — how likely is the target event to happen, or how close it is to reality, as construed by the perceiver'.*

Therefore, the way in which an individual feels the four dimensions of the psychological distance towards a phenomenon affects the way in which the individual perceives it. For this reason, these components of psychological distance affect the individuals' perception of the phenomenon analysed and mediate its impact in terms of their attitudes and behaviour (McDonald et al., 2015). This theory has also been adopted to investigate the relationship between the psychological distance perceived by people towards climate change phenomenon and the behaviour exhibited. Brügger et al. (2016) explored the effect of perceived psychological distance in the fight against climate change through two experiments in which a group of English university students was interviewed after being given proximal or distal information about climate change. The results show how the reduction in people's psychological distance of climate change does not increase their motivation to act. Rather, the psychological distance would act indirectly, through emotions, on the willingness to support policies related to climate change. Consistent with this, Schoenefeld and McCauley (2016) and Shwom et al. (2008) revealed that the variation in the psychological distance from the phenomenon in spatial terms does not lead to any statistically significant attitude

towards climate change mitigation. Spence and Pidgeon (2010), instead, observed that the attitude towards climate change mitigation could be promoted when the long-term and social impacts of the phenomenon and the possible positive effects deriving from mitigation are more perceived. The CLT is certainly an effective theoretical lens that attempts to show the relationship between cognitive factors and individuals' commitment to the mitigation of climate change; nevertheless, it does not provide a full explanation of the behaviour of individuals towards climate change policies. Although cognitive drivers would be correlated with behavioural intention in a climate change contest (Di Falco and Sharma, 2018), it would be useful to include other factors in the conceptual framework to better explain individuals' behaviour towards the adoption of climate change mitigation policies. Regarding this, Brügger et al. (2016) suggest adding this theoretical approach to other variables, such as the level of feasibility of certain strategies or actions, the opinion of others and the personal values of the individual.

3.3.2. Theory of Reasoned Action

The TRA, pioneered by Martin Fishbein and Icek Ajzen, is a useful theoretical basis that can be integrated with the CLT in order to investigate individuals' voluntary behaviour in relation to climate change. According to the TRA, the behaviour of an individual is mediated by his predisposition towards a specific action (Fishbein and Ajzen, 1975). To predict the behavioural intention of an individual, the theory uses two primary constructs:

- The attitudes towards a behaviour that constitutes the level of positive or negative evaluation in performing an individual's given behaviour (Ajzen and Fishbein, 1980). In other words, the attitudes represent the personal conduct towards a given behaviour, or rather the attitude that an individual has in adopting or not adopting a specific behaviour (Ajzen and Fishbein, 1980;

Fishbein and Ajzen, 1975). These attitudes are determined by two variables, which are (i) the strength of behavioural beliefs in relation to the outcomes of the performed behaviour that enables an understanding of the motivations of the individuals for their behaviour (Ajzen, 2012; Fishbein and Ajzen, 1975) and (ii) the evaluation of the potential outcomes that refers to the way in which people evaluate the outcomes of an exhibited behaviour (Fishbein and Ajzen, 1975).

- The subjective norms represent the pressure derived from people that the individual considers important in relation to their behavioural expectations (Fishbein and Ajzen, 1975). In this view, the subjective norms can be defined as the influence that the opinions of others exert on the choices of the individual (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975). Moreover, the subjective norms, being a reflection of the values perceived by the individual in the environment in which they live, can be considered as a form of cognitive social capital (De Carolis and Saporito, 2006; Lee and Jones, 2008).

These two constructs affect the formation of a given behavioural intention (Fishbein and Ajzen, 1975). The TRA, in fact, is a valid theoretical approach that explains the relationship between an individual's attitudes and subjective norms, and behavioural intention. In this regard, Sheppard et al. (1988) tested the predictive utility of the model on the behavioural intention of individuals through a meta-analysis of previous research. The TRA is often adopted to analyse the pro-active behaviour of individuals on environmental issues, such as climate change (Kim et al., 2012; Masud et al., 2016; Ramdas and Mohamed, 2014; Untaru et al., 2016; Zhang et al., 2019). Masud et al. (2016) and Zhang et al. (2019) showed how attitudes towards climate change and subjective norms significantly affect the behavioural intention of individuals in terms of reducing the impact of global warming and, respectively, the adoption of pro-environmental behaviours and the WTP for climate mitigation policy. However, it was found that the influence of these constructs on the WTP varies in relation to several aspects, with some studies showing a stronger link between

attitudes and behavioural intention and others showing a stronger link between subjective norms and behavioural intention. For instance, Kim et al. (2012) and Untaru et al. (2016) showed that attitudes regarding the prevention of climate change are positively related to pro-environmental intention, whereas this link is weaker in relation to subjective norms. To better understand the dynamics associated with citizens' WTP for environmental issues, Ramdas and Mohamed (2014) proposed an extension of the TRA in their model, including socioeconomic and demographic variables, considering their influence on the behavioural intention of individuals and contributing to enriching the TRA-based framework and suggesting the utility of this model to explain the pro-environmental behaviour and the relative WTP for environmental issues.

3.3.3. Conceptual framework

In light of the above and in order to achieve our research aims, in this study a conceptual model is proposed based on the two theoretical approaches mentioned above (Figure 2). On the one hand, the CLT allows individuals' cognitive perception of the phenomenon and its influence on citizens' behaviour related to climate change mitigation to be evaluated. In addition, the model includes attitudes and subjective norms of individuals, which are the constructs of the TRA. Furthermore, the influence of the socioeconomic and demographic variables of individuals (integrated within the theoretical approach of the TRA) has been added into the model in order to be able to better identify the main factors affecting the willingness of local communities to pay to diminish the effects of climate change on fish resources. The use of a conceptual framework based on these two theoretical approaches enables a better understanding of the influence of the level of perception of the phenomenon by individuals, their attitudinal factors and those linked to social capital on the WTP by citizens. In particular, the proposed conceptual theoretical framework that is developed, starting from two different and consolidated theories, allows for a more

comprehensive picture of the main factors affecting the WTP of citizens to finance climate change mitigation policies.

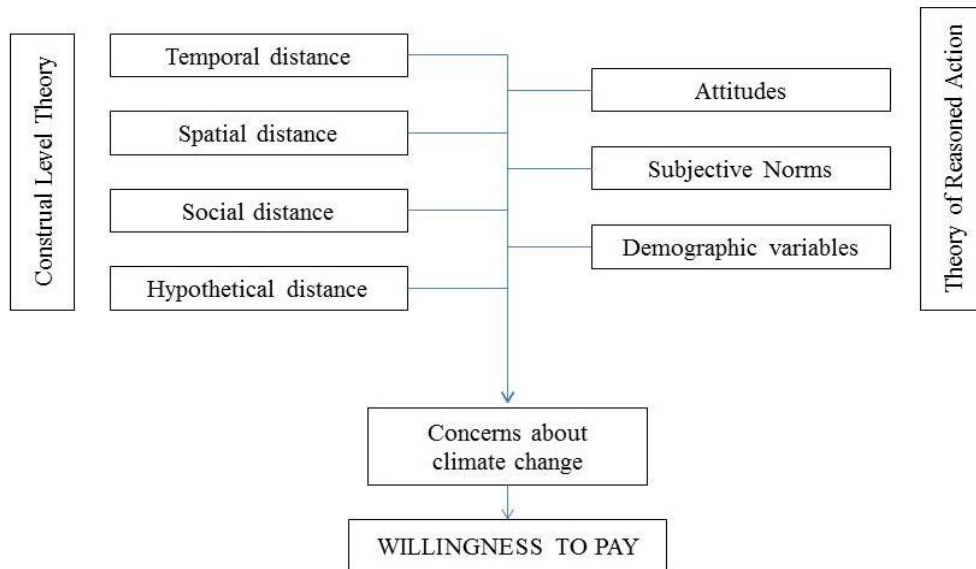


Figure 2. Conceptual framework

3.4. Research hypotheses

This chapter shows how the willingness of citizens to pay for the financing of mitigation policies mainly depends on their perception of the phenomenon, the attitudes towards the climate change of individuals, their beliefs and subjective norms, and their socio-demographic characteristics. Furthermore, it demonstrates how the propensity to support the government's policies for climate changes varies from one population to another.

On the basis of the reference literature analysed and the conceptual framework adopted, and with reference to the coastal communities investigated in this thesis, the following research hypotheses are examined:

H1. Attitudes towards climate change, the concern about the impacts of the phenomenon and the reduction of the psychological distance perceived by individuals positively affect willingness to pay;

H2. The subjective norms positively affect willingness to pay;

H3. Willingness to pay increases in communities placed at lower latitudes, where the negative effects of climate change are greater.

CHAPTER IV

MATERIALS AND METHODS

4.1. Introduction

This chapter discusses the research methodology adopted in this thesis. In particular, the areas of study investigated and the reasons that led to the choice of the three coastal communities investigated are presented. The sampling phase and the survey instrument adopted are then described, followed by analysis of the data collected and the methodology used.

4.2. Study areas

To meet the purpose of the research, a survey was carried out among citizens living in three coastal communities in Italy bordering the Mediterranean Sea. Here, the local fish market and the associated fishing tourism are the major socioeconomic drivers able to generate income throughout the value chain of seafood, affecting the distribution of income among the different actors involved in these activities (Rodrigues and Villasante, 2016). Furthermore, residents in these communities are more exposed to the changes of the climate because of the risks related to sea-level rise and stronger storms (McGranahan et al., 2007). In addition, their position in the Mediterranean Sea makes them particularly suitable for studying the phenomenon of climate change, as this sea is an 'ocean in miniature' (Lejeusne et al., 2010). In light of this, the communities studied were Chioggia, Mazara del Vallo, and Sciacca, being among the most important communities from an economic perspective in the Italian fishing industry, characterised by different structural features and specificities (Fleet Register, 2019) and located at different latitudes.

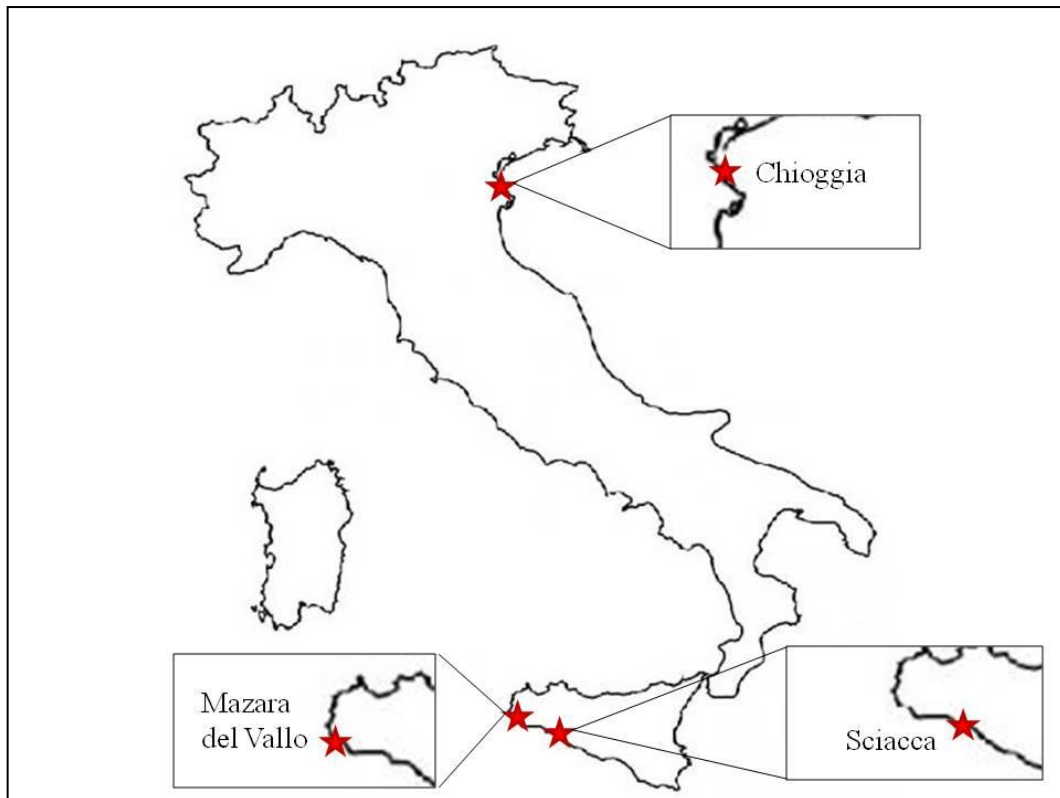


Figure 3. Study areas

4.2.1. Chioggia

Chioggia is one of the most important centres for the storage, sale and processing of fish products at the national level (ChioggiaPesca, 2019). It is characterised by the presence of a complete supply chain of fish, ranging from shellfish farming to the cultivation of mussels, clams and oysters, the canning industry, and the fresh product trade (Distretto Ittico, 2019). The fishing fleet of the community consists of 213 boats, with a gross tonnage of around 8,175 tons, which make it one of the most important and equipped fleets in the entire Upper Adriatic sea and the second fishing port at a national level (Fleet Register, 2019). Forty-five percent of boats have an overall length of between 12 and 18 metres, whereas 28% are part of small-scale fishing, with an overall length of less than 12 meters (Fleet Register, 2019). In 2017, the catches consisted of about 13,000 tons, made up mainly of anchovies, sardines and mackerel (OSEPA, 2018). The production of bivalve molluscs, such as sea clams, cockles,

Philippine clams and mussels grown in the lagoon area, which reached a total annual production of about 4,000 tons in 2017, is of considerable importance (OSEPA, 2018). Even the catches of blue fish play an important role in the community, with the production of anchovies and sardines showing higher prices in 2017 than the previous year (BMTI, 2017). Here, the fish products are partly transformed *in situ* for the production of frozen foods, preserves and fish-based dishes, and partly sold fresh or frozen thanks to well-organised logistics, equipped with cold platforms and specialised trucking companies (ChioggiaPesca, 2019). In light of this, the fishing industry plays a significant economic role in the community; in fact, it employs 17.07% of the territory with 3,712 employees, of whom 1,189 work in the fisheries and 1,326 in aquaculture (GacChioggia, 2019). Moreover, the fishing industry includes 13.77% of the companies operating in Chioggia (GacChioggia, 2019).

4.2.2. Mazara del Vallo

The fishing port of Mazara del Vallo, with its 224 boats and 16,725 tons of gross tonnage, is currently the most important in Italy and the second in Europe (Fleet Register, 2019). The economy of the community of Mazara del Vallo is driven by the fishing industry. In fact, 4,000 fishermen are embarked on the fishing vessels, in addition to the employees in the industry of processing and conservation of fish and shipbuilding (Regione Siciliana, 2017). Here, deep-sea fishing is practiced between 300 and 800 meters deep and at a distance from the coast of 12 miles, using large fishing vessels able to sail in international waters and to remain at sea for 20–30 days, thanks to the presence of equipment for fish storage on ships. A particularly well-known product are the red shrimp of Mazara (*Aristaeomorpha foliacea*), captured at a depth of about 700 meters using trawl nets in the Sicilian Channel and exported mainly for consumption on the domestic and foreign markets (Rosso di Mazara, 2019). Moreover, other important fish production is represented by blue fish, in particular

sardines and anchovies, squid, cuttlefish, squid, scorpion fish and mullet (Regione Siciliana, 2017).

4.2.3. Sciacca

This community has the second-largest fishing fleet in Sicily and the fourth in order of importance at the national level, with 160 vessels and a gross overall tonnage of approximately 5,934 tons (Fleet Register, 2019). The fleet is mainly equipped for coastal fishing; the vessels have an average overall length between 12 and 18 meters and are able to carry out daily fishing trips, landing fresh product caught in the same day (Popescu, 2010). Sciacca holds the regional record in the capture of various fish species, such as the deep-water rose shrimp (*Parapenaeus longirostris*) and blue fish (Regione Siciliana, 2010). In particular, the catches of blue fish led to the development of the fish canning industry, renowned for the processing, above all, of anchovies and sardines in salt and oil. These products are exported worldwide, making Sciacca one of the major European productive centres in the fish canning industry (Regione Siciliana, 2010). The fishing industry is the main economic sector of the community. To date, there are approximately 820 fishermen, of whom approximately 500 are trawlers, 250 are dedicated to seine fishing and approximately 70 are involved in small-scale fishing (Sciacca.it, 2019). Furthermore, in Sciacca there are approximately 60 companies operating in the fish-canning industry, with approximately 750 employees working in the processing of blue fish (Sciacca.it, 2019).

4.3. Sample and survey instrument

To achieve the aims of this thesis, an online survey was carried out between October 2018 and August 2019 among the three coastal communities mentioned above. Participants were invited to respond to the survey via social networks, namely

Facebook, Instagram and WhatsApp as the most widespread and used online communication channels in Italy (GlobalWebIndex, 2018). To ensure wide participation in the survey, snowball sampling was adopted, where existing study subjects recruited future subjects from their acquaintances (Naderifar et al., 2017). For this reason, all participants were invited to share the online survey in their social networks. This technique does not provide a statistically representative sample, mainly due to the greater propensity of the young to use the Internet compared to older people (Aker and Bennett, 2011). However, the online survey method was chosen because it is a relatively efficient means of collecting a wide variety of complex information in a reasonably short period of time (McCullough, 1998). Moreover, the use of this method allows thousands of people to be reached who live in different communities, in a short amount of time with really low costs (Wright, 2005). A total of 1,031 responses were received. Among these, 37 were incomplete, so only data from 994 questionnaires were used, distributed as follows: 308 for the coastal community of Chioggia, 353 for Mazara del Vallo, and 333 for Sciacca. This allowed us to carry out an analysis of the perception of climate change among the main Italian coastal communities and the willingness of these populations to pay to mitigate the effects of the climate change phenomenon.

The survey instrument was designed by considering previous empirical studies on the perception of local populations who are suffering from the effects of climate change and their WTP to mitigate it (Jones et al., 2015; Koenigstein et al., 2016; Masud et al., 2016; Remoundou et al., 2015; Tran et al., 2017; Tseng et al., 2015; Winden et al., 2018), and considering the conceptual framework proposed, developed by the CLT and the TRA. A preliminary version of the questionnaire was reviewed and tested by a team of professionals to ensure interviewees correctly understood it, thus improving its quality and effectiveness.

The final version was organised in three specific sections. The first detected respondents' socioeconomic and demographic characteristics, such as age, gender,

education level, number of household members, number of members aged between 0 and 6 in the household, occupation, household monthly net income in euros, average consumption of fish products, work experience in the sector, membership in environmental associations, municipality of residence and political orientation. In particular, the age of the participants in the survey was considered, grouping respondents into post-millennials (people under 30 years old) and adults (people aged 30 or over) (Świerkosz-Hołyś, 2016, p. 441; Wiktorowicz and Warwas, 2016, p. 22; Wojtaszczyk, 2013; Żarczyńska-Dobiesz and Chomątowska, 2014, p. 407). The level of income was collected on the basis of the income brackets used in the Italian tax system (The Italian Times, 2019) and classified into two categories: income of the lower classes (<€ 15,000 per year) and income of the middle-upper classes (>€ 15.001) (Istat, 2018). As for the political affiliation of the respondents, the populist orientation of the interviewees was investigated in the survey, being the orientation that in the last national elections had the greatest popular support (Ministero dell'Interno, 2019).

The second section collected information on the interviewees' perception of climate change. In particular, respondents' level of involvement compared to the phenomenon studied was measured in terms of perceived distance, as proposed by Liberman and Trope (1998). To measure this parameter, four items were used to determine the psychological distance of respondents towards climate change in spatial, temporal, social and hypothetical terms respectively. To evaluate the attitudes and the subjective norms affecting the respondents' behaviour, the items proposed by Masud et al. (2016) and Winden et al. (2018) were adopted and appropriately integrated and modified according to the specificity of the research. Specifically, four items related to the attitudes of respondents and two items to their subjective norms were used. In addition, the level of concern that members of the sample had for climate risks and the future impact that climate change could have on fish resources and marine habitats was also investigated using the main items proposed by Koenigstein et al. (2016). In particular, information regarding the level of concern linked to the impacts on fish resources (3 items), the chemical-physical changes in the

marine environment (2 items), and the potential national and international disputes for the exploitation of fish resources (2 items) were collected. The responses in the second section were ranked on a five-point Likert scale, where 1 was 'Strongly disagree' and 5 was 'Strongly agree' in terms of measuring the psychological distance perceived by respondents, their attitudes and subjective norms, whereas 1 was 'Not at all' and 5 was 'Very much' in the scale to assess respondents' level of concern of in relation to the impacts of climate change on fish resources.

The final section of the questionnaire collected information, expressed in euros, on respondents' WTP, adopting a continuous variable as proposed by Jobstvøgt et al. (2014), with 16 levels (0, 1, 2, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60 and 65). This approach, based on stated preferences, makes it easy to estimate the individual WTP to finance climate change mitigation policies in the fishing industry to safeguard fish resources. At the same time, it is not free from limitations, deriving from (i) hypothetical bias, due to untruthful values provided by respondents caused by the description of a scenario that is not very close to reality; (ii) strategic bias, which occurs when the respondent believes they might have a personal advantage according to their response; (iii) embedding effect, caused by the difficulty of respondents in understanding the contours of the survey; and (iv) design bias, due to the way in which the information is presented (Boardman et al., 2005; Campbell and Brown, 2003; Garrod and Willis, 1999). To avoid all of these biases, in this section, respondents were presented with the potential impacts of climate change on Mediterranean fish resources in biological and ecological terms, along with the relative consequences for fishery management and fishing activities, in line with what has been proposed by Hidalgo et al. (2018). Survey participants were told that implementing mitigation policies in the fishing industry would have new costs and the community would be asked to cover these expenses. Respondents were then asked to state how much money they would be willing to pay monthly for mitigation policies in the fishing industry (in particular, to safeguard fish production from the risks of climate change) in terms of both promoting fuel-efficient fishing vessels and methods

and reducing the overcapacity of the fishing fleet. Before responding, respondents were reminded to consider their budget line and to consider other household expenses in order to reduce the likelihood of hypothetical bias resulting from an incorrect assessment of their WTP. In the case of a positive bid, respondents were asked if they would prefer to pay that money through a monthly tax set up for climate change mitigation or through a monthly fixed payment, such as a donation, carbon tax or other. Conversely, the reason for people to be unwilling to contribute economically to the fight against climate change to protect marine fish resources was investigated using the statements proposed by several authors (Jones et al., 2015; Remoundou et al., 2015; Tran et al., 2017; Tseng et al., 2015) and adjusted in relation to the research's specificity.

4.4. Principal Component Analysis

To summarise the number of variables and to identify the latent factors between the various items considered within the same grouping and referred to the same coastal community, a Principal Component Analysis (PCA) was performed on items with three variables, such as the attitudes that members of the sample had towards climate change, the psychological distance that respondents perceived towards the phenomenon in spatial, temporal, social and hypothetical terms, and the level of concern that participants had for the risks related to climate and to the future impact that climate change could have on the fish resources of the sea. In particular, two criteria were used for the selection of the principal components: (i) the share of total variance explained and (ii) the Kaiser rule. With the first criterion, a number of principal components are considered so that it takes into account a sufficiently high percentage (in our case greater than 65%) of the total variance. With the Kaiser rule, or Eigenvalue rule, all the principal components whose eigenvalue is greater than 1 are considered. The *ratio* of this criterion derives from the fact that the eigenvalue of a principal component is equal to its variance and that by operating on standardised

variables these have unitary variance. Therefore, it was decided to maintain a principal component only when it explained a share of total variance greater than that of a single variable. Finally, for the selection of items within each principal component, or factor, factor loadings were considered greater than 0.6.

4.4.1. Principal Component Analysis of the Chioggia sample

The PCA used to identify latent factors that share variables in common, linked to attitudes towards climate change among the Chioggia sample, generated two factors that explain 72.5% of the data variance, with eigenvalues greater than 1 (Figure 4). The rotated factor loadings are listed in Table 2. Factor 1, Awareness and Intention (*Awar_Int*), includes three items related to the awareness of the risks that climate change can cause on fish resources and the intention of respondents to reduce the effects of this phenomenon on fish resources. Factor 2, Human Cause of Climate Change (*Hum_Cau*), comprises an item on the awareness of human action as the main cause of the phenomenon.

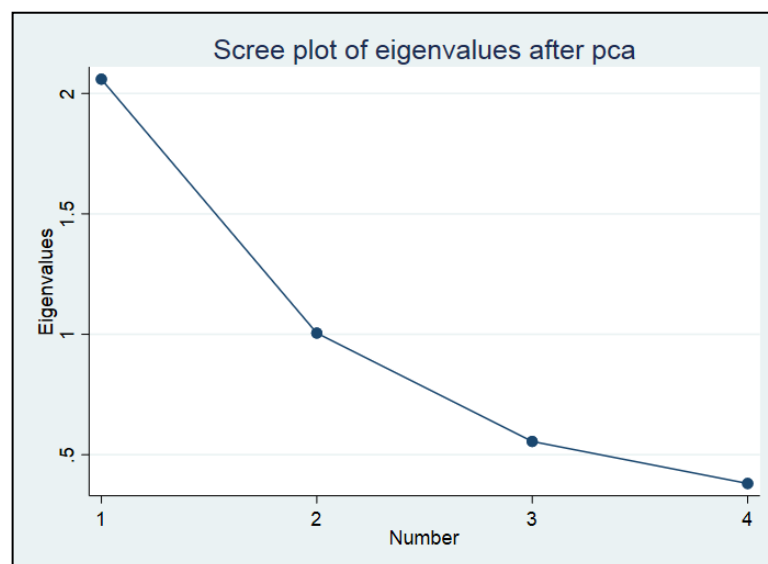


Figure 4. Scree plot of eigenvalues of the attitudes of the Chioggia sample

Table 2. PCA for the attitudes towards climate change – Chioggia sample

Var.	Items	Rotate factor loadings	
		<i>Awar_Int</i>	<i>Hum_Cau</i>
v1	Climate change is a phenomenon primarily caused by man	0.0097	0.9937
v2	Climate change endangers the fish resources	0.7799	-0.0053
v3	I am willing to pay a certain amount of money to reduce the impact of climate change to protect fish resources	0.7920	0.1334
v4	My contribution to the mitigation of the phenomenon can make the difference	0.8067	-0.0817

Note: Factor loadings greater than 0.6 are shown in bold

The PCA on the psychological distance perceived by the Chioggia sample towards climate change shows only one principal component with an eigenvalue greater than 1 and able to explain 78.3% of the variance of the variables introduced in the model. In particular, Factor 1, labelled Perceived Psychological Distance (*Psyc_Dist*), contains the four items related to the four dimensions of psychological distance (Table 3).

Table 3. PCA for the perceived psychological distance of climate change – Chioggia sample

Var.	Items	Rotate factor loadings
		<i>Psyc_Dist</i>
v1	Climate change is a phenomenon in progress	0.8597
v2	Climate change is affecting fish resources	0.8880
v3	Climate change has a social impact on coastal communities	0.8934
v4	Climate change involves more risks than benefits for fish resources	0.8968

Note: Factor loadings greater than 0.6 are shown in bold

Finally, with reference to the level of concern by the Chioggia sample towards the risks linked to climate change, PCA produced only one principal component with an eigenvalue greater than 1 and variance explained by the variables included in the model equal to 71.4%. This Factor, labelled *Conc*, includes five items connected to the environmental concerns related to the effects of changes on the seas and fish resources, and two items related to the social concern arising from possible local and international disputes over the exploitation of fish resources (Table 4).

Table 4. PCA for the level of concern for risks linked to climate change – Chioggia sample

Var.	Items	Rotate factor loadings
		<i>Conc</i>
v1	Risks related to marine habitats and aquatic species	0.9114
v2	Chemical/physical changes of marine waters	0.8845
v3	Melting of the glaciers	0.7705
v4	Increase of tropical/subtropical species	0.7774
v5	Fish migration in deep water	0.8676
v6	Local disputes for the use of resources	0.8638
v7	International disputes for the exploitation of fish resources	0.8308

Note: Factor loadings greater than 0.6 are shown in bold

4.4.2. Principal Component Analysis of the Mazara del Vallo sample

The PCA of the sample of Mazara del Vallo shows similar results to the previous sample of the Chioggia communities. In particular, the PCA of the attitudes towards climate change generated two principal components with an eigenvalue greater than 1 and that together explain 76.6% of the variance of the variables in the model (Figure 5). Both Factor 1, *Awar_Int*, and Factor 2, *Hum_Cau*, include the same items previously described (Table 5).

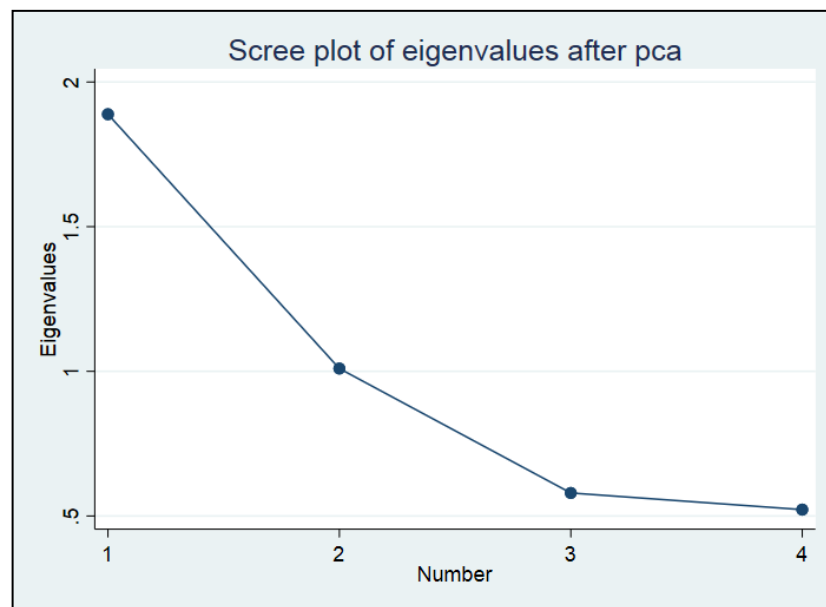


Figure 5. Scree plot of eigenvalues of the attitudes of the Mazara del Vallo sample

Table 5. PCA for the attitudes towards climate change – Mazara del Vallo sample

Var.	Items	Rotate factor loadings	
		<i>Awar_Int</i>	<i>Hum_Cau</i>
v1	Climate change is a phenomenon primarily caused by man	-0.0051	0.9981
v2	Climate change endangers the fish resources	0.7869	0.0540
v3	I am willing to pay a certain amount of money to reduce the impact of climate change to protect fish resources	0.8322	0.0246
v4	My contribution to the mitigation of the phenomenon can make the difference	0.8646	-0.0729

Note: Factor loadings greater than 0.6 are shown in bold

In relation to the psychological distance perceived by the respondents of the Mazara del Vallo community, the results of the PCA indicated only one factor, labelled *Psyc_Dist*, with an eigenvalue greater than 1 and able to intercept 80.9% of the variance of the variables referring to the four dimensions of the distance psychological (Table 6).

Table 6. PCA for the perceived psychological distance of climate change – Mazara del Vallo sample

Var.	Items	Rotate factor loadings
		<i>Psyc_Dist</i>
v1	Climate change is a phenomenon in progress	0.8973
v2	Climate change is affecting fish resources	0.9290
v3	Climate change has a social impact on coastal communities	0.8600
v4	Climate change involves more risks than benefits for fish resources	0.9092

Note: Factor loadings greater than 0.6 are shown in bold

Finally, the PCA for to the level of concern related to the risks connected to climate change in the Mazara del Vallo sample generated only a single factor with an eigenvalue greater than 1 and able to explain 65.5% of the variance of the data. In addition, in this case Factor 1, labeled *Conc*, included all seven items related to the level of concern perceived in the Mazara del Vallo community in relation to the environmental and social risks deriving from climate change on marine environments and fish resources (Table 7).

Table 7. PCA for the level of concern for risks linked to climate change – Mazara del Vallo sample

Var.	Items	Rotate factor loadings
		<i>Conc</i>
v1	Risks related to marine habitats and aquatic species	0.9025
v2	Chemical/physical changes of marine waters	0.8613
v3	Melting of the glaciers	0.7411
v4	Increase of tropical/subtropical species	0.7152
v5	Fish migration in deep water	0.7867
v6	Local disputes for the use of resources	0.8251
v7	International disputes for the exploitation of fish resources	0.8191

Note: Factor loadings greater than 0.6 are shown in bold

4.4.3. Principal Component Analysis of the Sciacca sample

With reference to the attitudes towards climate change of the respondents living in Sciacca, PCA indicated two factors with eigenvalues greater than 1 that explain 70.12% of the variance of the variables in the model (Figure 6). Factor 1, Awareness and Intention (*Awar_Int*), includes three items concerning people's awareness of the effects of climate change on fish resources, and their intention to commit to reduce the impact of climate change on fish resources. Factor 2, Human Cause of Climate Change (*Hum_Cau*), includes an item concerning the assessment of climate change as a phenomenon primarily dependent on human action (Table 8).

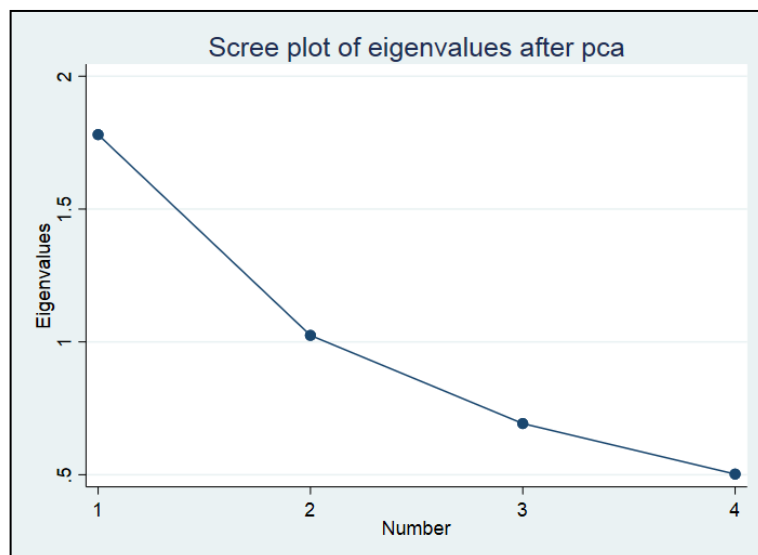


Figure 6. Scree plot of eigenvalues of the attitudes of the Sciacca sample

Table 8. PCA for the attitudes towards climate change – Sciacca sample

Var.	Items	Rotate factor loadings	
		<i>Awar_Int</i>	<i>Hum_Cau</i>
v1	Climate change is a phenomenon primarily caused by man	0.0077	0.9857
v2	Climate change endangers the fish resources	0.7166	0.1005
v3	I am willing to pay a certain amount of money to reduce the impact of climate change to protect fish resources	0.7620	0.1630
v4	My contribution to the mitigation of the phenomenon can make the difference	0.8236	-0.1553

Note: Factor loadings greater than 0.6 are shown in bold

Regarding the psychological distance perceived towards climate change in spatial, temporal, social and hypothetical terms, PCA showed a single factor with eigenvalues greater than 1 that is able to interpret 71.09% of the variance of the variables included in the model. This factor has been labelled Perceived Psychological Distance (*Psyc_Dist*), and it groups the four dimensions of psychological distance in respondents' perceptions about climate change on fish resources, showing their involvement with the phenomenon (Table 9).

Table 9. PCA for the perceived psychological distance of climate change – Sciacca sample

Var.	Items	Rotate factor loadings
		<i>Psyc_Dist</i>
v1	Climate change is a phenomenon in progress	0.8209
v2	Climate change is affecting fish resources	0.8992
v3	Climate change has a social impact on coastal communities	0.8275
v4	Climate change involves more risks than benefits for fish resources	0.8223

Note: Factor loadings greater than 0.6 are shown in bold

Finally, with regard to the level of concern the participants have about the risks associated with climate change and the future impact these may have on marine fish resources, the PCA identified two main factors with eigenvalues greater than 1 that explain 75.90% of the variance of variables in the model (Figure 7). In particular, Factor 1 includes items related to respondents concerns about changes in the marine environment, whereas Factor 2 groups items connected to their concern for local and international disputes over the exploitation of fish resources. These two factors have

been labelled Concern for Marine Environment (*Conc_ Env*) and Concern about Disputes for Resources (*Conc_Dis*) (Table 10).

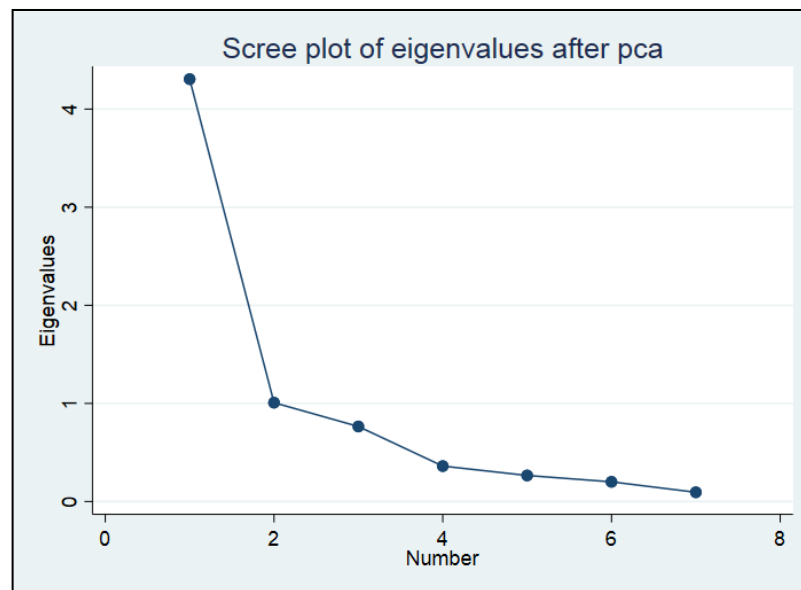


Figure 7. Scree plot of eigenvalues of the level of concern of the Sciacca sample

Table 10. PCA for the level of concern for risks linked to climate change – Sciacca sample

Var.	Items	Rotate factor loadings	
		<i>Conc_ Env</i>	<i>Conc_Dis</i>
v1	Risks related to marine habitats and aquatic species	0.7587	0.2388
v2	Chemical/physical changes of marine waters	0.8201	0.3893
v3	Melting of the glaciers	0.8161	0.2449
v4	Increase of tropical/subtropical species	0.6792	0.2848
v5	Fish migration in deep water	0.7667	0.3156
v6	Local disputes for the use of resources	0.2671	0.9377
v7	International disputes for the exploitation of fish resources	0.2179	0.9501

Note: Factor loadings greater than 0.6 are shown in bold

4.5. Tobit analysis

To investigate the main factors affecting coastal communities' WTP to finance climate change policies aimed at containing the negative effects of climate change on fish resources, a Tobit model was performed for each coastal community investigated, using STATA software, version 15.1. This model enabled an assessment of the sample's

WTP when the dependent variable is continuous but has a limited number of values, including a large number of zero observations (Gupta, 2016), without causing distortion in the sample (Wooldridge, 2014). The Tobit model has been adopted in several studies that use contingent assessment methods to analyse people's WTP (Denant-Boemont et al., 2018; Dutta et al., 2007; Gupta, 2016; Lee and Heo, 2016; Li et al. 2018; Tran et al., 2017; Wang et al. 2018b).

The dependent variable, expressed as WTP, indicates respondents' willingness to contribute with monthly payments to lessen the effects of climate change on the fishing industry. Representing the maximum amount that individuals are willing to pay, this variable cannot take negative values. For this reason, as in several studies on people's WTP that use the Tobit regression, the zero values were excluded. This happens because among the zero bids there are both individuals whose WTP is zero (legitimate zero bids) and individuals who instead have a negative WTP, such as protest bids (legitimate protest bids) (Tran et al., 2017). The protest bids, in fact, are a rejection of the contingent market rather than a real value of the WTP by the respondents, and their amount is not considered a true reflection of the value attributed by the respondent, but a value assigned as a sign of protest and lack of acceptance towards a given policy (Tran et al., 2017). To overcome this problem, Tran et al. (2017) excluded legitimate protest bids from their analysis, as they cause bias in the analysis, as documented by Halstead et al. (1992) in their research on the effects of protest bids in the contingent valuation.

In the present paper, the WTP was synthesised (-1 = protest bids; 0 = legitimate zero bids; 1 = bids of 1 and 2 euro; 2 = bids of 5 and 10 euro; 3 = bids from 15 to 65 euro). Two Tobit models were then estimated for each coastal community investigated in order to achieve the research aim. In the first model, all zero bids, including those of protest, were excluded. In the second model, only the protest bids were censored. The Log likelihood, the Akaike's information criterion (AIC) and the Bayesian information criterion (BIC) were calculated to choose the best model. Based on the higher value of Log likelihood and the lower values of AIC and BIC, the first

model was preferred and used in this research for the three coastal communities considered. In detail, the final regression model was defined as follows.

$$WTP_i^* = x_i\beta + u_i, \quad u_i \sim N(0, \sigma^2)$$
$$WTP_i = \begin{cases} WTP_i^*, & WTP_i^* > 0 \\ 0, & WTP_i^* \leq 0 \end{cases}, \quad \text{where}$$

WTP_i^* is the latent variable, WTP_i represents the observed dependent variable censored at zero and x_i is the vector of the independent variables.

Table 11 shows the meaning of the variables introduced in the Tobit model.

Among the explanatory variables, *Com_All* was removed from the regression analysis in the sample of the communities of Chioggia and Mazara del Vallo for the high values of collinearity with other variables, whereas *Pers_Com* was excluded in the regression of the sample of the Sciacca community for the same reason.

Finally, to test the significance of the model, several fit statistics were verified, such as LR chi2, Prob > chi2, R, R-squared and Pseudo R2.

Table 11. Description and statistics of the Tobit model's variables

Code	Name	Description
<i>WTP</i>	Willingness to Pay	Monthly willingness to pay for the mitigation of climate change on marine fish resources
<i>Awar_Int</i>	Awareness and Intention	Awareness of risks and intention to commit in order to reduce the climate change impacts on fish resources
<i>Hum_Cau</i>	Human Cause of Climate Change	Evaluation of climate change as a phenomenon caused by man
<i>Conc_Env</i>	Concern for Marine Environment	Level of concerns related to changes in the marine environment
<i>Conc_Dis</i>	Concern about Disputes for Resources	Level of concern for possible local and international disputes related to the exploitation of fish resources
<i>Com_All</i>	Commitment of All	Subjective norms linked to the commitment of all people to reduce the impact of climate change on fish resources
<i>Pers_Com</i>	Personal Commitment	Subjective norms linked to the personal commitment to reduce the impact of climate change on fish resources
<i>Psyc_Dist</i>	Perceived psychological distance	Perceived psychological distance of climate change by respondent
<i>Gender</i>	Gender	Male respondent
<i>Post-millennial</i>	Post-millennial	Respondent under 30
<i>Income</i>	Income	Respondent's income level
<i>Populist</i>	Political Orientation	Populist orientation of the respondent

CHAPTER V

RESULTS

5.1. Introduction

This chapter presents the main findings of the econometric model adopted in order to evaluate the WTP of citizens living in three coastal communities (Chioggia, Mazara del Vallo and Sciacca) to support measures aimed at mitigating the negative effect of climate change on fish resources and the most relevant factors affecting their behaviour. In detail, the following sections initially provide a description of the three reference samples studied, with particular attention for the main socioeconomic characteristics of the respondents, which is useful to better understand the behaviour of the studied sample. Subsequently, the WTP of the three samples and the socioeconomic and cognitive factors and those related to the perception by respondents of climate change on fish resources are analysed. Therefore, the research hypotheses, previously provided and hereinafter re-stated, are examined with reference to the willingness by residents in coastal communities to pay for the financing of mitigation policies aimed at protecting the fish resources of the sea:

H1. Attitudes towards climate change, the concern about the impacts of the phenomenon, and the reduction of the psychological distance perceived by individuals positively affect willingness to pay;

H2. The subjective norms positively affect willingness to pay;

H3. Willingness to pay increases in communities placed at lower latitudes, where the negative effects of climate change are greater.

5.2. Willingness to pay of the Chioggia community

Table 12 presents the main characteristics of the sample investigated in the Chioggia community, namely the gender, age, income level and political orientation of the respondents to the survey. In particular, the sample shows a similar percentage between males (44.8%) and females (55.2%), as well as between post-millennials (45.1%) and adults (54.9%). Moreover, respondents in the sample have an average annual income of between €15,000 and €28,000, with 81.5% of the sample falling in the middle class. Moreover, with reference to the political orientation, 23.7% of the sample declares a centre-left political orientation and 15.3% membership of a populist movement, whereas only 6.5% are part of the centre-right.

Table 12. Profile of respondents – Chioggia sample

		Obs	%
<i>Gender</i>	Male	138	44.8
	Female	170	55.2
<i>Age</i>	18-29	139	45.1
	>29	169	54.9
<i>Income</i>	Low income	57	18.5
	Upper-middle income	251	81.5
<i>Political orientation</i>	Populist	47	15.3
	Centre-right	20	6.5
	Centre-left	73	23.7
	Other party	29	9.4
	No orientation	139	45.1

Our elaboration on data collected

Regarding the willingness of respondents who live in Chioggia to finance mitigation measures to protect the fish resources against the negative effects of climate change, our findings show that this willingness is on average equal to €9.24/month if all 308 responses (Table 13) are considered. Removing the zero and protest bids, this value increases to €12.27/month. This confirms what Halstead et al. (1992) noted, according to which the inclusion of zero and protest bids can lead to an underestimation of the contingent assessment. Among the 232 respondents willing to pay, 50.4% prefer to pay a tax to mitigate climate change and 35.4% prefer to donate, whereas 13.8% of respondents choose other payment methods, such as a carbon tax or additional

income tax. On the other hand, respondents who were unwilling to contribute economically assert that (i) governments should bear this cost (40.8%), (ii) they do not trust the institutions (18.4%), or (iii) they do not have sufficient income to be able to contribute economically to the fight against climate change for the protection of marine fish resources (13.2%).

Table 13. Willingness to pay – Chioggia sample

	N	Minimum €	Maximum €	Mean €	Median €	Std. deviation €
All responses	308	0	60	9.24	5	13.55
Excluding zero and protest bids	232	1	60	12.27	5	14.37

Table 14 shows the results and the marginal effects of the explanatory variables included in the model. The latter will be interpreted to understand their effect on the WTP of the sample to mitigate the negative impact of climate change on fish resources. The observations censored by the analysis are 24.7% of the sample's observations, since there were 76 protest and legitimate bids. The proposed model is statistically significant, since the combined effect of all of the variables in the model is different from zero (LR $\chi^2(9) = 101.21$; Prob > $\chi^2 = 0.0000$). The Log likelihood value of the Tobit model is calculated at four iterations. The value of R, which expresses the correlation among the values predicted from the model and those observed for WTP is 0.5395, whereas, according to the value of R-squared, the predicted values share approximately 28.94% of their variance with the reference population's WTP. Moreover, the Pseudo R², tested by comparing it with other empirical studies such as Tran et al. (2017), is 0.1034.

Of the nine explanatory variables introduced in the model, seven are significant. In particular, the marginal effects of the variables show that the attitudes of respondents towards the studied phenomenon (*Awar_Int*), the concerns related to the impacts of climate change on the marine environment and the possible disputes over the exploitation of fish resources (*Conc*), the subjective norms related to a personal commitment in the fight against climate change (*Pers_Com*), the age in terms of post-

millennials (*Post-millennial*), and the income level (*Income*) are statistically significant variables and positively linked with the dependent variable. Therefore this shows how younger individuals with a higher level of income, who are more aware of the risks associated with climate change and who are more worried about the consequences of the phenomenon on fish resources, are more likely to pay to finance mitigation policies to safeguard fish resources. Conversely, a negative relationship emerges between the WTP for mitigation policies aimed at protecting fish stocks and male respondents and those who perceive a greater psychological distance from climate change.

In light of the above, it is possible to confirm the research hypotheses H1 and H2 for the Chioggia community sample.

Table 14. Results of the Tobit model (n = 308) – Chioggia sample

Variable code	Variable name	Coefficient	Std. Error	t-value	Marginal effect
<i>Awar_Int</i>	Awareness and Intention	.7661152***	.113656	6.74	.6660066***
<i>Hum_Cau</i>	Human cause of climate change	.0304186	.0707418	0.43	.0264438
<i>Conc</i>	Concern for Marine Environment and Disputes for Resources	.1866959**	.0875668	2.13	.1623002**
<i>Pers_Com</i>	Personal Commitment	.1263655*	.0758732	1.67	.1098533*
<i>Psyc_Dist</i>	Perceived psychological distance	-.5396485***	.106774	-5.05	-.4691324***
<i>Gender</i>	Male	-.2381982*	.1414265	-1.68	-.2064396* ^a
<i>Post-millennial</i>	Post-millennial	.3477224**	.142424	2.44	.3030398** ^a
<i>Income</i>	Income	.3473472*	.1824705	1.90	.2944275* ^a
<i>Populist</i>	Political Orientation	.066357	.0608164	1.09	.0576861
<i>_cons</i>		.4450617	.3350993	1.33	

Model significance

LR chi2(9) = 101.21	R = 0.5395
Prob > chi2 = 0.0000	R-squared = 0.2894
Log likelihood = -438.95999	Pseudo R2 = 0.1034
AIC = 899.92	BIC = 940.9511

Uncensored = 232
 Left-censored obs = 76
 Right-censored obs = 0

(***) Significance at 1%, (**) at 5%, and (*) at 10%.

(^a) dy/dx is for discrete change of dummy variable from 0 to 1.

5.3. Willingness to pay of the Mazara del Vallo community

Table 15 summarises the main socioeconomic characteristics of the sample of the Mazara del Vallo community. In detail, this sample is comprised of 57.5% female respondents and 42.5% male respondents. Those under 30 years of age, the so-called post-millennials, comprise 87.8%. The sample has an average annual income of €28,000 to €55,000. In particular, 17.6% of the sample belongs to the lower class, whereas the remainder (82.4%) has an upper-middle income. Furthermore, 22.9% have a centre-left political orientation and 17.0% declare support for the ideas of populist parties, whereas 10.2% adhere to political parties of the centre-right.

Table 15. Profile of respondents – Mazara del Vallo sample

		obs	%
<i>Gender</i>	Male	150	42.5
	Female	203	57.5
<i>Age</i>	18-29	310	87.8
	>29	43	12.2
<i>Income</i>	Low income	62	17.6
	Upper-middle income	291	82.4
<i>Political</i>	Populist	60	17.0
<i>Orientation</i>	Centre-right	36	10.2
	Centre-left	81	22.9
	Other party	22	6.2
	No orientation	154	43.6

Source: our elaboration on data collected

Regarding the willingness to finance mitigation measures to help protect fish resources against the negative effects of climate change, our results show that, among the respondents who live in Mazara del Vallo, this willingness is on average equal to €10.44/month if we consider all 353 responses (Table 16). Removing the zero and protest bids, this value increases to €13.51/month. Among the 273 respondents willing to pay, 46.5% would prefer to pay a tax to mitigate climate change and 41.8% would prefer to donate, whereas 11.7% of respondents would choose other payment methods. On the other hand, respondents who were unwilling to contribute economically stated that either (i) governments should bear this cost (46.3%), (ii) they do not have sufficient income to be able to contribute economically to the fight

against climate change for the protection of marine fish resources (20.0%) or (iii) they do not trust the institutions (10.0%).

Table 16. Willingness to pay – Mazara del Vallo sample

	N	Minimum €	Maximum €	Mean €	Median €	Std. deviation €
All responses	353	0	60	10.44	5.00	13.99
Excluding zero and protest bids	273	1	60	13.51	10.00	14.56

The variables included in the model and the marginal effect of the same on the willingness of respondents living in the Mazara del Vallo community to pay in order to mitigate the negative effect of climate change on fish resources are shown in Table 17). In particular, the Tobit analysis censored 22.7% of the observations, since these were zero bids. The regression proposed presents a relevant explanatory power, with the combined effect of all the variables in the model being non-zero (LR $\chi^2(9) = 123.93$; Prob > $\chi^2 = 0.0000$). The Log likelihood value of the Tobit model is calculated at four iterations. The value of R, which expresses the correlation between the values predicted and the observed WTP values is 0.5231. Furthermore, the value of R-squared shows that the predicted values share approximately 27.36% of their variance with the reference population's WTP, whereas the Pseudo R2 is 0.1102.

Moreover, as is evident in Table 17, the results reveal that six of the nine variables included in the model are statistically significant. In detail, the marginal effects of the variables indicate that the WTP of the Mazara del Vallo community to actively contribute to the mitigation of climate change to safeguard the sea's fish resources from the negative effects of global warming is positively affected by the attitudes of citizens, resulting from a greater awareness of the impacts of climate change and by their intention to participate actively in mitigating the phenomenon (*Awar_Int*). Furthermore, this availability is greater among citizens who are more worried about the impact of climate change – on the marine environment and the exploitation of fish resources (*Conc*). Similarly, younger individuals (*Post-millennials*) and those who show a populist orientation (*Populist*) are more inclined to pay to finance mitigation policies

in order to safeguard the fish resources of the sea. Conversely, the WTP of residents in the coastal community of Mazara del Vallo is negatively linked to the personal commitment in the fight against climate change (*Pers_Com*) and to the psychological distance towards the phenomenon perceived by respondents (*Psyc_Dist*). This shows how the citizens less willing to pay for the protection of fish resources are those less active in the fight against climate change and that consider climate change as a phenomenon that is far removed from them.

In addition, in this case it is possible to confirm research hypothesis H1, whereas research hypothesis H2 is rejected.

Table 17. Results of the Tobit model (n = 353) – Mazara del Vallo sample

Variable code	Variable name	Coefficient	Std. Error	t-value	Marginal effect
<i>Awar_Int</i>	Awareness and Intention	.8579233***	.1116127	7.69	.7681975***
<i>Hum_Cau</i>	Human cause of climate change	.0874784	.0645968	1.35	.0783294
<i>Conc</i>	Concern for Marine Environment and Disputes for Resources	.2979108***	.0773141	3.85	.2667538***
<i>Pers_Com</i>	Personal Commitment	-.2155138**	.0864141	-2.49	-.1929743**
<i>Psyc_Dist</i>	Perceived psychological distance	-.4181515***	.0942818	-4.44	-.3744192***
<i>Gender</i>	Male	-.0236414	.1313638	-0.18	-.0211622 ^a
<i>Post-millennial</i>	Post-millennial	.9760543***	.2120348	4.60	.7986286*** ^a
<i>Income</i>	Income	.1567797	.1709046	0.92	.1390661 ^a
<i>Populist</i>	Political Orientation	.1119302**	.0554898	2.02	.100224**
<i>_cons</i>		1.151567***	.4037546	2.85	

Model significance

LR chi2(10) = 123.93	R = 0.5231
Prob > chi2 = 0.0000	R-squared = 0.2736
Log likelihood = -500.5054	Pseudo R2 = 0.1102
AIC = 1023.011	BIC = 1065.542

Uncensored = 273
 Left-censored obs = 80
 Right-censored obs = 0

(***) Significance at 1%, (**) at 5%, and (*) at 10%.

(^a) dy/dx is for discrete change of dummy variable from 0 to 1.

5.4. Willingness to pay of the Sciacca community

Table 18 provides the descriptive statistics of the respondents of the Sciacca community. Specifically, in the sample population, 50.8% are male respondents and 49.2% are female. Approximately three quarters of the sample were born from 1990 onwards (74.5%). Respondents have, moreover, an average annual income between €28,000 and €55,000, with 72.7% of the sample belonging to the upper-middle class. With reference to political orientation, 21.3% declare support for the centre-left parties and 15.3% support populist political movements, whereas 10.8% support the centre-right parties.

Table 18. Profile of respondents – Sciacca sample

		obs	%
<i>Gender</i>	Male	169	50.8
	Female	164	49.2
<i>Age</i>	18-29	248	74.5
	>29	85	25.5
<i>Income</i>	Low income	91	27.3
	Upper-middle income	242	72.7
<i>Political orientation</i>	Populist	51	15.3
	Centre-right	36	10.8
	Centre-left	71	21.3
	Other party	21	6.3
	No orientation	154	46.2

Source: our elaboration on data collected

Our findings show that the willingness of respondents who live in Sciacca to finance mitigation measures to protect the fish resources against the negative effects of climate change is on average equal to €6.81/month if we consider all 333 responses (Table 19). Removing the zero and protest bids, this value increases to €9.86/month. Among the 230 respondents willing to pay, 46.1% preferred to pay a tax to mitigate climate change and 41.7% preferred to donate, whereas 12.2% of respondents chose other payment methods. On the other hand, respondents who were unwilling to contribute economically asserted that (i) governments should bear this cost (52.4%), (ii) they do not trust the institutions (21.4%) or (iii) they do not have sufficient income

to contribute economically to the fight against climate change for the protection of marine fish resources (20.4%).

Table 19. Willingness to pay – Sciacca sample

	N	Minimum	Maximum	Mean	Median	Std. deviation
		€	€	€	€	€
All responses	333	0	65	6.81	2.00	11.82
Excluding zero and protest bids	230	1	65	9.86	5.00	13.13

The results of the Tobit model regarding the factors affecting the WTP by the Sciacca sample in order to mitigate the negative effect of climate change on fish resources are shown in Table 20. The percentage of censored observations corresponds to 30.9% of the sample observations. The model is statistically significant, the combined effect of all the variables in the model being different from zero (LR $\chi^2(10) = 104.55$; Prob > $\chi^2 = 0.0000$). The Log likelihood value of the Tobit model is calculated at four iterations. The correlation R between the values predicted from the model and those observed for the WTP is 0.5118, whereas the explained variation by the model with respect to the total variance is 26.19%. Furthermore, the value of Pseudo R² is equal to 0.1026.

The independent variables introduced in the model are all statistically significant, except for the concern derived from the negative impacts of climate change on possible disputes for the exploitation of fish resources of the sea (*Conc_Dis*). Specifically, the data related to the variables' marginal effect suggest that, in the Sciacca community, individuals who are more concerned about the impacts of climate change on marine environment and fish resources, expressed by the variable *Conc_Env*, and those more aware of the effects of climate change on fish resources and that have a greater intention to actively participate in the fight against global warming (*Awar_Int*) are more willing to pay for policies that mitigate the phenomenon. In particular, those who believe that climate change is a phenomenon mainly caused by man (*Hum_Cau*) have a greater WTP compared to the sceptics. In contrast, those who perceive that everyone should be actively involved in the fight

against climate change (*Com_All*) and those that perceive climate change as a phenomenon that is far removed from them (*Psyc_Dist*) are less willing to pay to finance mitigation policies of climate change to safeguard fish resources. Moreover, with reference to the socioeconomic variables, those who are most willing to finance mitigation policies to protect the fish resources of the sea are women and young individuals. Equally, citizens belonging to the upper-middle income groups and those with a populist political orientation display similar behaviour.

Based on these findings, research hypothesis H1 is also confirmed in the Sciacca community, whereas hypothesis H2 is rejected.

Table 20. Results of the Tobit model (n = 333) – Sciacca sample

Variable code	Variable name	Coefficient	Std. Error	t-value	Marginal effect
<i>Awar_Int</i>	Awareness and Intention	.7279979***	.0974919	7.47	.5718308***
<i>Hum_Cau</i>	Human cause of climate change	.2249743***	.0719289	3.13	.1767138***
<i>Conc_Env</i>	Concern for Marine Environment	.1632056*	.0848171	1.92	.1281954*
<i>Conc_Disp</i>	Concern about Disputes for Resources	.102214	.0749516	1.36	.0802875
<i>Com_All</i>	Commitment of All	-.2153041*	.1113622	-1.93	-.169118*
<i>Psyc_Dist</i>	Perceived psychological distance	-.3131169***	.097227	-3.22	-.2459484***
<i>Gender</i>	Male	-.3442922**	.1453324	-2.37	-.2703866** ^a
<i>Post-millennial</i>	Post-millennial	.4887972***	.1684209	2.90	.3687776*** ^a
<i>Income</i>	Income	.3696172**	.1641232	2.25	.0905149*** ^a
<i>Populist</i>	Political Orientation	.1152345*	.0611087	1.89	.2824396*
<i>_cons</i>		1.295083**	.5261504	2.46	
Model significance					
LR chi2(10) = 104.55		R = 0.5118			
Prob > chi2 = 0.0000		R-squared = 0.2619			
Log likelihood = -457.2905		Pseudo R2 = 0.1026			
AIC = 938.581		BIC = 984.2787			
Uncensored = 230					
Left-censored obs = 103					
Right-censored obs = 0					

(***) Significance at 1%, (**) at 5%, and (*) at 10%.

(^a) dy/dx is for discrete change of dummy variable from 0 to 1.

5.5. Conclusion

This chapter presented the results from the online survey carried out in the three main Italian coastal communities where fishing is a prevalent sector: Chioggia, Mazara del Vallo and Sciacca.

The analysis of the data shows that the willingness of the coastal communities investigated to pay for mitigation policies in the fishing industry in order to safeguard the fish resources from the negative effects of climate change ranges from €6.81 to €10.44 on the basis of the different socioeconomic characteristics of these communities. In particular, this willingness is greater in the community of Mazara del Vallo (€10.44), followed by the WTP of the community of Chioggia (€9.24) and Sciacca (€6.81). This WTP increases on the basis of the importance that the fishing industry plays in the socioeconomic fabric of the three investigated communities. In fact, Mazara del Vallo, where there is the greatest WTP, is the first Italian fishing port, followed by Chioggia, which holds the second largest fishing fleet in the country, and finally Sciacca with the fourth fishing fleet at a national level. Furthermore, according to the geographical location of the three coastal communities, the study shows that the greater WTP emerges from a coastal community (Mazara del Vallo) located along the southern strip of the Mediterranean Sea. However, the same WTP is not found in the nearby coastal community of Sciacca, where there is the lowest WTP to finance climate change mitigation policies to protect fish resources. For this reason, hypothesis H3 cannot be confirmed.

The research findings suggest that the willingness of citizens to pay depends on their attitudes, concerns and beliefs towards climate change, and their cognitive perception of the phenomenon, as well as their socioeconomic profile. In all three samples studied, the attitude of respondents to climate change, in terms of awareness of the effects of climate change on fish resources and the intention in limiting its effects, is the main factor that affects the WTP of citizens. Even the perceived psychological distance towards climate change strongly affects the willingness of

individuals to contribute economically in terms of mitigating climate change to safeguard fish resources. In addition, concerns related to climate change impacts on fish resources also play an important role in all samples analysed. These three pieces of evidence respectively confirm research hypothesis H1. In contrast, the significant but negative relationship between the subjective norms of the respondents and their WTP that emerges in two out of the three investigated communities suggests that hypothesis H2 is not confirmed.

Regarding the socioeconomic variables, results suggest that age is the variable that most affects the WTP of the respondents. In fact, the age group called the post-millennials, made up of those respondents under the age of 30, show a greater attention to the issue of climate change, stating a greater WTP for mitigation policies aimed at safeguarding fish stocks. Furthermore, the gender and the income level of the respondents play an important role in their WTP. Nevertheless, they are statistically significant only in the models of the Chioggia and Sciacca communities. In both cases, in fact, women and respondents with a higher income show a positive link with the dependent variable. Finally, the political orientation of the citizens is also an important factor affecting the WTP by respondents. This variable, in fact, is statistically significant in the communities of Mazara del Vallo and Sciacca, where individuals oriented towards the so-called Italian populist parties are more likely to pay to support economic climate change mitigation policies in the fishing industry in order to protect the fish resources of the sea.

CHAPTER VI

DISCUSSION

6.1. The willingness to pay of the coastal communities

The survey carried out and the econometric model adopted enabled an assessment of the WTP of citizens living in the main Italian coastal communities to finance mitigation measures aimed at safeguarding the fish resources of the sea strongly endangered by the effects of global warming. The research shows that the stated average WTP ranges from €6.81 to €10.44 per month on the basis of the different socioeconomic characteristics of these communities and in relation to the different attitudes of respondents towards climate change. A comparison with similar empirical studies, although referring to a different period of time and socioeconomic conditions, shows a greater WTP of Italian people to support climate change mitigation policies. In fact, the coastal community of Santander, in Northern Spain, had a lower WTP, between €1.56 and €3.46 monthly, in order to defend the coastal and marine ecosystem and also ensure that future generations can benefit from it (Remoundou et al., 2015), and Scottish citizens had a monthly WTP of £5.83 to £6.42 to protect deep-sea biodiversity from the impacts of climate change (Jobstvogt et al., 2014). This result could be explained by the greater importance that fish resources represent in the diet of Italian citizens and in the economic fabric of Italian coastal populations. In particular, Mazara del Vallo has the most important Italian fishing port and the second most important port at the European level (Fleet Register, 2019), with approximately 4,000 units embarked on its vessels, in addition to the employees of the processing and shipbuilding industry (Regione Siciliana, 2017). The Chioggia community, instead, has the second fishing fleet in order of importance at the national level (Fleet Register, 2019), with just over 3,700 workers in the fishing industry, renowned for its fishing and shellfish production (GacChioggia, 2019). Finally, the Sciacca community is one of

the most important European productive centres in the fish canning industry, renowned for the processing of anchovies and sardines (Regione Siciliana, 2010), intercepting approximately 1,500 workers in the fishing industry (Sciacca.it, 2019).

6.2. Differences among the coastal communities

The conducted analysis shows a different WTP of individuals among the three investigated coastal communities. In particular, the largest WTP was observed among the people of Mazara del Vallo (€10.44), followed by the inhabitants of Chioggia (€9.24) and the Sciacca community (€6.81). Compared to the initial hypothesis, our results do not confirm that Southern communities are more willing to pay in order to mitigate the impact of climate change on fish resources.

Based on these findings, it would seem that the WTP for mitigation policies in the fishing industry aimed at protecting fish resources from climate change depends on the importance that the fishing industry plays in the economic fabric of the communities. In fact, the WTP of the three coastal communities seems to be linked to the number of vessels comprising the fishing fleet of the several coastal populations (Fleet Register, 2019), and consequently also to the number of workers in the sector of the different communities investigated (GacChioggia, 2019; Regione Siciliana, 2010, 2017). In other words, the greater WTP is related to the importance that fish resources play in the socioeconomic context of the communities. This evidence is in line with the principle that regulates the adopted method, that is the contingent evaluation. This method expresses the value/interest that respondents assign to a good or service (Carson, 2000). For this reason, the greater WTP expressed by individuals to continue to benefit from a good or service suggests a greater value and importance attributed to it by individuals (Carson, 2000).

Furthermore, the WTP for the protection of fish resources from the negative effects of climate change also seems to be linked to the various measures financed by the

European Union, the government and local administrations to increase environmental awareness among the population, in particular the youngest, and to enhance fisheries and marine fish resources. In this regard, in fact, there are several initiatives that have been launched in the community of Mazara del Vallo. For example, *Blue Sea Land*, which involves the participation of over 100,000 visitors, is the most important event for which approximately €280,000 is invested each year to promote blue growth, environmental sustainability and to enhance local fish resources (Palumbo, 2019). Added to this are the initiatives promoted within the schools to make young people aware of the environment and its sustainability through environmental and ecological education laboratories (Leotta, 2016). With regards to the Chioggia community, the main initiatives include the *Chioggia Fish Festival*, with over 100,000 visitors, aimed at the enhancement of local fish (Proloco Chioggia, 2019) and the *Festival of the Blue Fish of Chioggia Sottomarina*, with more than 50,000 participants. Furthermore, Chioggia is the site of the degree course in *Marine Biology*, the role of which is to train experts in the sustainable management of marine resources and ecosystems in relation to their commercial promotion and to aspects related to climate change and environmental pollution (University of Padua, 2019). Finally, even in the Sciacca community, events have been launched to raise awareness of environmental sustainability, climate change and the importance of fish and fisheries. In this regard, an important role was played by schools, in which various environmental education projects were launched to raise awareness among young people about the phenomenon of climate change and the importance of the sustainable exploitation of fish resources, funded by the local action group for fisheries of the territory of Sciacca (GAC Sciacca, 2015). Furthermore, to enhance the local blue fish in a globalised market, it has promoted the international festival of the Mediterranean entitled *Azzurro Food*, which includes a cooking laboratory and fish tasting, and attracts over 50,000 visitors every year (Azzurro Fest, 2019).

6.3. Factors affecting the willingness to pay

As shown in the reference literature, the willingness of citizens, living in the Italian coastal communities, to pay mitigation measures in order to protect fish resources from the negative effects of climate change are different and closely related to the socioeconomic characteristics of the respondents, their attitudes towards climate change, their level of concern about the impact of phenomenon, the subjective norms of individuals and their level of perception of climate change.

6.3.1. Attitudes towards climate change

The results of the models show that the attitude towards climate change is the main factor affecting the willingness of citizens to finance climate change mitigation policies to safeguard fish resources from the effects of global warming. This result is consistent with von Borgstede et al. (2013), Nistor (2013) and Uehleke (2016), who stated that attitudes towards climate change positively affect individuals' pro-environmental intentions, such as their WTP to reduce the impact of climate change. Specifically, the awareness of the impacts of climate change and the intention to contribute actively to the fight against climate change (Awareness and Intention) is positively and strongly correlated with individuals' WTP in all three Italian communities. This result shows that the attitudes of citizens, which are the result of a greater awareness of the risks of climate change and of the intention to actively participate in the fight against climate change, positively affect the WTP, most likely because these attitudes are sometimes associated with a high awareness of human action. In light of this, in the results those who believe that climate change is mainly caused by the action of people (Human Cause of Climate Change) are more willing to finance mitigation policies. Furthermore, other authors (Rotaris and Daniels, 2019; Winden et al., 2018) have indicated that people who are more aware about environmental issues and risks related to climate change are more inclined to support

policies that mitigate the phenomenon in order to stem it and reduce its impact on the environment. In line with this, for example, Rotaris and Daniels (2019) noted that citizens who believe in human responsibility for climate change are more likely to pay in order to finance climate change mitigation policies. Furthermore, Winden et al. (2018) showed that beliefs act on the level of concern of individuals, and consequently on the WTP in order to limit the impacts of climate change on the environment.

6.3.2. Concern about the impacts of climate change

People's concern about the impacts of climate change on fish resources and marine ecosystems is another factor affecting the WTP. Respondents mostly concerned about the effects of climate change on the marine environment and the potential disputes coming from the exploitation of sea fish resources, in fact, show a greater propensity to economically support government measures to mitigate the effect of climate change on fish resources. In fact, as suggested by Tulone et al. (2020) a greater level of concern deriving from the environmental issues caused by climate change would push citizens to be more willing to finance mitigation policies, with the aim of reducing the negative effects of the climate change phenomenon. In this regard, Winden et al. (2018) and Jones et al. (2015) have shown how high levels of concern about climate change entail a growing propensity by individuals to take action to minimise these effects, in the event of greater awareness about the negative impacts of climate change and in order to limit its effects for fear that they will occur.

6.3.3. Subjective norms

Even the subjective norms would seem to have a significant impact on WTP for the safeguarding of fish resources. However, the link between the subjective norms linked to the commitment of all people to fight climate change, coming from the social

pressure of the community in which an individual lives (Commitment of All), and the WTP for mitigation policies in the fishing industry shows a negative relationship. This reveals that those who are less interested in the opinions of other people are more willing to pay to finance climate change mitigation policies. Therefore, the study shows how important a citizen's sense of responsibility towards climate change is, regardless of the opinions of others, demonstrating the role played by subjective norms on behavioural intention, as proposed by the TRA.

With reference to the relationship between the subjective norms linked to the personal commitment that an individual feels in the fight against climate change (Personal Commitment) and the WTP for mitigation policies, our findings reveal opposing results. This could suggest that the personal responsibility of individual citizens towards climate change, in terms of commitment to mitigation of the phenomenon, can affect the willingness to finance mitigation policies in two opposite ways. On the one hand, citizens that perceive individual efforts as insignificant for a phenomenon with global effects and that are less predisposed to implement behaviours aimed at containing the effects of climate change may be less predisposed to pay for policies that mitigate the phenomenon. This evidence is also suggested by Akter and Bennet (2011), who propose that many citizens that believe that an individual effort is insignificant for an issue with global repercussions, such as the climate change phenomenon, are willing to pay less for the financing of mitigation policies. This could explain why those who show a low personal commitment in the fight against climate change would be less willing to finance mitigation policies in the fishing industry to safeguard fish resources. On the other hand, those who are already committed to environmentally friendly behaviour might consider their commitment sufficient to mitigate climate change and therefore consider further actions on their part superfluous. In this regard, von Borgstede et al. (2013) found that individuals that actively participate in the fight against climate change are less willing to pay for mitigation policies, as they consider their personal mitigation actions sufficient to

counteract the phenomenon. For this reason, citizens already engaged in pro-environmental behaviours would show a low WTP.

6.3.4. Perception of climate change

The models suggest that the reduction of the perceived distance of climate change increases an individual's involvement with the phenomenon and, therefore, citizens' willingness to contribute economically to the mitigation of climate change impacts. Therefore, the perception of the phenomenon plays a fundamental role in the dynamics related to the willingness of citizens to finance mitigation policies. This supports the use of Liberman and Trope (1998)'s CLT in this kind of research. In fact, the introduction of the variable on psychological distance in the study shows that when the psychological distance perceived by citizens towards climate change decreases, the involvement of the individuals with the phenomenon and their awareness of the possible risks and impacts coming from it increases. Thus, individuals would be incentivized to counter the phenomenon, making them more willing to pay to finance climate change mitigation policies. However, in the economic literature, results are conflicting. Although on the one hand McDonald et al. (2015) found that psychological distance affects the perception of the phenomenon and the behaviour exhibited by individuals, some other authors (Schoenefeld and McCauley, 2016; Shwom et al., 2008; Spence and Pidgeon, 2010) have demonstrated that the variation of psychological distance does not influence individuals' attitudes and their choice to take action to mitigate the negative pressure of climate change.

6.3.5. Respondents' socioeconomic characteristics

The intention to economically support mitigation policies is also related to socioeconomic characteristics, such as the respondents' gender, their age, their

income level and their political orientation. According to the research results, these variables affect the coastal communities' WTP.

Empirical evidence suggests that women are more willing to pay for the mitigation of the potential impacts of climate on fish resources. This is probably due to their role, which is strongly rooted in Italy, in caring for their family and children and therefore in caring about future generations. The findings of many studies, where women are more sensitive than men towards the environmental issues, support this result (Akter and Bennet, 2011; Bakaki and Bernauer, 2017; Joireman and Liu, 2014; Rotaris and Danielis, 2019). In particular, according to Joireman and Liu (2014), women who are more concerned about the future consequences of climate change are more predisposed to support environmental issues, as they are generally concerned for others and, as a consequence, more concerned for the environment in which they live.

Another interesting result of the research is that young people, in the study indicated as post-millennials, are more concerned about possible future scenarios, and therefore, they adopt pro-environmental behaviours, choosing, in this case, to contribute more to mitigating the negative impacts of climate change. This was also clear in several studies, such as Nistor (2013) and Duan et al. (2014), which show that young people have a greater sensitivity towards the climate change risks and a greater WTP for the mitigation of the phenomenon. This behaviour of young respondents could be explained by the fact that the effects of climate change will be most visible in future decades, and thus will mainly affect the young generations of today who will be the adults of tomorrow. In this regard, a study carried out by Plesner (2018) on environmental activism by millennials towards climate change showed that the young are deeply concerned about their carbon footprint and that they are really interested in protecting the environment and natural resources in order to protect the Earth and their future. For this reason, they are strongly willing to act and to take action to limit the negative effects of climate change on the environment (Plesner, 2018).

In the same way, as emphasised in the economic literature (Carlsson et al., 2012; Jones et al., 2015; Rotaris and Danielis, 2019; Uehleke, 2016), individuals who earn a high income are willing to pay more to support mitigation measures and, in this study, to support government's policies to reduce the impact of climate change on fish resources. As suggested by Carlsson et al. (2012) and Rotaris and Danielis (2019), this could be due to a positive relationship between a high availability of income and a higher level of education of the interviewees. These individuals, therefore, could have a greater understanding of the risks connected to climate change that would lead them to be more willing to finance mitigation policies in order to limit the damage caused by climate change on the environment and fish resources.

Finally, individuals who identify themselves with political ideas closer to populism have a greater WTP to protect fish resources from the impacts of climate change. This emerges from the variable about political orientation, adopted in this research to verify the relationship between the respondents' populist orientation and their WTP for mitigation policies in the fishing industry. In particular, this research result contrasts strongly with what is happening in much of Europe and Anglophone countries, where the rise of right-wing populist movements is associated with the diffusion of sceptical positions regarding climate change (Forchtner et al., 2018; Lockwood, 2018; Selby, 2019). However, it should be noted that in Italy, the greatest contribution to populist parties in terms of popular consensus derives from a political movement with a strong ecological connotation and a marked push towards encouraging the green economy and sustainable development, and in which environmentalism is a strong element of cohesion among its own electorate (Maggini, 2012). From this perspective, the link between the proximity to populist ideas and the greater WTP for the protection of the fish resources, which is recorded in our survey, can be explained.

6.4. Conclusion

This chapter discussed the main results in relation to the research questions proposed. In particular, the investigation allowed the WTP of citizens living in the coastal communities to be identified and analysed, and to understand the main factors affecting this behaviour.

This research shows how the WTP of residents in the main Italian coastal communities to finance measures of mitigation policies in the fishing industry in order to safeguard fish resources from the negative effects of climate change is consistent with the economic literature and, in some cases, it seeks to expand on the existing knowledge.

The study also shows that the greater WTP of the Italian coastal communities for climate change mitigation policies for the protection of fish resources of the sea, compared to what has emerged from the economic literature in other European regions, is most likely due to the greater importance that fish resources have in the diet of Italian citizens and in the economy of Italian coastal populations. Moreover, this WTP would seem to differ from one population to another according to public investments aimed at raising awareness on issues related to the environment, climate change and the fishing industry. In addition, the citizens' attitudes towards climate change, their subjective norms, the level of concern about the risks and the impacts of the phenomenon, and its perception are important factors affecting the WTP of citizens, as well as the socioeconomic characteristics of respondents, as discussed in this chapter.

CHAPTER VII

CONCLUSION

7.1. Key findings

This thesis shows interesting evidence of coastal communities' WTP to protect the fish resources from climate change and identifies the main factors affecting this behaviour. First of all, the results suggest the usefulness of the proposed conceptual model to better explain an individuals' behaviour to finance the Government's climate change mitigation policies. The study identifies a relationship between citizens' willingness to support climate mitigation policies in the fishing industry and their perception of and concern about climate change, on the one hand, and their socioeconomic and cognitive characteristics, on the other hand. In particular, the research demonstrates that the willingness of citizens living in Italian coastal communities to pay for climate change mitigation policies for the protection of fish resources ranges from €6.81 to €10.44, depending on the characteristics of the respondents. In detail, this WTP is greater for citizens who have positive attitudes towards climate change, those who are most concerned about the potential impacts of the phenomenon on marine environments and fish resources, and those who perceive climate change as a phenomenon close to them. In addition, female citizens, post-millennials, respondents with higher incomes and people who declare a populist political orientation also show a greater propensity to pay to mitigate the climate change phenomenon in order to safeguard the fish resources of the sea. Finally, the thesis also provides evidence that the willingness of individuals to pay for the protection of fish resources is positively linked to the importance that the fishing industry has in the socioeconomic fabric of the investigated population and to the existence of public investments aimed at raising awareness among citizens of issues related to the environment, climate change and fisheries.

7.2. Theoretical implications

The present thesis fills a gap in the current scientific literature related to the few studies that investigate the willingness of coastal communities to pay to finance climate change mitigation policies to protect the fish resources of the sea. In this way, the thesis enriches the academic literature on WTP by analysing coastal communities' intention to contribute economically to preserving marine fish resources affected by the climate change phenomenon.

The thesis provides a clear and, as far as possible, complete framework of the main factors affecting the willingness to finance mitigation policies. In particular, on the basis of individuals' perception of the phenomenon and their socioeconomic characteristics, the study investigates the willingness of residents in coastal communities to mitigate the effects of climate change and thus to safeguard their fish resources. The present dissertation demonstrates the adequacy and the usefulness of the proposed conceptual model, based on two theoretical approaches, the CLT and the TRA, used to explain individuals' intention to pay to mitigate the negative pressure of climate change on fish resources. In particular, the CLT enabled an assessment of the willingness of individuals to pay in relation to their level of involvement with the phenomenon investigated, whereas the TRA provided better knowledge about the influence of individuals' attitudes and their social capital on their WTP. The results show the validity of the constructs formulated by both theoretical approaches, suggesting their relevance in studies that analyse pro-active behaviours and activism aimed at climate change mitigation. Specifically, the research confirms the positive relationship between the reduction of psychological distance perceived by citizens and their attitudes on individuals' WTP. However, regarding subjective norms, the study shows a negative relationship with the propensity of citizens to finance mitigation policies, compared to other similar studies. This negative relationship between subjective norms and WTP shows the low weight that citizens give to the opinions of

others in relation to the climate issue, which has strong repercussions for the lives of all citizens. This result, however, does not differ completely from the postulates of the TRA, confirming the importance of citizens' sense of responsibility towards climate change and the validity of the proposed conceptual framework. Nevertheless, more factors related to the characteristics of the individual should be considered, possibly also by adopting other theoretical approaches capable of investigating the proactive behaviour of citizens, in order to fully explore the relationship between the subjective norms of the individuals and their willingness to pay for climate change mitigation policies.

7.3. Practical implications

From a political perspective, the research findings provide insights and indications for policy makers to define participatory tools, which the population could share, that could contribute to the mitigation of climate change, but which require further study. In particular, local, national and European governments should raise awareness among local communities about the issues of climate change and its long- and short-term effects, encouraging citizens to change their lifestyles to reduce their impact on the environment, and transforming their willingness to support mitigation policies into concrete actions (Duan et al., 2014). To this end, it would be useful to promote environmental education programmes in primary school pupils through videoconferencing, virtual games and augmented realities (Buchanan et al., 2019), to increase awareness of the link between the sea and its resources and the relative benefits it provides society (Jobstvogt et al., 2014). In this regard, the Italian Ministry of the Environment and the Italian Ministry of Education have been funding various education projects to increase environmental awareness among young people, with the aim of building a society which is attentive to the environment and its safeguards so as not to commit the mistakes made in the past (MATTM, 2018b; MIUR, 2018). Awareness-raising actions should also involve the local communities and fishery

stakeholders that are most directly impacted by climate change, and should also consider the specifically economic impact of this phenomenon. In more detail, local administrations and governments should periodically organise information campaigns and directly involve the main stakeholders in defining specific measures to reduce the negative effects of climate change on the local economy. Modern information technology, and in particular social media (Facebook, Twitter, Instagram, etc.), could represent a favoured channel to convey information and raise awareness among local community actors, from individual citizens to operators in the fishing sector. Social media activism can involve raising awareness and visibility of the climate change phenomenon, by putting in place various actions such as posting, liking, sharing info, news and photos, commenting, discussing and debating specific issues. Furthermore, the study shows that citizens' attitudes towards climate change, their level of concern about the risks and the impacts of the phenomenon and its perception are important factors affecting the WTP of citizens, as well as the socioeconomic characteristics of respondents. This suggests that knowing the characteristics of the individuals of a territory is of fundamental importance in the planning and formulation of mitigation policies, especially if these policies are to have a strong impact on the territory and the economy of a community.

As was demonstrated in the thesis, the results also show that the WTP of citizens for climate change mitigation policies in order to protect the fish resources is linked to the importance that the fishing industry covers in the socioeconomic fabric of the investigated populations. The greater WTP of coastal communities where fisheries constitute a crucial sector in the economy of the population was to be expected, suggesting that businesses and entrepreneurs operating in the fishing industry must commit to meeting citizens' expectations taking into account their high sensitivity and willingness to mitigate the effects of climate change on fish resources. From this point of view, businesses should undertake increasingly sustainable capture systems by adopting socially and environmentally responsible behaviour. The adoption of these responsible behaviours should then be communicated to the local population, even if

not exclusively, through effective strategies that use different channels in relation to the desired target population (e.g. millennials or people born in or before 1980). Forms of effective communications through traditional media or social network, such as Facebook, or through innovative tools, such as Instagram, could reach and affect individuals' behaviour, creating a close link between businesses and people. In addition, the development of aquaculture systems could be a valuable tool that may be able to reduce the fishing pressure on sea fish, which is strongly threatened by the phenomenon of climate change and by overfishing and, at the same time, guarantee jobs and adequate fish production to be placed on the markets for human consumption. In this way, fish resources could be safeguarded by balancing the economic interests of entrepreneurs and employers of the sector and the needs for greater protection of the environment.

7.4. Limitations

The main limitation of the research is based on the sampling method. Participants in the survey were involved through an online survey, carried out through the main social networks, such as Facebook, Instagram and WhatsApp, and spread among the acquaintances of the survey participants according to snowball sampling methods. Therefore, the sample obtained was not fully representative of the three areas investigated, mainly due to the strong prevalence of young respondents, most likely due to their greater propensity to use online communication channels than adults. At the same time, however, this sampling method allowed a wide variety of data to be collected and many citizens living in different coastal communities to be involved in a reasonably short period of time.

Another limitation of the research is linked to any bias associated with the preferences stated by respondents on the WTP in order to finance climate change mitigation policies in the fishing industry to safeguard fish resources. Although the

research collected information related to WTP through the adoption of a continuous variable, as proposed by Jobstvogt et al. (2014), the methodology may be affected by some limitations. In particular, these limitations could come from any (i) hypothetical bias, due to untruthful willingness to pay provided by respondents caused by the description of a scenario that is not very close to reality; (ii) strategic bias, which occurs when respondents believe they may have a personal advantage according to their response; (iii) embedding effect, caused by respondents' difficulty in understanding the edge of the survey subject; and (iv) design bias, due to the way in which the information is presented. To try to remove all of these biases, however, the research question was asked clearly, respondents were reminded to consider their budget line and their household expenses, and the scenario of climate change with its impacts and implications on fish resources and fishing activities were explained.

7.5. Future research

Given the research limitations, future research should address a sample that is more representative of the communities under investigation. In this regard, a broader sampling frame would be advisable, expanding the collection of data to include face-to-face interviews and not only data collected through social networks. Furthermore, regarding the collection of information on citizens' WTP, future research could adopt different evaluation methods to determine this variable in order to minimize the presence of bias in the survey results. Moreover, it would be interesting to extend the research conducted so far. In particular, on the one hand, the assessment of willingness to pay could be performed on a national basis, considering all Italian coastal communities, in order to be able to generalize the results and lay out the salient features that push residents in Italian coastal areas to finance climate change mitigation policies aimed at safeguarding fish resources. On the other hand, a cross-country study could be developed comparing the WTP of coastal communities in other countries in order to verify possible differences among populations living in different

regions. In the future, it could also be useful to analyse the weight of each factor affecting the willingness of citizens to pay in order to better address climate change mitigation policies by governments. In addition, considering that individuals' attitudes, beliefs, perception and concerns towards climate change are affected by several factors, it could be useful to include new variables in the proposed conceptual model that are also related to other theoretical approaches. Furthermore, it would also be interesting to compare the different WTP among citizens employed in the fishing industry and those who indirectly take advantage of the exploitation of fish resources, so as to better understand individuals' intentions to contribute to climate change mitigation policies from a dual perspective. Finally, the conceptual framework proposed could be used to understand the relationship between the factors that influence the proactive behaviour, not only of the citizens, but also of the stakeholders of the sector, or used in other fields of investigation to test its validity for analysing the pro-environmental behaviour of individuals.

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