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Changing frame, not the climate: a study on the interaction between eco-anxiety and need for cognitive closure on pro-environmental behaviors

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INTRODUCTION

The Office of the United Nations High Commissioner for Human Rights (OHCHR; 2022) stated that human-induced climate change is the biggest threat to the environment and society that the world has ever seen. The most affected are poor countries. The main cause of climate change is the increasing carbon dioxide which is mostly irreversible for 1,000 years after the emission (Solomon et al., 2009). Therefore, anthropogenic climate change is not only dangerous based on the significance of the change but especially based on its irreversibility. Higher concentrations of carbon dioxide in the atmosphere would result in irreversible reductions in rainfalls and inevitable sea level rise (Solomon et al., 2009). Climate change would also cause a higher number and more intense hurricanes, changes in water supply, etc. It is wrongly assumed that a rapid choice about a slow process like climate change would quickly reduce emissions. This belief is confuted by the longevity of atmospheric carbon dioxide perturbation and ocean warming (Solomon et al., 2009). It has been shown that even in the absence of additional emissions, a single pulse of carbon into the atmosphere is enough to increase the global temperature (Matthews & Caldeira, 2008). To this day, the anthropogenic CO_2 in the atmosphere has caused physical climate changes that are largely irreversible. To avoid further irreversible effects on the planet, and to keep the climate constant at a certain temperature, we need to cease man-made emissions immediately, reaching near-zero future carbon emissions (Matthews & Caldeira, 2008; Solomon et al., 2009). CO_2 is one of the major greenhouse gases (Meinshausen et al., 2009) and our lifestyle plays an important role in reducing greenhouse gas (GHG) emissions (Wynes & Nicholas, 2017). Almost 65% of GHG emissions on the planet are produced directly and indirectly by individuals (Ivanova et al., 2015). However, most of the pro-environmental behaviors promoted as efficient strategies to reduce our carbon footprints, such as recycling or energy savings, are inadequate to reach this goal (Tabi, 2013; Wynes & Nicholas, 2017). Therefore, it's important not only to conduct pro-environmental behaviors but also to be aware of which of those behaviors can efficiently help reduce CO_2 emissions. Behaviors such as having one fewer child, living car-free and eating a plant-based diet can radically decrease annual personal emissions of carbon dioxide (Wynes & Nicholas, 2017). Furthermore, the severity of climate change is progressively worsening mental well-being causing increasing rates of

depression and anxiety, as well as higher post-traumatic stress disorder (PTSD) and suicide (Berry et al., 2010; Whitmarsh et al., 2022; Palinkas & Wong, 2020). These detrimental effects are more likely to affect communities whose needs are directly threatened by climate change e.g., in a natural disaster aftermath (Whitmarsh, 2022). There is less literature regarding indirect exposure to climate change risks (e.g., media coverage) and its effects on mental well-being (Whitmarsh, 2022). It has been found that one of the most widespread mental health problems related to climate change is eco-anxiety, also called climate anxiety, a phenomenon that compromises people's ability to function, causing both cognitive-emotional impairment and functional impairment (Clayton & Karazsia, 2020). However, there is still confusion about its definition and whether eco-anxiety is a wide dysfunction or an adaptive response to climate change (Whitmarsh, 2022).

The aim of this study is to have a deeper understanding of what eco-anxiety is and what effects it has on pro-environmental behaviors. We also want to understand how different frames of the same message regarding climate change can elicit willingness to adopt pro-environmental behaviors and which frame is the most effective. Lastly, we want to consider the role of social norms and personal norms, the need for cognitive closure and political orientation on pro-environmental behaviors.

CHAPTER 2: HOW WE PERCEIVE CLIMATE CHANGE, THE RELATIONSHIP BETWEEN CLIMATE CHANGE AND MENTAL HEALTH

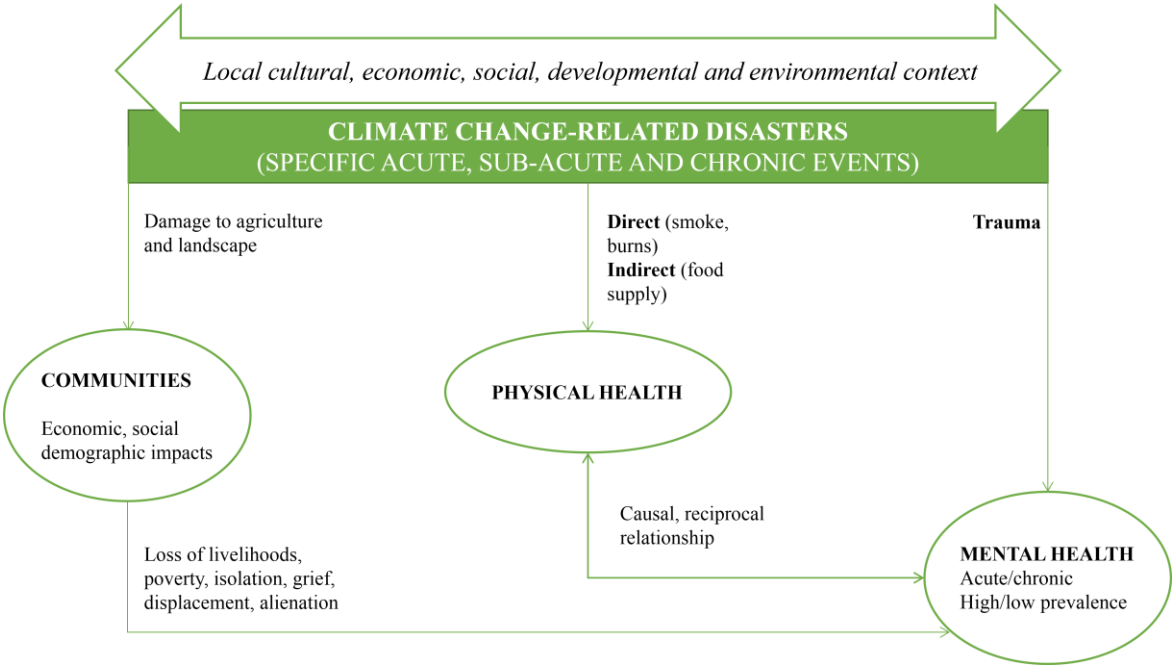
Since 1992, with the publication of the United Nations Framework Convention on Climate Change (United Nations, 1993) climate change mitigation has become the major concern and focus, around which it revolves a large part of scientific and policy literature (Matthews & Caldeira, 2008). However, the goal of stabilizing the amount of GHG in the atmosphere is not sufficient to avoid raising global temperatures (Matthews, 2006). The reason is that global temperatures will continue rising even after the point of CO_2 stabilization (Matthews, 2006). To avoid this effect we should decrease, not stabilize, human-induced GHG emissions, reaching near zero carbon emission (Matthews & Caldeira, 2008). Therefore, climate change policies should reflect the findings about GHG emissions and their lasting effect on the atmosphere, even after the cessation of the emissions (Matthews & Caldeira, 2008). Despite these findings, the international targets proposed to be reached by the year 2050 are most likely inadequate to prevent future global climate warming (Weaver et al., 2007). Due to the nature of this unprecedented threat, climate change is receiving more media coverage (Ágoston et al., 2022) and, therefore, public awareness about its effects is increasing (Baudon & Jachens, 2021). International news allows people all over the world to have access to information about the distant but disastrous consequences of climate change already occurring. Given the severity of the phenomenon, people are increasingly experiencing psychological stress and disturbing emotions related to climate change (Whitmarsh et al., 2022; Wullenkord et al., 2021). However, there is still confusion around the effects of indirect exposure to the climate crisis (Whitmarsh et al., 2022).

2.1 Eco-anxiety

Climate change is affecting the mental health of communities directly impacted by its effects (Fritze et al, 2008). Mental health can be defined as a person's ability to live with their emotions and to understand them as well as other people's reactions and the ability to think and to learn (Herrman, 2001). The World Health Organization (WHO) defines mental health as a "state of mental well-being that enables people to cope with

the stresses of life, realize their abilities, learn well and work well, and contribute to their community" (World Health Organization, 2022). People who experienced Hurricane Katrina report higher rates of PTSD (Acierno et al., 2007), substance abuse, depression, domestic violence, and a higher number of suicide attempts (Larrance et al., 2007). The psychological sequelae of the hurricane were not only a consequence of the direct exposure to the event itself, but also to the following events leading to unstable housing, displacement and lack of support services and employment (Larrance et al., 2007). Hurricanes are also one example of several extreme weather events or natural disasters that negatively affect the mental health of people involved (Palinkas & Wong, 2020). Along with floods, wildfires and heat weaves, hurricanes elicit high rates of anxiety and acute stress (Palinkas & Wong, 2020). The loss of place or grief from a close one's death can result in a decreased sense of self but also suicidal ideation and suicide. It has been found that female gender, younger age, lower level of education, lower socioeconomic status and lack of social support are risk factors that increase the probability of developing mental illness after a traumatic weather event (Palinkas & Wong, 2020). The number of people who experience detrimental mental health outcomes after being exposed to natural disasters is between 25% and 50%. For most of these individuals, these outcomes will decrease after years, but not for all of them (Palinkas & Wong, 2020). Along with other natural disasters, heat waves are a type of weather event that, based on their duration, can be considered an acute or subacute event. The longer the heat wave, the more profound the mental health impacts (Palinkas & Wong, 2020). Higher ambient temperature usually increases aggressiveness and criminal behaviors, which sometimes result in higher rates of homicides and physical assaults (Palinkas & Wong, 2020). Berry and colleagues (2010) proposed a causal pathways model to show how climate change can affect those who are directly and indirectly exposed to trauma. Indirectly, it can cause damaging effects on people's mental health through two specific indirect pathways that result in response to a subacute event: (1) physical health (through higher stress, injuries, diseases and disruption to food supply) and (2) community wellbeing (through damage to the economic and social fabric of communities; Figure 1).

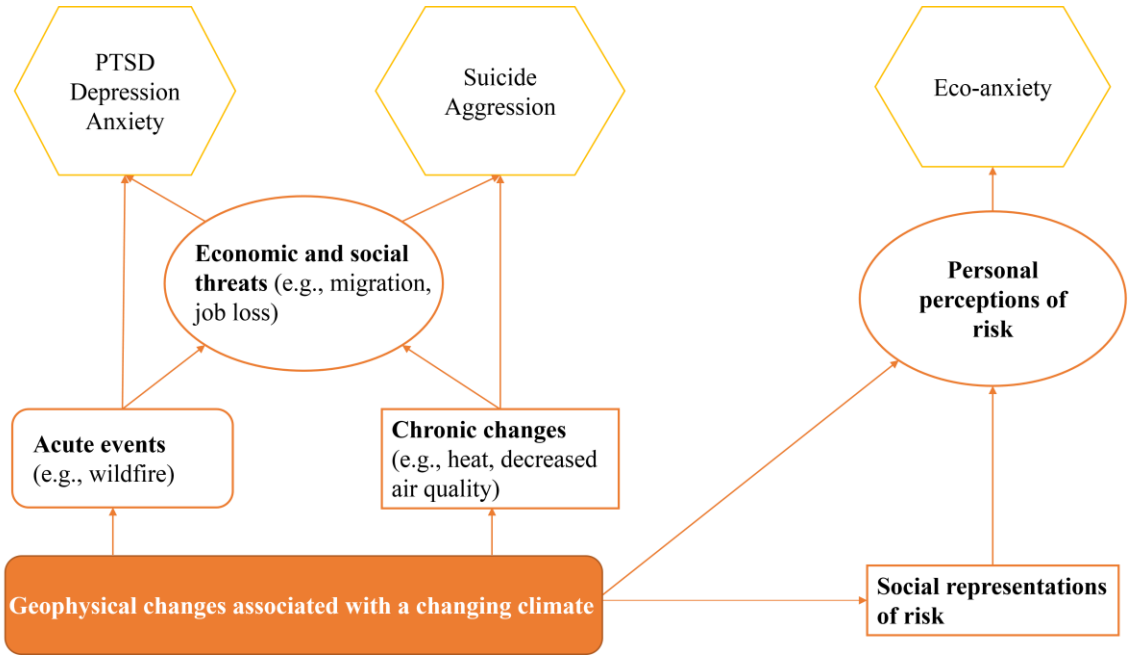
Figure 1.



Putative Causal Pathways Linking Climate Change and Mental Health.
Adapted from: Berry, Bowen & Kjellstrom (2010).

However, even those who are not (directly or indirectly) exposed to trauma and climate change disasters can also be affected by climate change. They can experience climate anxiety when they are exposed to a social representation of risk and/or they develop a personal perception of risk which affects their mental health (Figure 2).

Figure 2.



Impacts of Climate Change on Mental Health.

Adapted from: Clayton (2021).

While the first portrayals of climate change in the media were focused on the consequences for animal species (e.g., polar bears) and faraway lands (e.g., Antarctica), in the last few years, public media switched the depiction of climate change emphasizing the major risks for the human species (Clayton, 2021). Public awareness of the dangerous impacts of climate change is resulting in a higher number of people experiencing stressful mental health symptoms (Baudon & Jachens, 2021). These symptoms can be grouped under the name of "eco-anxiety" (Baudon & Jachens, 2021). According to the American Psychological Association (APA, 2017), eco-anxiety can be defined as the "chronic fear of environmental doom". Albrecht (2012) defines it as "the generalized sense that the ecological foundations of existence are in the process of collapse". Perhaps due to the novelty of the problem and its multifaceted nature, there is a lack of clarity about this concept and there are many different definitions in literature that describe it (Coffey et al., 2021). Sometimes "eco-anxiety" is also called "climate anxiety" and these terms are used interchangeably while other times, climate anxiety is considered as a form of eco-anxiety (Pihkala, 2020b). According to APA (2021) the term "eco-anxiety" refers to the experience of anxiety related to the environmental crisis

in general, while “climate change anxiety” and “climate anxiety” are more specific terms that refer to anxiety resulting from anthropogenic climate change, which includes global warming, the rise of sea levels and the increasing number of natural disasters (Coffey et al., 2021). In this paper, we are going to address this phenomenon as eco-anxiety, which, as stated before, also includes climate change anxiety. Fundamental characteristics of anxiety, as well as eco-anxiety, are uncertainty, unpredictability, uncontrollability and overwhelm (Pihkala, 2020a). Even though the term anxiety usually refers to pathological psychological conditions, this is not the case for eco-anxiety (Verplanken et al., 2020). Verplanken and colleagues (2020) found that the latter can be defined as a constructive and adaptive response to climate change and the climate crisis in some people, while for others habitual climate change worry can be unconstructive and part of an individual dysfunction. Anxiety itself has also different definitions. It’s an emotion similar to worry and fear and the result of facing concerning situations (Kurth, 2018). According to Weintrobe (2013), anxiety is a psychological phenomenon that springs from repressed emotions and a conflict between different parts of ourselves. Its main purpose is to alter us to threats and dangers to our life (Weintrobe, 2013). As stated in the name, anxiety is the main symptom of eco-anxiety, along with depression and stress, which result from the concern about climate change (Coffey et al., 2021; Searle & Gow, 2010). Moreover, individuals may also present emotions such as powerlessness and helplessness, worry, fear, anger, and feelings of loss (Baudon & Jachens, 2021; Pihkala, 2020a). Worry is strictly correlated to anxiety, and eco-anxiety, as well as anxiety, can result in both constructive worry or unconstructive worry, and therefore both adaptive and maladaptive responses (Verplanken et al., 2020). To be worried means to have a chain of thoughts and repetitive images picturing potentially dangerous events in the future (Borkovec et al., 1983). *Constructive worry* involves problem-solving, by taking action and engaging in the potentially threatening event which diminishes anxiety (Davey, et al., 1992; Verplanken et al., 2020; Wells, 1999). *Unconstructive worry* leads to repetitive and generalized worry which can be associated with intrusive thoughts, and it’s often correlated to anxiety-related pathologies (Newman et al., 2013; Verplanken et al., 2020; Wells, 1999). The latter tends to result in unhelpful solutions such as superstitious thinking or avoiding triggering situations (Wells, 1999). It’s still unclear whether eco-anxiety is a constructive response to climate

change. As stated before, eco-anxiety and habitual global warming worry can be unconstructive and dysfunctional for many individuals, while for others can be a constructive and adaptive response to the environmental crisis and could lead to pro-environmental behaviors (Verplanken et al., 2020). Emotions provoked by climate change and global warming also play an important role in inducing adaptive responses (Verplanken et al., 2020). Both positive (e.g., determined) and negative emotions (e.g., angry) can lead to a constructive response. However, according to Stanley and colleagues (2021), eco-anxiety leads to less adaptive responses and lower well-being. They found that those who feel eco-anxiety are less likely to engage in collective pro-environmental actions, while people who experience eco-anger are more engaged in pro-environmental behaviors and pro-climate activism. Eco-anger also predicts better mental health than eco-anxiety, resulting in lower depression, anxiety and stress. Eco-anger appears to be a healthier way to cope with climate change, while eco-anxiety seems to be more debilitating (Stanley et al., 2021). Anger experienced because of injustice or unfairness, leads to frustration and anger which are adaptive responses. Verplanken and colleagues (2020) found that global warming worry is also associated with anger, which can be a constructive response among others. In a more recent study by Heeren and colleagues (2022), it has been found that people who report high levels of eco-anxiety also show less pro-environmental behaviors than people who show low levels of eco-anxiety. This effect is the result of "eco-paralysis" (Albrecht, 2012) which implies levels of anxiety about the climate crisis so high, that paralyzes people from taking real behavioral action. The level of impairment encountered due to high levels of eco-anxiety could damage one's ability to engage in pro-environmental behaviors (Whitmarsh et al., 2022). Whitmarsh and colleagues (2022) found that pro-environmental behaviors that can be carried out with more ease (e.g., buying products with less packaging) are not engaged by those who have higher climate anxiety. While other behaviors such as buying second-hand items or renting items, were more frequent among them. Therefore, it's important to reduce eco-anxiety because higher levels of eco-anxiety are as unproductive as lower levels (Heeren et al., 2022). Interestingly enough, Whitmarsh and colleagues' (2022) research also showed that people with higher environmental values reported lower eco-anxiety. They theorized that individuals with high environmental values might be less anxious about the climate crisis because

they already engage in more pro-environmental behaviors, which reduce eco-anxiety. That's also why eco-anxiety is considered a multidimensional construct that can result in cognitive-emotional impairment and functional impairment (Clayton & Karazsia, 2020) *Cognitive impairment* includes rumination, namely repetitively thinking about environmental crisis and climate change, resulting in fueling greater eco-anxiety. *Functional impairment* includes interference with working activities or studying. According to Hogg and colleagues (2021), eco-anxiety also includes affective symptoms and anxiety about one's negative impact on the climate and, with rumination and behavioral symptoms, these dimensions are distinct from stress, anxiety and depression. By way of explanation, the Hogg Eco-Anxiety Scale include symptoms such as "Feeling nervous, anxious or on edge", "Unable to stop thinking about losses to the environment" and "Feeling anxious about the impact of your personal behaviours on the earth" (Hogg et al., 2021). Since stress is also closely related to eco-anxiety, some papers refer to this phenomenon as "climate change distress" instead of "climate anxiety" (Searle & Gow, 2010). Coffey and colleagues (2021) also define eco-anxiety as a form of distress resulting from climate change and anxiety about one's future. Worrying is an appropriate response to the escalation of climate change, however, many people are reporting intense concern that can interfere with their everyday lives (Fritze et al., 2008). People who engage in rumination about their eco-anxiety can find benefits in distancing themselves from the topic (Clayton, 2020). Another way to manage high levels of eco-anxiety would be to practice mindfulness, which results in developing an attitude of acceptance and non-judgmental observation towards their experience (Whitmarsh et al., 2022). As evidence of this, Whitmarsh and colleagues (2022) found that climate anxiety is higher among those with lower mindfulness. The role of personality in eco-anxiety is still uncertain. However, according to Pihkala (2020a), anxiety sensitivity may play a role in eco-anxiety, but there are also many cases in which other factors seem to have a bigger role in eco-anxiety. Being a climate scientist or someone who is already suffering the effects of climate change plays a major role in experiencing eco-anxiety. Individuals identified as female and younger generations (under 35 years old) are more likely to worry about climate change and to have pro-environmental attitude (Heeren et al., 2022; Searle & Gow, 2010), as well as those who work in the field of climate change (Fritze et al., 2008). Whitmarsh and colleagues

(2022) explored the indirect experience of climate change through passive exposure to information about the issue and active information seeking about the issue. They found that exposure to climate change-related information predicts climate anxiety which could mean that the media plays a key role in eco-anxiety. Moreover, the stronger predictor of climate anxiety is active information-seeking by individuals (Whitmarsh et al., 2022). Looking up information about a real threat such as climate change is likely to increase stress and anxiety, which could be balanced by seeking out reliable information at an appropriate time and frequency. Whitmarsh and colleagues (2022) also found that nature-relatedness predicted climate anxiety, therefore people with higher nature-relatedness reported higher climate anxiety. Overall, indigenous groups, people connected to the natural world, young people and individuals identified as female are the most affected by eco-anxiety (Coffey et al., 2021). Heeren and colleagues (2022) gave different explanations about the genre differences based on the current literature. Women could be more vulnerable to climate change because they perceive a lack of power which in many countries is associated with their roles as females when they are facing natural threats. It seems that culture plays an important role in the experience of climate change and how men and women live loss of economic opportunity and consequences for future generations. Another explanation could be that anxiety and similar disorders are already reported as more common in women than in men, therefore the gender difference in eco-anxiety could mirror gender differences in anxiety and depression in general. Heeren and colleagues (2022) also suggest that the higher reports of eco-anxiety are in younger, which could be explained by the increasing worry of young adults about their future which will be impacted by climate change and also by their perception of betrayal and abandonment by governments and older people who are not reacting appropriately. According to Weintrobe (2013), even though we can perceive climate anxiety to the extent of being incapacitated by it, we are also not realistically anxious enough, given the current state of warming and its estimated progression. Given that climate change cannot be solved quickly, it is important to find effective coping strategies to ease anxiety (Pihkala, 2020b). Mental health professionals are therefore choosing appropriate treatment plans to alleviate distressing symptoms (Baudon & Jachens, 2021). Most of these treatments focus on the people's inner work and their inner resilience and have the goal of encouraging them to engage in activities

that would reduce the symptoms. Treatments also include looking for a social connection and support from different groups and connecting people with nature. These interventions should have a holistic model both addressing the different layers of the individual's inner experience of climate change and then creating connections between the individual, nature and groups in which they are part of (Baudon & Jachens, 2021). The treatment should not only involve dealing with the individual's distress but also encourage them to engage with nature and connect with something greater than themselves (Baudon & Jachens, 2021). It is also important to let the client express their emotion as well as to encourage them to act and lead them towards a more ecological lifestyle. Avoiding the subject is not an effective strategy to prevent eco-anxiety, because it could result in an escalation of anxiety (Weintrobe, 2013). An effective strategy would be to give people emotional support to bear their eco-anxiety and minimize ineffective strategies such as disavowal, a form of denial that involves rejecting any responsibility for something (Weintrobe, 2013).

As it's still not the clear the effects of different levels of eco-anxiety on engaging in pro-environmental behaviors (Heeren et al., 2022; Verplanken et al., 2020; Whitmarsh et al., 2022), the present study aims at exploring the role of eco-anxiety in predicting the willingness to engage in pro-environmental behaviors.

2.2 Goal Framing: climate communication, and climate perception

In these past decades, a lot of progress was made in climate communication, however, many challenges are still present such as a superficial understanding of the problem itself, how to behave in a pro-environmental and efficient way, and how to deal with eco-anxiety (Moser, 2016). Climate communication is key to convey scientific knowledge to individuals, to create mass mobilization and to implement political regulations (Moser, 2016). However, according to Bilandzic and colleagues (2017), we can consider this type of communication as a collective-risk social dilemma for many reasons, some of them being: people have to repeatedly engage in pro-environmental behaviors before they can notice the outcome and any pro-environmental behavior is a lost investment (i.e., no refunds). Moreover, in some countries the immediate result of

many pro-environmental behaviors and financial sacrifices for climate protection, would initially only benefit a smaller group of people who actually perceive the effects of global warming (e.g., those who live in alpine regions; Bilandzic et al., 2017). Since climate change outcomes are an indirect or low personal threat for most citizens, at least in the short-term, the beneficial outcome of pro-environmental behaviors might be perceived as distant and abstract (Bilandzic et al., 2017). A solution to the collective-risk social dilemma would be to make citizens believe that there is a very high probability that they will be affected by climate change outcomes if a certain target (e.g., reduction of GHG emissions) is not met by a precise date (Milinski et al., 2008). Perception of a high risk of climate change outcomes would result in higher voluntary individual cooperation, especially if connected to causing a severe financial loss to the individuals themselves. Milinski and colleagues (2008) found that when people have almost the certainty (i.e., 90% probability) that if they fail to prevent simulated climate change, they will be losing their savings, they usually come close to preventing it. On the other hand, this target is not met when people perceive the risk of loss as high as the necessary investment, therefore, they fail to prevent climate change outcomes. According to Bilandzic and colleagues (2017), the messages about climate and pro-environmental behaviors must be framed in order to so to evoke emotions and, therefore, facilitate engagement in pro-environmental behaviors. Thus, when implementing climate change communication, we must consider the ways to frame a message about climate change and the behaviors we want to highlight. Framing a message means to make salient selected aspects of a perceived reality or information, in a communicating text, with the purpose of highlighting a certain problem definition, promoting a treatment recommendation and/or a moral evaluation (Entman, 1993). Therefore, emphasizing and making a part of information more noticeable and memorable to the target of the message, results in an increased probability that the audience will process it and memorize it. Also, the way that information is contextualized or framed determines how we interpret the information itself (Scheufele & Iyengar, 2014). Framing can be conceptualized in two macro-categories: *equivalence framing*, which consists of introducing the same information in different framing or orientations (e.g., gaining or losing the same object) and *emphasis framing*, which highlights certain factors or perspectives of an event or issue compared to others (e.g.,

community goals vs. individual goals; Scheufele & Iyengar, 2014). An example of equivalence framing is goal-framing. Goal framing is a type of frame that consists of presenting the information in a different light: either positive or negative (Bilandzic et al., 2017; Levin et al., 1998). Specifically, the framed message highlights either the negative consequences of not engaging in the behavior suggested or the positive consequences of engaging in it (Levin et al., 1998). The Goal Framing Theory suggests that behaviors are a consequence of multiple motivations and goals which can be strengthened by the goal frame when the latter is compatible with the individual's goals (Lindenberg & Steg, 2007). According to Lindenberg and Steg (2007), the frames that influence the process of decision-making can be divided into three categories: *hedonic* (that highlights the importance of feeling good), *gain* (that emphasizes preserving and improving resources) and *normative* (that underlines behaving appropriately). Gain-frames are those frames that highlight the positive consequences elicited when a suggested behavior is engaged. Specifically, gain-positive frames underline the positive outcome of performing in climate protection (e.g., "if we reduce meat consumption, the global temperature will remain stable"; Bilandzic et al., 2017). Whereas gain-negative frames stress how performing a recommended action would result in avoiding negative consequences (e.g., "if we reduce meat consumption, the global temperature will not rise"; Bilandzic et al., 2017). On the other hand, loss frames are those frames that highlight the negative consequences elicited when a suggested behavior is not engaged e.g., "if we do not reduce meat consumption, the global temperature will not remain stable"; Bilandzic et al., 2017). Different types of frames can lead to different types of outcomes in readers. Given that human behavior is responsible for more than half of GHG emissions on the planet (Wynes & Nicholas, 2017), it is important to reach as many people as possible with effective messages to encourage pro-environmental behavior. Chang and Wu (2015) found that highlighting the potential negative outcome of not buying green products is an efficient marketing strategy to promote pro-environmental behavior. This effect is higher when the consumer has higher (vs. lower) intrinsic environmental motivation. Bilandzic and colleagues (2017) found that different framing of climate change outcomes and behaviors can evoke different emotions and therefore elicit pro-environmental actions and climate engagement. Specifically, scenarios in the gain-negative frame increase the willingness to sacrifice and the

perceived threat of climate change, while messages in the gain-positive frame increase hope but lower perceived threat and willingness to sacrifice (Bilandzic et al., 2017). Moreover, they found that loss-frames increase willingness to sacrifice and perceived threat of climate change in the readers of a loss-framed scenario, through negative emotions, namely guilt and fear. According to the authors, a gain-positive frame could transmit a too-positive message which is not an effective strategy to induce pro-environmental behavior. That is because climate change outcomes are perceived as abstract and distant, therefore, to motivate individuals to act pro-environmentally, messages need to accentuate the need for individual behaviors, which is effective when associated with threats. Therefore, a too-positive message, in a gain-positive frame that attenuates potential threats, does not seem to be an effective strategy to increase climate engagement (Bilandzic et al., 2017). Due to the abstract and distant nature of climate change outcomes in Germany, motivation to act requires accentuation of the need for individual action, which is directly related to threats (Bilandzic et al., 2017). The role of framing is crucial when creating a message to elicit a behavior because it is a process that generates core motivation by integrating selective attention to some aspects of the situation, goal pursuit, sensitivity to some information and the activation of the individual's memory and knowledge (Lindenberg, 2006). In the present study, we will focus on the equivalence framing, specifically: the goal-framing. Based on Bilandzic and colleagues (2017) we will create different messages framed either in a gain-positive or gain-negative frame, to understand which one is more efficient in electing pro-environmental behaviors.

2.2.1 Pro-environmental behaviors and their effectiveness

Pro-environmental behaviors (PEB) can be described as concrete actions that can contribute to the protection of the environment or that harm it as little as possible (e.g., recycling; Soutter et al., 2020; Steg & Vlek, 2009) and as the omission of actions that could harm the environment (e.g., avoid taking flights; Lange & Dewitte, 2019). This type of behavior might be conflicting as it springs an internal conflict between fulfilling one's personal short-term interest or acting to fulfil the long-term interest of the environment or the society (Nordlund & Garvill, 2002). To decide whether to engage in

PEB or not, many variables come into play, one of them being personal norms which are one of the most important predictors of PEB (Nordlund & Garvill, 2002). PEB are also associated with pro-environmental attitude, personal responsibility, and locus of control (Bamberg & Möser, 2007). Thus, people with higher pro-environmental attitude are more inclined to engage in PEB, as well as those who perceive the protection of the environment as their responsibility, and people who have a higher sense of self-efficacy. Furthermore, it has been found that high issue awareness and social norms are also predicting of a higher intention to engage in PEB (Bamberg & Möser, 2007). Socio-demographics also play a role. In particular, individuals identified as female, people with higher education and a higher income are more likely to conduct PEB (Schultz & Zelezny, 1998). Cottrell (2003) found that verbal commitment is the stronger predictor of engagement in self-reported PEB. Moreover, a study from Cologna and colleagues (2022) shows that accurate knowledge of what the most efficient PEB are, is crucial in helping people to actually reduce their carbon footprints. Even when citizens are willing to behave pro-environmentally, the misinformation around these behaviors usually leads them to underestimate the potential of a certain action (e.g., eating less meat; de Boer et al., 2016; Lazzarini et al., 2016) while overestimating the potential of others (e.g., recycling; Cologna et al., 2022; Pickering et al., 2020; Truelove & Parks, 2012; Wynes et al., 2020). Eating less meat is one of the most effective but underestimated high-impact PEB (Truelove & Parks, 2012; Wynes et al., 2020). Given that the perceived effectiveness of PEB is more positively correlated with the intention of engaging in those behaviors, rather than the objective knowledge about their actual effectiveness, it's important that high-impact PEB are perceived as effective (Truelove & Parks, 2012). To understand the role of objective knowledge in predicting the willingness to engage in PEB, Cologna and colleagues (2022) decided to divide PEB into two categories: high-impact behaviors and low-impact behaviors. We consider as high-impact actions those behaviors that result in lower CO_2 emissions per year per individual than others (Cologna et al., 2022; Wynes & Nicholas, 2017). High-impact behaviors include the PEB that have a CO_2-eq reduction potential higher than 265 ($kgCO_2$-eq/year) up to 58600 ($kgCO_2$-eq/year), such as avoiding transatlantic flight, less car use, sustainable diet, reducing food waste and saving standby power. Low-impact behaviors include those PEB that have a CO_2-eq reduction potential lower than 40

($kgCO_2$-eq/year), such as efficient lightbulbs, buying unpackaged food and switching to canvas bags. Cologna and colleagues (2022) found that higher levels of objective knowledge negatively predict intentions to undertake low-impact behaviors and they positively predict intentions to undertake high-impact behaviors. Moreover, higher perceived mitigation potential positively predicts the willingness to engage in both low- and high-impact behaviors. Overestimating low-impact PEB can lead to reducing the engagement in other PEB (*negative spillover*), because of the feeling of having already acted in an environmentally friendly way (Cologna et al., 2022). This is even more likely, in people with weak environmental values and motivated by financial goals (Sorrell et al., 2020). Perceiving environmental improvements (e.g., in energy efficiency) can also lead to attenuating the perceived consequences and to a higher diffusion of responsibility (Santarius & Soland, 2018). These processes can be detrimental given that they can result in higher energy consumption and, therefore, a higher climate impact (Sorrell et al., 2020). Differently from Cologna and colleagues (2022), Wynes and Nicholas (2017), divide PEB into three categories: high-impact actions, moderate-impact actions and low-impact actions (Figure 3). High-impact actions can save more than 0.8 tCO_2e (tonnes of carbon dioxide equivalent) and some examples are having one fewer child (each parent was attributed with half of the child's emissions), living car-free, avoiding transatlantic flight, and eating a plant-based diet (i.e., a vegan diet). Moderate-impact actions can lead to reducing the emissions in a range between 0.2-0.8 tCO_2e. Examples of these actions are: washing clothes in cold water, recycling, and hanging dry clothes. Finally, low-impact actions can save up to 0.2 are and one example is upgrading light bulbs. Wynes and Nicholas (2017) found that younger generations are more willing to conduct PEB, therefore it would be important to teach them which behaviors are most effective. However, most recommendations found in government documents and in literature are moderate-impact actions (e.g., driving a more fuel-efficient vehicle), omitting high-impact actions for reducing emissions (e.g., having one fewer child, living car-free, avoiding airplane travel, and eating a plant-based diet; Wynes & Nicholas, 2017). Being aware that there are high-impact actions that we can engage in and that climate change is not inevitable in nature, is crucial to act environmentally and, therefore, reducing CO_2 emissions (Wynes & Nicholas, 2017).

Figure 3.

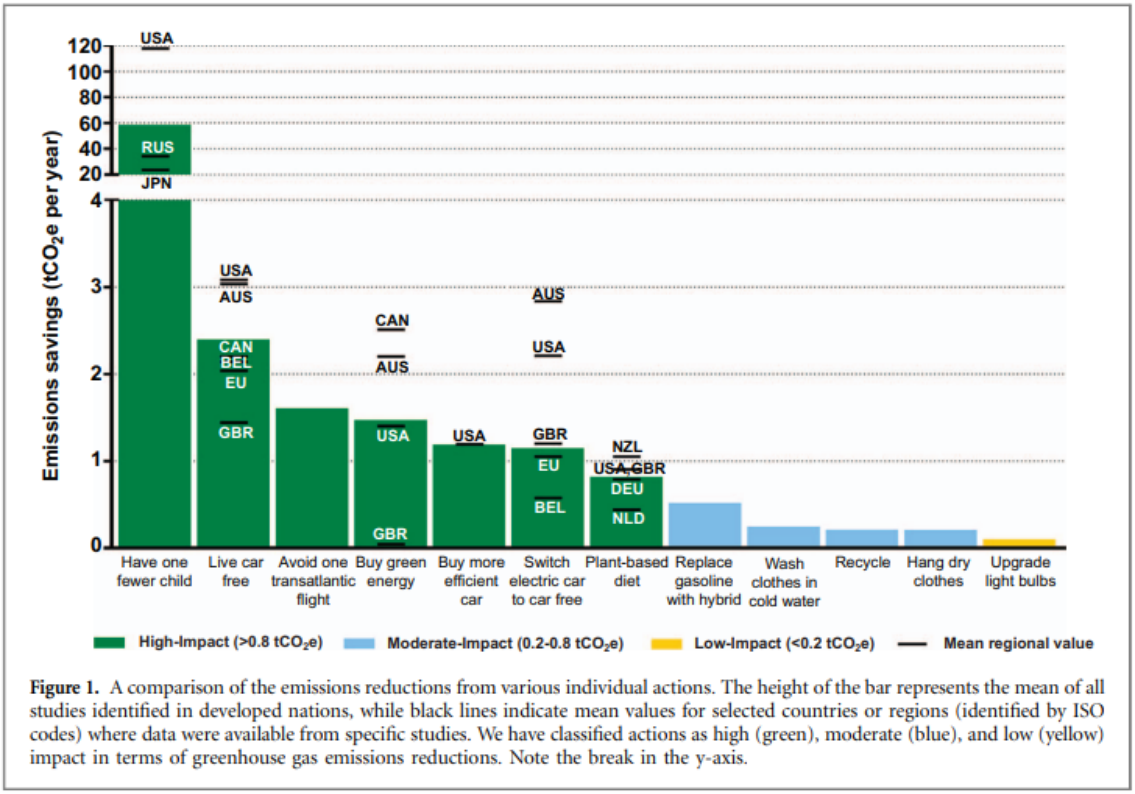


Figure 1. A comparison of the emissions reductions from various individual actions. The height of the bar represents the mean of all studies identified in developed nations, while black lines indicate mean values for selected countries or regions (identified by ISO codes) where data were available from specific studies. We have classified actions as high (green), moderate (blue), and low (yellow) impact in terms of greenhouse gas emissions reductions. Note the break in the y-axis.

Pro-environmental behaviors and their impact.

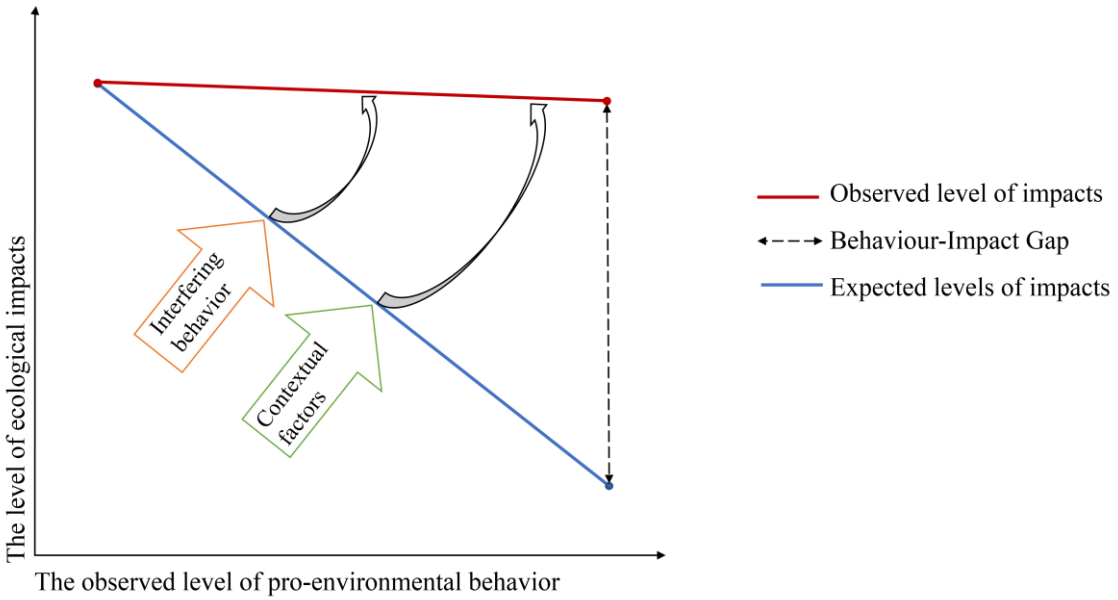
Adapted from: Wynes and Nicholas (2017).

Being committed and mindful of engaging in PEB should lead to lowering one's individual emissions (Wynes & Nicholas, 2017). Nevertheless, Csutora (2012) found no significant difference between the carbon emissions of "green" (ecologically committed consumers) and "brown" (ecologically not-committed consumers) consumers, meaning that being committed to adopting PEB may not always result in lower emissions. This finding was explained by proposing the behavior-impact gap (BIG) problem focusing on the gap in environmental awareness (Figure 4). This problem arises when a PEB doesn't result in the ecological effect desired. Csutora (2012) claims that one reason that could explain this issue is the lack of knowledge about the actual ecological impact of their PEB, leading to overestimating low-impact actions, as also claimed by Wynes and Nicholas (2017). Other contributors to the BIG problem are contextual factors. Individuals can be willing to switch to a more environmentally friendly lifestyle but if the resources to do such a change are not sufficient in their country, they will consume

resources imported from other places and, therefore, the positive effects of PEB will be counterbalanced by the carbon emissions of transportation. Another contributor that interferes with the ecological impact of PEB is interfering behavior in other areas. Being particularly engaged in recycling, but not paying attention to avoiding plastic bottles or not buying bottles made from recycled materials, may lead to a surplus of waste, thus lowering the positive impact of recycling. It's also worth noticing that higher-income "green" consumers have a higher carbon emission than lower-income indifferent or "brown" consumers (Csutora, 2012). However, the results of this study also show that we can lower our carbon emissions at all levels of income. Csutora (2012) states that individual PEB and type of consumption are still important, depending on how the individual consumes, considering also the aforementioned negative spillover.

Since previous literature found a strong empirical link between PEB and the intention to engage in PEB (Bamberg & Möser, 2007), in this study we will consider the willingness to engage in PEB as the dependent variable. As stated before, individuals' PEB are crucial in the fight against climate change, only if engaged with knowledge of the facts about their impact (Cologna et al. 2022). Therefore, we will explore the role of objective knowledge and perceived potential in predicting the willingness to engage in PEB (both high- and low-impact).

Figure 4.



The Behaviour-Impact Gap (BIG) Problem.

Adapted from: Csutora (2012).

2.3 Social norms and personal norms

Given that anthropogenic consumption patterns are beyond the capacity of the earth, many organizations and governments are recognizing their responsibility to modify these patterns towards more engagement in PEB (de Groot et al., 2021). To reach this goal, they shape their interventions, making salient certain social norms. Social norms are defined as the perception that people have about rules that are relevant to important members of a group which could be our friends, family, colleagues, or community (Cialdini & Trost, 1998). These norms affect our daily lives, for example, leading us to believe in which degree different behaviors could aggravate climate change and which behaviors could mitigate it (Kim & Seock, 2019). Social norms are shaped in each interaction we have, and they are not always explicit (Cialdini & Trost, 1998). According to Opp (1982), three types of formation allow norms to emerge: *institutional norm formation*; *voluntary norm formation* and *evolutionary norm formation*. The institutional norm formation happens when some individuals (e.g., head of a department) or institutions (e.g., parliament) prescribe a behavior and, by regulating it,

they enforce the norm that suggests it. The voluntary norm formation consists in the emerging of a norm after a group (i.e., a number of persons) find a common and voluntary agreement that a certain behavior is either forbidden or compulsory. Lastly, the evolutionary norm formation happens when norms gradually and spontaneously develop sometimes in an evolutionary way after trials and errors. In this last case, the creation of norms is not explicitly planned or announced. Opp (1982) also argues that most norms that guide our daily life are determined by behaviors we performed repeatedly and that resulted in rewards. Because of the rewarding element, these behaviors become the preferred response to certain situations. Subsequently, the non-normative behaviors' cost is known, and the behavior is discouraged by the other members of the social network by telling them what they should or shouldn't do. Social norms are then accepted and internalized by the components of the group. This *societal-value perspective* leads to believe that every behavior that is reinforced will become the norm, however, other perspectives consider also other elements (Cialdini & Trost, 1998). According to the *functional perspective*, norms could be developed in order to survive on an individual level or a group level (Cialdini & Trost, 1998). Culturally shared belief systems (e.g., stereotypes, norms) evolve in a way that can be compared to the natural selection of species (Schaller & Latané, 1996). Individuals feel the selective pressure to share with others which behavior patterns are more effective and informative and in that moment norms emerge. Therefore, norms will communicate behaviors useful to survive (e.g., affiliating with others, acquiring food) and they will be adaptive in promoting those actions that help surviving. Both these perspectives should be taken into consideration to understand the development of norms (Cialdini & Trost, 1998). Amongst the many behaviors that norms can predict, it has been found that social norms are strong predictors of PEB (Farrow et al., 2017). Thøgersen (2014) found that in many studies indirect effects of norms are often stronger than the direct effects, on both intentions and actual behavior. Their effect on PEB is even stronger when they are made salient (Cialdini et al., 1990). For this reason, many interventions created to change behavior are shaped around social norms. These types of interventions are particularly popular because they are considered convenient to make, easy to administer and cheap (de Groot et al., 2021; Mortensen et al., 2019). Social norms interventions are often created by making salient two types of social norms called *injunctive social norms* and

descriptive social norms (Cialdini et al., 1990). Injunctive norms are defined as norms that focus on what people approve or disapprove of within a certain relevant group. On the other hand, we consider descriptive norms those that focus on how the relevant group usually behaves in a certain situation (de Groot et al., 2021). When both norms align and are presented together in a normative message, they will increase the message's impact on the targeted behavior (Schultz et al., 2008). Many studies found that both types of social norms are associated with different PEB and pro-environmental intentions (e.g., Alcott, 2011; de Groot et al., 2013; de Groot & Schuitema, 2012). When individuals are more identified with the group, injunctive norms are more likely to better predict personal norms than descriptive norms, the latter predict them directly (Bertoldo & Castro, 2016). Injunctive norms also tend to predict people's recommendations to others about engaging in risky behaviors, whereas descriptive norms influence more people's decisions for themselves (Zou & Savani, 2019). Interventions and messages based on social norms consist of making people aware of how others act, therefore, norms need to be salient (Cialdini et al., 1990). To make social norms salient the preferred method is normative messages (Schultz et al., 2008). Descriptive normative messages can be divided into two categories: the *majority social norms* and the *minority social norms* (de Groot et al., 2021). The first category comprehends those messages that expose people to a majority norm (e.g., "The majority of people like yourself are recycling") which results in letting them know what the norm is. Those who are exposed to this message will be more likely to behave consistently than the majority (de Groot et al., 2021). The second category includes messages that make people aware of a minority of people, like themselves, which are acting a certain way, and this results in making them less likely to engage in that behavior (de Groot et al., 2021). When using social normative messages, we can also find another distinction: *static descriptive norms* and *dynamic descriptive norms* messages (Loschelder et al., 2019; Sparkman & Walton, 2017). Static norms are focused on perceptions of current behavior, whereas dynamic norms are focused on perceptions of the behavior in the past and the expected future developments about it. According to de Groot and colleagues (2021), the latter could be more positively influential when the majority show a change in their behavior, however, at this moment, the majority of individuals still do not engage in those PEB that need to be promoted. The use of social norms can be

considered the most widely spread social influence approach to promote change in PEB today (Abrahamse & Steg, 2013). However, it is a less effective approach compared to the block leader approach, the use of public commitment or modelling. The effectiveness of social norms interventions may depend on many factors such as the alignment between descriptive and injunctive e norms or whether individuals already follow the social norm or not (Abrahamse & Steg, 2013). Moreover, social influence approaches appear to be more effective in those whose social interactions are prevalent in their daily life such as employees and students, and social identity could play a role too, as well as group identification (Abrahamse & Steg, 2013). Interestingly, Abrahamse and Steg (2013) also found that the effectiveness of these approaches does not depend on the type of behavior encouraged. These types of approaches and interventions aim at behavior change and the durability of the change in the long term is positively influenced by the duration of normative messaging (Anderson et al., 2017). These messages influence more those who are highly influenced by social pressure to engage in the target behavior, compared to those with low social norms (Anderson et al., 2017). Therefore, normative messages should be sent repeatedly in time. People highly influenced by norms are more positively induced to engage in the desired behavior also in the short-term following intervention (Anderson et al., 2017). While people with low social norms sometimes can engage in the opposite behavior if they receive normative feedback instead of just the individual one. Thus, normative feedback should only target high-norm individuals, while low-norm individuals should only receive individual feedback (Anderson et al., 2017). However, the effectiveness of social norms interventions is still unclear and debated in literature (e.g., Abrahamse & Steg, 2013; Anderson et al., 2017; Scheibehenne et al., 2016; Yeomans & Herberich, 2014). In a more recent study, de Groot and colleagues (2021) found that people who have stronger personal norms tend to reduce their meat intake regardless of their perception of the social norms towards meat consumption. They also found that social normative messages are more effective when the individual has weaker personal norms towards the PEB the message is about. Therefore, it is important to consider people's personal norms when creating social norms messages or evaluating their effectiveness. Personal norms, or moral norms, can be defined as the feeling of moral obligation to do what we perceive as right (e.g., recycling to preserve the planet; Schwartz & Howard,

1981). Along with social norms, they are a strong motivator to engage in PEB (Schultz et al., 2016). They are a form of self-expectations and obligations, as well as sanctions, which are embedded in internalized values (Schwartz, 1977). They are a reflection of self-expectations, meaning what people hold for themselves (Schwartz, 1977). The main difference between social norms and personal norms is that the first ones are defined by the perception of how the most important people in our life or our community behave or think, which defines what is then considered a "normal" thing to do or think (Cialdini & Trost, 1998), whereas the second ones are self-imposed rules for our own behavior (Thøgersen, 2009). Personal norms are defined as what we perceive as moral and how we should act according to that. Thus, the stronger they are towards PEB, the stronger people's intention or PEB are, because they directly predict pro-environmental behavioral intention (Aertens et al., 2009; Joanes, 2019). A high sense of moral obligation also leads to higher purchase intention of eco-friendly products (Hwang et al., 2015) as well as higher engagement in PEB (Wynveen & Sutton, 2015). The relative importance given to norms is different from person to person, therefore the activation of personal norms will result in different degrees of perception of moral obligation in different situations even in the same action situation (Schwartz, 1977). Thus, the moral obligation perceived to act will be stronger when the norms relevant to a specific action are particularly important to the person. According to Schwartz (1977), a personal norm is the result of an internalized social norm. Therefore, a social norm intervention can trigger personal norms (de Groot et al., 2021). Each social interaction shape and modify our individual expectations (Schwartz, 1977). Personal norms are then activated in an explicit or subtle way during conversations with others or by the individual's thought that their behavior might be under the scrutiny of those whose reaction depends on the conformity of the individual's action to them (Schwartz, 1977). Previous literature shows that the relationship between PEB or pro-environmental intentions and social norms is partially mediated by personal norms, directly or indirectly influencing them (Doran & Larsen, 2016; Kim & Seock, 2019). Petty and Cacioppo (1986) proposed the Elaboration Likelihood Model (ELM) which assumes that people with weaker personal norms, therefore those without a strong pre-existing attitude about a specific issue or topic, are more persuadable by easily accessible cues. These cues can be activated with social normative messages and provide a perception of what other people may think or

do. Vice versa, people who already have a strong pre-existing attitude about a specific issue or topic (strong personal norms), are more likely to avoid peripheral cues because they prefer using their moral compass instead. This model was supported by the findings of de Groot and colleagues (2021) whose research showed that the stronger the personal norms are, the stronger their influence on PEB is. That is because people with stronger personal norms already have a stronger attitude about the topic presented. In contrast, people with weaker personal norms are more easily persuadable by salient social norms or other clues that provide them with information about how most people behave or think. Personal norms also have mitigating effects on both dynamic and static social norms, which affect less those who have stronger personal norms. Interventions based on personal norms might be more or less effective depending on many variables. According to Schwartz (1970; 1977), people who are aware of the consequences of their decision on the environment and people who accept the responsibility to do their part in order to reach a common goal will be more likely to engage in self-sacrificing or altruistic behavior. Schwartz's norm-activation theory (1977) aims to explain the moral decision-making behind people's altruistic behavior. This theory has also been extended not only to helping behavior but also pro-social behavior which also includes PEB (Van Liere & Dunlap, 1978). Its main proposition is that activating an individual's personal moral norms will influence their PEB. For this to happen, two preconditions must be present. The first one is called "awareness of consequences" according to which the person should be aware that their behavior has consequences on others and their welfare. The second one is called "ascription of responsibility" according to which the person should perceive a personal responsibility to engage in that behavior. For personal norms to influence taking action, both awareness of consequences and ascription of responsibility need to be high in the individual. However, this theory also hypothesizes that to engage in PEB, the activation of personal norms is not sufficient. That is because denying the consequences of individual's action on others or their responsibility to engage in these behaviors, could neutralize the activated norms. According to Schwartz (1977), the process of moral decision-making consists of a sequence of cognitive steps. The activation step is the first one, followed by obligation, defense and then response. The activation one starts when the individual is aware of the presence of a state of need and that some behaviors could relieve the need. This step ends when the person

perceives that they have the ability to address the need and feels some responsibility to engage in behaviors that would address it. At this point, the personally held moral will be activated and the individual will feel the moral obligation to take action. Violating personal norms would result in guilt, loss of self-esteem and self-deprecation whereas being consistent with our personal norms makes us feel pride, higher self-esteem and security (Schwartz, 1977). In the next step, the defense step, the cost of performing the action and the cost of violating it are calculated. If the costs of violating the action are lower or as high as the costs of performing it, the person will try to reduce the cognitive dissonance to avoid taking action by redefining the situation. To do so, they will try to neutralize the activated norms by either denying the state of need of others or denying their own responsibility to address the need. However, if the perceived moral obligation is too intense, it will outweigh the nonmoral costs of the behavior and the activation of personal norms will lead to altruistic behaviors. Schwartz's theory found empirical support in many settings such donation of bone marrow and volunteering (Schwartz, 1970). In literature, many studies that investigate the application of norm-activation to household PEB (e.g., recycling; Hopper & Nielsen, 1991) and most studies support the norm-activation model and its application to PEB (Guagnano, 1995; Guagnano et al., 1994; Stern et al., 1985; Van Liere & Dunlap, 1978). It has been found that people with high awareness of consequences (AC) for their behaviors and high ascription of responsibility (AR) to themselves tend to engage more in PEB (Turaga et al., 2010). Nordlund and Garvill (2002)'s study shows that personal norms play an important role in engaging in PEB (e.g., recycling, energy conservation, environmentally responsible consumption), as being an important antecedent of this type of behavior and having a direct strong positive effect on them. Personal norms also mediate the effect of problem awareness, environmental values and general values on PEB. In the present study, we will explore the role of both social and personal norms in predicting the willingness to engage in PEB.

2.4 Need for cognitive closure and political orientation

People's worldview and individual differences affect their approach to anthropogenic climate change. Different climate change-related messages could work with someone who has one worldview but not with someone whose worldview is different. One aspect that can determine a person's worldview is the need for cognitive closure (Orr et al., 2020). Need for cognitive closure (NCC) is a form of cognitive motivation which can be described as someone's desire to have a firm answer to a question, whatever this could be, as opposed to ambiguity or confusion (Webster & Kruglanski, 1994). NCC can be divided into two main categories: the *need for a specific closure* and the *need for a nonspecific closure* (Kruglanski & Webster, 1996). According to Kruglanski and Webster (1996), the first term refers to the desire to receive a specific answer to a question, whereas the second one refers to the desire to receive any answer to permanently cease a situation of ambiguity. The latter generates two tendencies: the *urgency tendency* and the *permanence tendency*. The urgency tendency refers to the desire for an immediate and quick closure (e.g., the ability to decide quickly), whereas the permanence tendency consists in the need to make the closure last, to perpetuate it (Kruglanski & Webster, 1996). These tendencies could lead the individual to seize and then freeze on an early judgment based on the first cues they could find or on past knowledge (Kruglanski & Webster, 1996). This process could result in reducing information processing, elevating judgmental confidence, and focusing the research of information only on prototypical evidence rather than diagnostic evidence (Kruglanski & Webster, 1996). It could also lead to using early cues exclusively, resulting in the primacy effect, anchoring effect or stereotypical judgment, and assimilating the judgment that is been created to primed constructs (Kruglanski & Webster, 1996). When closure is threatened, the NCC can result in negative affective reactions (Mannetti et al., 2002). While, when closure is achieved, it will result in positive affective reactions (Mannetti et al., 2002). NCC can be triggered by time constraints, fatigue or other contextual factors, as well as the individual's mental or physical state (e.g., fatigue or illness), which can also result in avoiding or postponing the closure (Mannetti et al., 2002). NCC seems to be induced by situationally induced motivation and/or individual differences (Mannetti et al., 2002). Those who report high chronic NCC prefer predictability and organization while tending to avoid uncertainty and

ambiguity which cause them discomfort (Roets et al., 2015). People with high NCC tend to make judgments quickly based on their past knowledge without considering additional information and they also usually avoid risky situations (Brizi & Biraglia, 2021). Thus, when they encounter an uncertain situation, they either feel an urgency to either seize a closure quickly, terminating the state of ambiguity, or they try to keep it from recurring, therefore maintaining or 'freezing' on closure (Roets & Van Hiel, 2011). Individuals with high NCC tend to prefer predictability as well as stable knowledge that cannot be challenged when encountering different circumstances. Thus, they are described as more close-minded because not willing to challenge their knowledge with alternative evidence (Nisbet et al., 2013; Roets & Van Hiel, 2011). Interestingly, those with high NCC and a prior opinion base on a specific subject usually choose a persuadable partner, whereas people with high NCC who a prior opinion base on a specific subject do not have, usually prefer a persuasive partner (Kruglanski & Webster, 1996). High NCC is also correlated with a high belief in conspiracy-based explanations for events, which are usually simple answers to complex issues (Marchlewska et al. 2017). However, this positive link is only observed when the cause of an event is unknown or uncertain, not when the cause is certain (Marchlewska et al. 2017). Thus, conspiracy theories seem to be useful for facing uncertainty, which is not tolerable for people with high NCC (Marchlewska et al. 2017). High NCC has been shown to result in behaviors such as ascribing failures to global self-characteristics (rather than specific ones) and using abstract linguistic descriptions when referring to negative out-group behaviors and to positive in-group behaviors (intergroup bias), differences that are absent when referring to negative in-group or positive out-group behaviors (Kruglanski & Webster, 1996). They also tend to avoid ample information seeking when their confidence in their hypothesis is low. On the other hand, when their initial confidence in the hypothesis is high, they show longer latencies of information seeking than those who have low NCC (Kruglanski & Webster, 1996). People high in NCC are also more likely to undergo a medical test (e.g., regular cervical cancer screening; Eiser & Cole, 2002). The authors attribute this phenomenon to the need of people with high NCC to resolute situations of uncertainty, which leads them to be more likely and motivated to get tested. Orr and colleagues (2020) suggest that this effect could also apply to climate change if framed similarly to a chronic medical problem or a

long-term illness that could be prevented if treated with precautionary acts. Nevertheless, different climate change messages are being spread at this time, and many of these are stating that this phenomenon is a hoax, which could cause conflict in people forming opinions about it (Orr et al., 2020). Related to climate change, Panno and colleagues (2018) found that NCC is related to PEB through political belief, and this relationship is mediated by political ideology. Ideologies can be defined as sets of attitudes which include belief systems that determine people's perception of important topics and that shape their interpretation of them (Jost et al., 2008). Thus, it's possible to predict the thoughts, behaviors and feelings of individuals based on their ideology. Political belief systems can be classified into two main categories: left-right also known as liberal-conservative (Jost et al., 2008). The main differences between the two factions are that liberals advocate for social change, while conservatives resist it and that the latter accept inequality whereas liberals reject it. People with certain ideologies use denial to avoid dealing with what climate change threatens, such as their privileges and safety resulting from their status quo and with this strategy they alleviate negative emotions such as anxiety and fear (Feygina et al., 2010). Environmental denial is the result of motivational tendencies to defend and justify their status quo, which leads people to ignore threatening events to defend the socioeconomic system, paradoxically increasing the risk of bearing the consequences of said events that would modify that very system (Feygina et al., 2010). Feygina and colleagues (2010) found that those who have higher system justification tendencies are also less committed to PEB and report higher denial of the environmental crisis. Specifically, conservatives are more likely to report higher system justification. They also found that it's possible to overcome denial and the consequence of system justification by framing pro-environmental change as patriotic and PEB as a useful tool to protect their status quo and their "way of life". Conservative or right-wing political ideology is negatively linked to PEB, while liberal or left-wing orientation is positively linked to it (Cottrell, 2003; Neumayer, 2004; Panno, et al., 2015). Moreover, liberals are more supportive than conservatives of pro-environmental policies and regulation (Allen et al, 2007; Dunlap & Van Liere, 1984; Neumayer, 2004). That is because left-wing parties tend to be less pro-business and more worried about the well-being and welfare of the lower social classes than right-wing political parties and because working classes and poor are more likely to

experience the dangerous outcomes of climate change and pollution than the rich (Neumayer, 2003). Therefore, liberals usually prioritize environmental protection over economic growth, and they are more confident in the Green/Ecology movement (Neumayer, 2004). Nisbet and colleagues (2015) also found that conservatives who pay greater attention to political news have lower climate change knowledge, meanwhile, it's higher for conservatives with greater attention to science. Moreover, higher TV entertainment use predicts less accurate climate knowledge (Nisbet et al., 2015). The processing and interpretation of information we are exposed to is determined by our prior attitude and political ideologies (Nisbet et al., 2015). Taber and colleagues (2009) suggest that people perceive arguments congruent with their prior beliefs as stronger than incongruent arguments. When presented with counterevidence, people try to persist and strengthen their prior beliefs actively denigrating arguments from the other faction. In literature, it has been found that prior beliefs and political ideologies result in at least three different biases or effects: *attitude congruence bias*; *disconfirmation bias* and *polarization effect* (Taber et al., 2009). The *attitude congruence bias* consists of judging as weaker the counter-attitudinal arguments compared to the pro-attitudinal arguments. The *disconfirmation bias* occurs when the counter-attitudinal arguments take longer to rate than pro-attitudinal arguments, and they will result in more disconfirming thoughts than the latter. The *polarization effect* determines a more extreme attitude after the aforesaid processing biases. Political ideology seems also to be associated with climate anxiety, namely, individuals with left-wing ideological values report more eco-anxiety than those with right-wing political orientation (Wullenkord et al., 2021). Orr and colleagues (2020) found that in the relationship between NCC and support for government policies and PEB, political conservatism is a mediator. However, when considering social conservatism, there is a gender-based difference in their findings. Specifically, in women, social conservatism plays a mediator role in the relationship between NCC and solution support. As opposed to men, where, in the relationship between NCC and solution support, social conservatism plays a suppressor role. Meaning that in men, social conservatism increases the positive effect of NCC on worry about climate change. However, Panno and colleagues (2018) found that NCC is a precursor of conservative orientation, people high in NCC are less likely to engage in PEB and this relationship is mediated by right-wing ideology. Nisbet and colleagues'

(2013) research shows that people high in NCC with right-wing views are less likely to engage in PEB, they tend to avoid weighting the overall benefits of PEB. Moreover, they found that men are less environmentally conscious than women. As stated before, previous literature suggests that not all individuals interpret scientific facts in the same way and that knowledge does not predict pro-environmental behavior and attitudes as much as individuals' ideology (Kahan et al., 2011; Nisbet et al., 2015). Even though there is scientific consensus around the climate change discourse, communication about the climate crisis shouldn't be based exclusively on the quality of the information proposed or the consensus of the scientific community (Sapiains et al., 2016). According to the "cultural cognition of risk" theory, individuals have the tendency to shape their perception of risk (about climate change, but also in general) congenially to their values (Kahan et al., 2011). Thus, given that scientists agree on the issue, the debate and disagreement about climate change is not a result of a lack of knowledge or contrasting scientific findings, but rather a disagreement of public opinion about what scientists are stating (Kahan et al., 2011). Citizens selectively credit or dismiss findings about risk according to their values, systematically overestimating results supporting their position and therefore recalling easily scientific support of their position (Kahan et al., 2011). To overcome this bias that reinforces our cultural position, communicators should consider not only the scientific content of the information but also the cultural meaning of it (Kahan et al., 2011).

Previous research suggests that people's worldview plays a key role in how they process information (e.g., about climate change). Therefore, we will explore how both political orientation and NCC affect the willingness to engage in PEB (high- and low-impact).

CHAPTER 3: MATERIALS AND METHODS

3.1 Hypotheses

In this study, we want to investigate the role of goal-framed messages in eliciting willingness to engage in PEB. According to Bilandzic and colleagues (2017), the willingness to sacrifice and the perceived threat of climate change can be increased by presenting scenarios in a gain-negative frame, whereas presenting messages in a gain-positive frame can result in lower perceived threat and willingness to sacrifice (Bilandzic et al., 2017). According to Chang and Wu (2015) highlighting the potential negative outcome of not buying green products results in a higher intention to conduct pro-environmental behaviors (i.e., buying green products). The negative message is more persuasive than the positive one. Thus, the framing of the message plays a key role in building the intention to act pro-environmentally. In our research, we will study whether exposure to scenarios with different frames affects the willingness to engage in PEB, considering them also divided into low- and high-impact pro-environmental behaviors (Wynes & Nicholas, 2017). Specifically:

Hypothesis 1a: Experimental conditions should influence the willingness to act in a pro-environmental way. In particular, the gain-negative frame should lead to a higher willingness to act in a pro-environmental way compared to the gain-positive frame condition, and, lastly, the not-climate-change-related condition should lead to an even lower willingness to act pro-environmentally compared to the other two conditions.

Hypothesis 1b: We decided to explore the role of framing in predicting the willingness to engage in both low- and high-impact PEB.

Cologna and colleagues' (2022) study shows that higher levels of objective knowledge negatively predict intentions to undertake low-impact PEB and they positively predict intentions to undertake high-impact PEB. Moreover, higher perceived potential predicts willingness to engage in both low- and high-impact behaviors. In this study, we will analyze the correlation between different levels of both perceived efficacy and objective knowledge of PEB' mitigation potential and the willingness to undertake PEB. In particular:

Hypothesis 2a: Objective knowledge should influence the willingness to engage in PEB. Specifically, higher levels of objective knowledge should positively predict a higher willingness to engage in high-impact PEB and negatively predict the willingness to engage in low-impact PEB. Perceived efficacy should also influence the willingness to engage in PEB. Higher levels of perceived efficacy should be associated with a higher willingness to engage in both low- and high-impact PEB.

Hypothesis 2b: We will also explore the interaction between objective knowledge and the conditions in predicting the willingness to engage in PEB (both high- and low-impact) and the interaction between perceived potential and the conditions in predicting the willingness to engage in PEB (both high- and low-impact).

As stated before, human-induced climate change is the biggest threat that the world has ever faced (OHCHR, 2022). Direct and indirect exposure to climate change risks affects people's mental health and well-being (Whitmarsh et al., 2022). We aim to understand the functioning of eco-anxiety, which is the experience of anxiety related to the environmental crisis (APA, 2021). We want to clarify the moderating role of eco-anxiety in predicting PEB. Previous studies showed that people with eco-anxiety are less likely to engage in collective PEB (Stanley et al., 2021). Specifically, it has been found that people high in eco-anxiety show less PEB than those low in eco-anxiety (Heeren et al., 2022). Moreover, Whitmarsh and colleagues (2022) found that climate anxiety predicts some PEB but not all of them. They found that people with climate anxiety are more likely to engage in effortful but low-impact PEB such as buying second-hand items or encouraging others to save energy. Whereas high-impact PEB, such as recycling or avoiding eating red meat, are not predicted by climate anxiety. We will analyze the correlation between different levels of eco-anxiety and PEB (both high- and low-impact) and the interaction between the conditions and the levels of eco-anxiety in predicting the willingness to engage in PEB. In particular:

Hypothesis 3a: Eco-anxiety should influence the willingness to engage in PEB. Specifically, medium levels of eco-anxiety should predict a higher number of PEB, compared to higher and lower levels of eco-anxiety. Based on previous data not published yet, we also expect an interaction between the condition participants are in and their level of eco-anxiety in predicting PEB (both high- and low-impact).

Hypothesis 3b: Based on previous literature, we also expect that higher levels of eco-anxiety will be associated with a higher willingness to engage in low-impact PEB but not high-impact PEB.

Further, we want to explore the role of social and personal norms on willingness to act in a pro-environmental way. Previous studies show that PEB are predicted by social norms and that this effect is even stronger when norms are made salient (Farrow et al., 2017; Thøgersen, 2014; Cialdini et al., 1990). Personal norms also directly predict PEB and pro-environmental behavioral intention (Doran & Larsen, 2016; Han et al., 2018; Harland, 2007; Kim & Seock, 2019). According to Anderson and colleagues (2017), the moderating role of social norms is crucial when eliciting willingness to engage in PEB (i.e., reducing energy use) through normative messages. Therefore, we will also explore the interaction between social norms and the conditions in predicting the willingness to engage in PEB. Moreover, de Groot and colleagues (2021) found that personal norms have a moderating effect when it comes to predicting PEB. Specifically, they found that social normative messages are more effective if people's personal norms towards the PEB are weak. Thus, we will explore the interaction between personal norms and the conditions in predicting the willingness to engage in PEB. In particular:

Hypothesis 4a: Social norms should influence the willingness to act in a pro-environmental way. Specifically, higher levels of social norms should be associated with a higher willingness to act in a pro-environmental way.

Hypothesis 4b: Based on the previous literature about the effects of social norms, we also expect an interaction between the condition participants are in and their level of social norms in predicting willingness to engage in PEB.

Hypothesis 5a: Personal norms should influence the willingness to act in a pro-environmental way. Specifically, higher levels of personal norms should be associated with a higher willingness to act in a pro-environmental way.

Hypothesis 5b: Based on the previous literature about the effects of personal norms, we also expect an interaction between the condition participants are in and their level of personal norms in predicting willingness to engage in PEB.

Lastly, we want to understand the role of political orientation and NCC on willingness to act in a pro-environmental way. Nisbet and colleagues (2013) found that people with higher levels of NCC are less supportive of climate policies and less likely to engage in PEB (Panno et al., 2018). Further, right-wing political ideology is negatively linked to PEB, while liberal or left-wing orientation is positively linked to it (Cottrell, 2003; Neumayer, 2004; Panno, et al., 2015). We will explore the correlation between political orientation, NCC and willingness to engage in PEB. Moreover, Taber and colleagues (2009) found that political attitude and prior beliefs play a moderating role when reading information (i.e., political arguments) or processing evidence. According to Marchlewska and colleagues (2017) when processing conspiracy theories, NCC is also an important moderator. We hypothesize that:

Hypothesis 6a: The need for cognitive closure should influence the willingness to act in a pro-environmental way. Specifically, higher levels of need for cognitive closure should be associated with a lower willingness to act in a pro-environmental way.

Hypothesis 6b: Based on the previous literature about the effects of NCC, we also expect an interaction between the condition participants are in and their level of NCC in predicting willingness to engage in PEB.

Hypothesis 7a: Political orientation should influence the willingness to act in a pro-environmental way. Political orientation should predict the willingness to act in a pro-environmental way. Specifically, right-wing orientation should be associated with a lower willingness to act in a pro-environmental way.

Hypothesis 7b: Based on the previous literature about the effects of political orientation, we also expect an interaction between the condition participants are in and their political orientation in predicting the willingness to engage in PEB.

3.2 Pretest

The experimental manipulation of the main study consisted in presenting differently framed scenarios. Thus, we decided to pretest 24 different scenarios to select the most

representative ones for the main survey. The scenarios were written facts (around 30 words) selected from national and international newspapers (e.g., The Guardian; BBC) about six different topics (i.e., using the bicycle instead of the car; following a vegan diet; avoiding flights; clothes dyeing process; deforestation; air pollution). We ran an online survey powered on Qualtrics which lasted around 5 minutes. Data was collected between the 13th of April 2023 and the 3rd of May 2023. 152 Italian participants were recruited through social media (e.g., WhatsApp, Telegram, Instagram) and using word-of-mouth techniques. We only considered as valid the surveys that were fully completed and participants who were over 18 years old and gave informed consent at the beginning of the questionnaire (N = 82). Overall, 61% of participants declared themselves to be female with a mean age of 39.5 (SD = 16.4). Participants were randomly assigned to one of 4 conditions: gain-positive frame condition (N = 21), gain-negative frame condition (N = 21), climate-change-related condition (N = 20) or control condition (not-climate-change-related; N = 20). After providing their informed consent, participants were asked to evaluate six different scenarios. For the gain-positive frame, gain-negative frame and climate-change-related conditions, scenarios were written about climate change facts regarding pro-environmental behavior or policies. For the control condition, we proposed facts not related to climate change about the selected topics. After each scenario, participants were asked to answer a set of questions. Specifically, they were asked to report the tone of the scenario with the item "*How do you perceive the tone of this message?*". Responses were measured on a 7-point Likert scale from 1 ("The tone of the message is negative") to 7 ("The tone of the message is positive"). The valence of the message was assessed with the item "*Does the reading of this scenario make you feel bad or good?*". Responses were measured on a 7-point Likert scale from 1 ("Very bad") to 7 ("Very good"). The arousal felt reading the scenario was measured with the item "*Does the reading of this scenario make you feel very calm or very agitated?*". Responses were measured on a 7-point Likert scale from 1 ("Very calm") to 7 ("Very agitated"). Then participants reported the positive/negative consequences of climate action by answering the item "*Did the reading of this scenario make you think about a negative or positive outcome of a certain action/situation?*". Responses were measured on a 7-point Likert scale from 1 ("Very negative") to 7 ("Very positive"). The climate change salience was assessed with the item "*How much*

did this reading of this scenario make you think about climate change?". Responses were measured on a 7-point Likert scale from 1 ("Not at all") to 7 ("Very much"). Lastly, they were asked to report how much the scenario made them want to act pro-environmentally with the item "*How much did the reading of this scenario make you think about acting to reduce climate change?*". Responses were measured on a 7-point Likert scale from 1 ("Not at all") to 7 ("Very much"). After the evaluations, participants provided some demographic information (i.e., age, gender, education level, political orientation, and income). Then they were debriefed about the pretest's purpose and the next steps of the research. To select the scenarios for the main study we considered the answers to the item about intention to act pro-environmentally, positive/negative outcome and salience of climate change. For the gain-positive and -negative conditions we selected the scenarios that elicited more intention to act pro-environmentally, those that elicited more thoughts about a positive outcome and those that elicited more thoughts about climate change. We found that four different scenarios for each condition had similar results reported by participants in these selected items. Therefore, we decided to present the four written facts for each condition. We also found that the difference between climate-change-related condition and control condition was not significant, thus we decided to not include the climate-change-related condition in the main study. To select the scenarios for the control condition we used the following criteria: neutral intention to act pro-environmentally, neutral outcome and neutral salience of climate change after reading the scenarios.

3.3 Participants

For the main study, we conducted another online questionnaire, using Qualtrics. Data was collected between the 11th of May 2023 and the 24th of June 2023. 1020 Italian participants were recruited through social media (e.g., WhatsApp, Telegram, Instagram) and using word-of-mouth techniques. However, we applied some exclusion criteria which reduced the number of data available for the analysis. To be included in the analysis the participants needed to be over 18 years old and to give informed consent at the beginning and at the end of the survey. Participants also had to fully complete the survey and don't fail the attentional check after the scenario, which consisted in an item

asking them to report how carefully they read the scenarios. To make sure participants remembered the scenarios throughout the survey, and to be included in the analysis, participants also had to successfully answer the manipulation check at the end of the survey. The correct answer option could have been easily found by reading the text of the scenario presented at the beginning. Therefore, participants who gave the wrong answer were excluded from the analysis. Considering the meantime to read the scenario, we also excluded from our sample those participants who took longer or less time than 3 SD from the mean. The final sample considered for the analyses consisted of 452 participants. Overall, 63.9% of participants identified themselves as female and they reported an average age of 31.9 (SD= 13.3). Specifically, the descriptive analyses show that the sample of participants was homogeneously distributed in the three conditions (Table 1). We investigated gender, age, as well as level of education, income, political orientation, and level of religiosity. Most of the participants had a high school diploma, reported an income between 15-22K and considered themselves as left-wing oriented. Also, most participants didn't describe themselves as religious.

Table 1. *Sample Characteristics.*

	Gain-Positive (N = 162)		Gain-Negative (N = 139)		Control (N = 151)	
	M	SD	M	SD	M	SD
Age	33.7	14.3	29.9	12	31.9	13.1
	M	%	M	%	M	%
Gender						
Female	102	63	91	65.5	96	63.6
Male	50	30.9	44	31.7	46	30.5
Non-binary	9	5.6	4	2.9	7	4.6
Prefer not to say	1	0.6	0	0	2	1.3
Education						
Middle	4	2.5	3	2.2	4	2.6
High school	68	42	40	28.8	53	35.1
Bachelor	44	27.2	61	43.9	55	36.4
Master	37	22.8	25	18	30	19.9
Specialization	9	5.6	10	7.2	9	6.0
Income						
<15K	19	11.7	16	11.5	26	17.2
15-22K	27	16.7	31	22.3	39	25.8
22-30K	35	21.6	17	12.2	29	19.2
30-38K	23	14.2	23	16.5	12	7.9
38-45K	10	6.2	10	7.2	8	5.3
>45K	25	15.4	14	10.1	17	11.3
Prefer not to say	23	14.2	28	20.1	20	13.2
	M	SD	M	SD	M	SD
Political orientation	2.60	1.24	2.18	1.11	2.59	1.23
Religion	2.45	1.78	2.24	1.75	2.48	1.71

3.4 Variables measured

3.4.1 Pro-environmental behaviors

There were two sets of questions, adapted from Cologna and colleagues (2022), related to pro-environmental behaviors. The nine behaviors were selected from Wynes and Nicholas (2017 e.g., “Live car-free”, “Plant-based diet”, “Recycle”) and can be found in Table 2. These PEB comprised three low-impact, three moderate-impact and three high-impact behaviors, which we selected based on the CO_2 emission of each of them, following the distinction provided in Wynes and Nicholas (2017) and Cologna and colleagues (2022).

The first question measured how willing participants were to conduct each of the nine PEB. The item was: "*Please indicate your degree of agreement with your personal intention to adopt each of the following pro-environmental behaviors*". Responses were measured on a 6-point Likert scale from 1 ("Strongly disagree") to 7 ("Strongly agree"). The scale was reliable with Cronbach's α = .74. The second question assessed how much participants thought these behaviors help mitigate climate change and reduce CO_2 emissions. The item presented to participants was: "*Please indicate how much you think each of the following pro-environmental behaviors could help mitigate climate change and reduce CO_2 emissions*". Responses were measured on a 6-point Likert scale from 1 ("Extremely little") to 7 ("Very much"). The scale was reliable with Cronbach's α = .81.

Table 2. *Pro-Environmental Behavior and Their Emissions.*

Pro-environmental behaviors	**CO_2-eq reduction potential (tCO_2e-eq/year)**
Avoid one transatlantic flight a year (e.g., Zurich– New York)	High impact (> 0.8)
Avoid car transport as much as possible	High impact (> 0.8)
Use public transport for shorter distances	Moderate impact (0.2-0.8)
Switch to a plant-based diet	High impact (> 0.8)
Recycling	Moderate impact (0.2-0.8)
Eat less meat	Moderate impact (0.2-0.8)
Waste less water	Low impact (<0.2)
Minimize waste and buying products with less packaging	Low impact (<0.2)
Switch from plastic to canvas bags	Low impact (<0.2)

Note. The data for the ranking are from Wynes & Nicholas (2017). The data for the ranking are from Cologna, Berthold and Siegrist (2022).

3.4.2 Social norms and personal norms

Social norms about PEB were measured through 4 items adapted from Kim and Seock (2019). Responses were measured on a 7-point Likert scale, from 1 ("Strongly disagree") to 7 ("Strongly agree"). Examples of items are: "*Family members whose opinion I value would approve of my engagement in pro-environmental behavior*" and "*Close friends who are important to me would support my engagement in purchasing*

eco-friendly products". The validation of these items has not yet been done in an Italian context thus we performed the Backwards Translation Procedure. The scale was translated by two different people fluent both in Italian and English. It was first translated from English to Italian by one person and then from Italian to English by the other one. The scale was reliable with Cronbach's α = .74. Personal norms about PEB were measured through 3 items adapted from van der Werff and colleagues (2013) and responses were measured along a 7-point Likert scale, from 1 ("Totally disagree") to 7 ("Totally agree"). Examples of items are: "*I feel morally obligated to behave in an eco-friendly manner, regardless of what others say*" and "*I would feel guilty if I do not behave in an eco-friendly manner*". The validation of these items has not yet been done in an Italian context thus we performed the Backwards Translation Procedure. The scale was reliable with Cronbach's α = .75.

3.4.3 Need for cognitive closure and political orientation

The brief version of the Need for Cognitive Closure scale (Carraro et al., 2011; Roets & Van Hiel, 2011) was used to assess the degree of need for cognitive closure. Responses to the 15 items were rated on a 7-point scale ranging from 1 ("Not similar at all") to 7 ("Very similar"). Examples of items are: "*I don't like situations that are uncertain*" and "*I dislike questions that could be answered in many different ways*". Political orientation was assessed by a general question about political identity on a 7-point scale from 1 ("Extreme left-wing party") to 7 ("Extreme right-wing party"). The scale was reliable with Cronbach's α = .77.

3.4.4 Eco-anxiety

Eco-anxiety was measured using the Hogg Eco-Anxiety Scale (HEAS-13; Hogg et al., 2021). This scale measured the eco-anxiety people experienced in the previous two weeks and it captures the four dimensions of eco-anxiety: affective symptoms, rumination, behavioral symptoms, and anxiety about one's negative impact on the planet. It consisted of 13 items and responses were measured along a 4-point frequency scale, from 0 ("Not at all") to 3 ("Nearly every day"). In the present research, the internal consistency was α=.93. The validation of these items has not yet been done in an Italian context thus we performed the Backwards Translation Procedure. Examples

of items are: 1. "*Feeling nervous, anxious or on edge*" (Affective symptoms), 7. "*Unable to stop thinking about losses to the environment*" (Rumination), 11. "*Feeling anxious about the impact of your personal behaviors on the earth*" (Anxiety about personal impact).

3.5 Other variables

Our questionnaire also explored other variables which were not considered in the analysis. These variables are here reported.

Risk perception of climate change was measured with 8 questions adapted from van der Linden (2017). The perception of climate change risk is measured along two levels, i.e., the personal risk (4 items) and the societal risk (4 items). The responses were measured on a 7-point Likert scale, from 1 ("Not concerned at all/Very unlikely/Not serious at all/Very rarely") to 7 ("Very concerned/Very likely/Very serious/Very frequently"). The validation of these questions has not yet been done in an Italian context thus we performed the Backwards Translation Procedure. Examples of items are: "*How concerned are you about climate change?*", "*In your judgment, how likely are you, sometime during your life, to experience serious threats to your health or overall well-being, as a result of climate change?*", and "*How serious of a threat do you think that climate change is to the natural environment?*". The scale was reliable with Cronbach's $\alpha = .82$.

Responsibility feeling was assessed with two ad-hoc questions adapted from Syropoulos and colleagues (2020). The first question asked to report how responsible participants felt about acting for nature. The item was "*To what extent do you truly feel it is your personal responsibility to protect the nature and the planet?*". The second question asked to report how responsible participants felt about acting for future generations. The item was "*To what extent do you truly feel it is your personal responsibility to act environmentally to protect future generations?*". Responses were measured on a 6-point Likert scale from 1 ("Definitely not my responsibility") to 6 ("Definitely my responsibility") for both questions. The two items correlate positively ($r = .57$)

Trait emotional intelligence questionnaire was measured using the Trait Emotional

Intelligence Questionnaire – Short Form (TEIQue-SF; Petrides, 2009). This questionnaire measures the trait of emotional intelligence. It consists of 30 items and responses were measured on a 7-point Likert scale response, from 1 ("Completely disagree") to 7 ("Completely agree"). Examples of questions are: "*Expressing my emotions with words is not a problem for me*", "*On the whole, I'm a highly motivated person*", and "*I usually find it difficult to regulate my emotions*". The validation of this scale has not yet been done in an Italian context thus we performed the Backwards Translation Procedure. The scale was reliable with Cronbach's $\alpha = .88$.

3.6 Procedure

The main study was run online through the Qualtrics platform, the survey lasted around 15 minutes. Participants first read the informed consent and, only if they gave their consent, they started the survey. Participants were randomly assigned to one of three conditions, namely: gain-positive frame condition (N = 162), gain-negative frame condition (N = 139) or control condition (N = 151). The experimental manipulation consisted in presenting pretested written scenarios (Table 3). The two experimental ones (gain-positive frame and gain-negative frame) described the future consequences derived from engaging in PEB. The first message highlighted the positive outcome of engaging in PEB (condition 1: gain-positive frame) whereas the second one focused on avoiding a negative outcome as a result of engaging in PEB (condition 2: gain-negative frame). Condition 3 described a neutral situation not related to climate change. Right after the scenario, participants were asked to report their attentional level while reading the scenario, through an attentional check. Then, participants were presented with 9 pro-environmental behaviors: they were asked how willing they were to conduct each of these behaviors, and then how much they thought these behaviors would help mitigate climate change and reduce CO_2 emissions. Then, participants were asked to answer questions regarding social norms and personal norms. Finally, they were asked to answer the scale that assessed eco-anxiety, their need for cognitive closure, and they were asked to answer the questions related to the other variables not considered in the analyses of the present thesis. To make sure participants carefully read the scenarios we created a manipulation check. Then, they were asked to report some demographical

information (e.g., age, gender, education level, political orientation, etc.). Political orientation was assessed by a general question about political identity. Finally, they were asked again to confirm their consent to participate in the study and they were given the written debriefing and the email to contact the experimenters. They were also offered the opportunity to receive further information about the study and pro-environmental behaviors cited in the survey via a link at the end of the questionnaire. We created a flyer (see Appendix) which included a PEB ranking based on their mitigation impact on climate change (according to their CO_2 emissions) as stated by Wynes and Nicholas (2017). In the flyer was also incorporated a link (https://linktr.ee/proenvironmentalbehaviors) which led to a main page that included suggestions on how to conduct PEB and sources to consult in order to increase one's knowledge about the most significant PEB.

Table 3. *Different Frames Used in Each Condition: Gain-Positive, Negative, And Neutral.*

Condition:	Scenario:	Translation:
Gain-positive frame (84 words)	Scegliere di non mangiare carne e latticini permette di **ridurre le emissioni** di anidride carbonica dovute agli allevamenti.	Choosing to avoid eating meat and dairy products allows to **reduce the carbon emissions** caused by farming.
	Scegliere di non prendere l'aereo e preferire mezzi come il treno permette di **ridurre le emissioni** di anidride carbonica dovute all'aviazione.	Choosing to avoid flights and prefer other transportation like the train allows to **reduce the carbon emissions** caused by aviation.
	Politiche che mirano a regolamentare il processo di tintura dei tessuti permettono di **ridurre le emissioni** globali di CO_2 e quindi di ridurre il riscaldamento globale.	Policies that aim to regulate the dying clothes process allow to **reduce the global carbon emissions** and, consequently, reduce global warming.
	Politiche che mirano a regolamentare la deforestazione permettono di **ridurre il riscaldamento globale**, tramite l'assorbimento di CO_2 delle foreste.	Policies that aim to regulate deforestation allow to **reduce global warming** through forests' absorption of CO_2.
Gain-negative frame	Scegliere di non mangiare carne e latticini permette di	Choosing to avoid eating meat and dairy products allows to **not**

(89 words)	**non aumentare le emissioni** di anidride carbonica dovute agli allevamenti. Scegliere di non prendere l'aereo e preferire mezzi come il treno permette di **non aumentare le emissioni** di anidride carbonica dovute all'aviazione. Politiche che mirano a regolamentare il processo di tintura dei tessuti permettono di **non aumentare le emissioni** globali di CO_2 e quindi di non peggiorare il riscaldamento globale. Politiche che mirano a regolamentare la deforestazione permettono di **non aumentare il riscaldamento globale**, tramite l'assorbimento di CO_2 delle foreste.	**increase the carbon emissions** caused by farming. Choosing to avoid flights and prefer other transportation like the train allows to **reduce the carbon emissions** caused by aviation. Policies that aim to regulate the dying clothes process allow to **not increase the global carbon emissions** and, consequently, not worsen global warming. Policies that aim to regulate deforestation allow to **not increase global warming** through forests' absorption of CO_2.
Control: neutral frame **(78 words)**	I vegetariani hanno tassi più bassi di ipertensione e diabete di tipo 2 rispetto ai non vegetariani. Il 17 dicembre 1903, per la prima volta un essere umano si alzava in volo su un mezzo meccanico, l'aeroplano. Il pregio dei coloranti reattivi per la tintura di cotone e altre fibre cellulosiche è la grande varietà di colori ottenibili. In autunno la concentrazione di clorofilla nelle foglie diminuisce, mentre aumenta quella di carotene che le rende di colore giallo-arancio.	Vegetarians have lower rates of hypertension and type 2 diabetes than nonvegetarians. On the 17th of December 1903, for the first time, a human being flew on a mechanical means, the airplane. The advantage of reactive dyes for dyeing cotton and other cellulosic fibres is the great variety of colors obtainable. In autumn the concentration of chlorophyll in the leaves decreases, while that of carotene increases which makes them yellow-orange.

CHAPTER 4: RESULTS

Before conducting the data analysis, we decided to divide our nine PEB into two groups (i.e., high- and low-impact PEB), according to their CO_2 mitigation potential, consistent with Cologna and colleagues' (2022) study. High-impact and moderate PEB were combined into one group called "High-impact PEB", whereas low-impact PEB were considered as a second group, namely "Low-impact PEB".

4.1 Descriptive statistics and correlations

4.1.1 Descriptives analyses

Descriptive statistics show the means, standard deviations and frequencies of the variables explored in this study (Table 4). The reported personal norms and social norms are slightly higher in the gain-positive condition. Whereas participants in the gain-negative condition reported more willingness to engage in both high-impact and low-impact PEB. We can also notice an overall higher willingness to engage in behaviors that are considered low-impact PEB, compared to those with a higher positive impact on the environment. The mitigation potential (PEB potential) of these behaviors is perceived as slightly higher by the participants in the gain-negative condition compared to the others. Moreover, participants in the gain-negative condition seem to have a very high objective knowledge of the actual environmental impact of the PEB, compared to the participants in the gain-positive conditions which presented a lower knowledge. The NCC is higher in the gain-positive and control conditions, compared to the gain-negative condition. It's also worth noticing that the reported levels of eco-anxiety (HEAS) are low in all conditions, especially in the gain-negative condition. Overall, there isn't a particular differentiation in the values reported by the different variables in the three conditions. We will further investigate these results in the following analyses.

Table 4. *Descriptive Statistics by Condition.*

	Gain-positive (N=162)		Gain-negative (N=139)		Control (N=151)	
	M	SD	M	SD	M	SD
Personal norms	5.62	1.21	5.5	1.14	5.49	1.21
Social norms	4.97	0.91	4.87	1.07	4.85	1.06
Low-impact PEB	6.41	0.85	6.43	0.71	6.30	0.85
High-impact PEB	5.28	0.98	5.50	0.91	5.21	1.06
PEB potential	5.54	1.00	5.56	0.94	5.49	0.96
Objective knowledge	-0.04	0.38	0.08	0.41	0.02	0.40
NCC	4.42	0.89	4.07	0.81	4.32	0.81
HEAS	0.76	0.57	0.82	0.58	0.73	0.67

4.1.2 Correlations

In the following tables, we reported the correlations specific to each condition, namely, the Gain-positive condition (Table 5), the Gain-negative condition (Table 6) and the Control condition (Table 7).

The results show that in the gain-positive condition, there is a significant positive correlation between high-impact PEB and eco-anxiety (HEAS). Meaning, that higher levels of eco-anxiety are associated with a higher willingness to engage in high-impact PEB. This correlation was not significant in the case of low-impact PEB. We can also notice that both high- and low-impact PEB correlate positively with personal norms and social norms. Therefore, higher levels of personal norms and social norms are associated with a higher willingness to engage in both high- and low-impact PEB. Personal norms also positively correlate with eco-anxiety, meaning that people with higher levels of personal norms are more likely to report higher levels of eco-anxiety. The results show a significant positive correlation between the Need for Cognitive Closure (NCC) and eco-anxiety. However, NCC does not correlate with either high-impact PEB or low-impact PEB. We can also observe that political orientation negatively correlates with high-impact PEB and eco-anxiety. Suggesting that people with conservative views are less likely to feel eco-anxious and less willing to engage in high-impact PEB. Political orientation does not significantly correlate with low-impact PEB. It negatively correlates with both the perceived potential of PEB and objective knowledge. Thus, people with right-wing views are more likely to report lower perceived potential of PEB and to have less accurate knowledge about the actual impact

of PEB. Both PEB perceived potential and objective knowledge correlate positively with high-impact PEB. However, objective knowledge correlates negatively with low-impact PEB. This means that participants with an accurate knowledge about these behaviors, were more willing to engage in high-impact PEB but not low-impact PEB. Thus, participants with a higher perception of the potential of PEB and more accurate knowledge about these behaviors were also more willing to engage in PEB.

In Table 6 we can observe the correlations in the gain-negative condition. We found that high-impact PEB and low-impact PEB positively correlate with eco-anxiety. Personal norms correlate positively with both high- and low-impact PEB, whereas social norms only correlate with low-impact PEB. The results also show a significant negative correlation between eco-anxiety and political orientation. Political orientation also negatively correlates with high-impact PEB. Meaning right-wing participants are less likely to report high levels of eco-anxiety and to engage in high-impact PEB. Political orientation also negatively correlates with objective knowledge. Thus, people with right-wing views are more likely to have less accurate knowledge about the actual impact of PEB. Both PEB potential and objective knowledge correlate positively with high-impact PEB. Meaning that participants with more accurate knowledge about these behaviors were also more willing to engage in high-impact PEB. PEB potential also positively correlates with low-impact PEB. In the gain-negative condition, NCC does not correlate significantly with eco-anxiety.

Lastly, the results of the correlations in the control condition (Table 7) show that eco-anxiety positively correlates with high-impact PEB, but not with low-impact PEB. Personal norms positively correlate with both high-impact PEB and low-impact PEB, as well as eco-anxiety. Social norms do not correlate with eco-anxiety or PEB. Results also show a negative significant correlation between political orientation and high-impact PEB as well as low-impact PEB. Political orientation also negatively correlates with eco-anxiety and with both the perceived potential of PEB and objective knowledge. Thus, conservatives are more likely to report lower eco-anxiety, lower perceived potential of PEB and to have less accurate knowledge about the actual impact of PEB. Both PEB perceived potential and objective knowledge correlate positively with high-impact PEB. However, objective knowledge correlates negatively with low-impact

PEB. NCC negatively correlates with willingness to engage in high-impact PEB. Meaning participants who reported higher NCC, were less willing to engage in PEB.

Overall, in all three conditions, personal norms are positively correlated with PEB, both high- and low-impact. Therefore, regardless of the condition, participants who reported higher personal norms also showed higher willingness to engage in any type of PEB. Eco-anxiety is also positively correlated with high-impact PEB, but not significantly correlated to low-impact PEB. In all conditions, we found a significant negative correlation between political orientation and willingness to engage in PEB as well as high-impact PEB. However, only in the control condition, we found a significant negative correlation with low-impact PEB. Thus, conservative participants in all conditions were less willing to engage in PEB, especially high-impact PEB. Whereas in the control condition, conservative participants were also less willing to conduct low-impact PEB compared to those in the experimental conditions. Moreover, in all conditions, the perceived mitigation potential of PEB is positively associated with willingness to engage in PEB (both high- and low-impact). Meaning, participants who reported a higher perception of potential mitigation of the PEB, also reported more willingness to engage in PEB. The objective knowledge of the actual impact of PEB on climate change is also positively associated with PEB and high-impact PEB, however, this correlation is not found with low-impact PEB. Specifically, we found a significant negative correlation between objective knowledge and low-impact PEB in both gain-positive and control condition. This negative correlation is also found in the gain-negative condition, but it's not significant. Thus, participants with actual knowledge of the impact of PEB are more willing to engage in those behaviors, especially the high-impact PEB. Moreover, the higher the objective knowledge, the lower the willingness to engage in PEB that aren't actually useful in mitigating climate change (i.e., the low-impact PEB). It's also worth noticing that in all conditions, political orientation is negatively associated with objective knowledge. Thus, conservative participants were more likely to have less accurate knowledge about the actual impact of the PEB. Lastly, political orientation is also negatively associated with eco-anxiety in all three conditions. Therefore, participants with right-wing views were less likely to report experiencing eco-anxiety.

Table 5. *Correlations in Gain-Positive Condition.*

	age	political orientation	PEB	high-impact PEB	low-impact PEB	PEB potential	objective knowledge	personal norms	social norms	HEAS	NCC
age											
political orientation	0.20*										
PEB	0.00	-0.39***									
high-impact PEB	-0.04	-0.46***	0.94***								
low-impact PEB	0.10	-0.04	0.65***	0.37***							
PEB potential	0.04	-0.18*	0.59***	0.52***	0.48***						
objective knowledge	-0.11	-0.25**	0.16*	0.27***	-0.17*	-0.13					
personal norms	0.19*	-0.21**	0.58***	0.50***	0.48***	0.49***	0.01				
social norms	0.11	0.02	0.26***	0.23**	0.20*	0.21**	0.16*	0.25*			
HEAS	-0.08	-0.32***	0.39***	0.42***	0.12	0.25**	-0.01	0.42***	0.00		
NCC	0.02	0.04	-0.06	-0.04	-0.07	0.05	-0.06	0.13	0.05	0.24**	

Note. * p <.05; ** p < .01; *** p < .001

Table 6. *Correlations in Gain-Negative Condition.*

	age	political orientation	PEB	high-impact PEB	low-impact PEB	PEB potential	objective knowledge	personal norms	social norms	HEAS	NCC
age											
political orientation	0.20*										
PEB	-0.09	-0.31***									
high-impact PEB	0.10	-0.38***	0.95****								
low-impact PEB	-0.01	0.03	0.59***	0.30***							
PEB potential	-0.11	0.18*	0.35***	0.27**	0.38***						
Objective knowledge	-0.23**	-0.33***	0.31***	0.38***	-0.03	-0.27**					
personal norm	0.07	0.00	0.39***	0.36***	0.26**	0.38**	0.03				
social norms	-0.14	0.11	0.15	0.08	0.22*	0.21*	0.00	0.32***			
HEAS	-0.12	-0.28**	0.49***	0.51***	0.18*	0.27**	0.11	0.47***	0.11		
NCC	-0.4	0.12	-0.11	-0.12	-0.02	0.12	0.05	0.11	0.04	0.00	

Note. * p <.05; ** p < .01; *** p < .001

Table 7. *Correlations in Control Condition.*

	age	political orientation	PEB	high-impact PEB	low-impact PEB	PEB potential	Objective knowledge	personal norms	social norms	HEAS	NCC
age											
political orientation	0.04										
PEB	-0.09	-0.55***									
high-impact PEB	-0.13	-0.58***	0.95***								
low-impact PEB	0.07	-0.21*	0.64***	0.37***							
PEB potential	0.02	-0.23**	0.52***	0.43***	0.50***						
Objective knowledge	-0.11	-0.19*	0.18*	0.29***	-0.16*	-0.07					
personal norm	0.10	-0.15	0.40***	0.30***	0.45***	0.42***	-0.10				
social norms	-0.13	0.09	-0.01	-0.06	0.12	0.22**	-0.05	0.21**			
HEAS	-0.06	-0.37***	0.44***	0.48***	0.13	0.16	0.16	0.36***	-0.16		
NCC	0.09	0.20*	-0.24**	-0.25**	-0.09	-0.05	-0.14	0.05	0.08	-0.15	

Note. * p <.05; ** p < .01; *** p < .001

4.2 Regression models

DIFFERENCES BETWEEN CONDITIONS

To test our hypotheses and explore the variables that were correlated with willingness to engage in PEB, linear regressions were conducted to understand the unique contributions of each predictor to willingness to behave pro-environmentally. We created two dummy variables using Helmert's contrasts to test the differences between conditions. The first dummy variable ("Frame VS. Control") was created to compare the control condition with the experimental conditions (namely, gain-positive condition = -1/3, gain-negative condition = -1/3, control condition = 2/3). The second dummy ("Gain-Neg VS. Gain-Pos") variable was created to contrast the two experimental conditions, so to understand the differences between the effects of climate-change messages presented in a gain-negative frame and the ones presented in a gain-positive frame (namely, gain-negative = 1/2, gain-positive = -1/2; control = 0).

4.2.1 Willingness to engage in pro-environmental behaviors

To test hypothesis 1a, we ran a linear regression model with willingness to engage in PEB as the dependent variable and the contrasts as predictors (R^2_{adj} = .04). The results (Table 8) show that there is a significant difference in the first contrast, i.e., participants in the experimental conditions (Frame) were more willing to engage in PEB than those in the control condition (Control). However, there is no significant difference in the second contrast, i.e., between the two experimental conditions (Gain-Neg and Gain-Pos), in willingness to engage in PEB. It's worth noticing that the male gender significantly predicts a lower willingness to behave pro-environmentally.

Table 8. *Model Predicting the Willingness to Engage in PEB.*

	B	**S.E.**	***t***	***p-value***
Frame VS. Control	-0.17	0.08	-2.21	<.05
Gain-Neg VS. Gain-Pos	-0.16	0.09	-1.73	0.09
Age	-0.002	0.003	-0.78	0.43
Gender male	-0.21	0.08	-2.61	<.01
Gender Non-binary	0.33	0.18	1.8	0.72

We also ran two different models to assess if the willingness to engage in PEB is different for low-impact and high-impact behaviors. The first model (Table 9) has the willingness to engage in low-impact PEB as the dependent variable and the contrasts as predictors (R^2_{adj} = .003). The second model (Table 10) has the willingness to engage in high-impact PEB as the dependent variable and the contrasts as predictors (R^2_{adj} = .05). Both models control for the covariates. The first model shows that there is no significant difference in willingness to engage in low-impact PEB when comparing the control condition and the experimental conditions, and also when comparing the two experimental conditions. The latter is shown also in the model with the willingness to engage in high-impact PEB, however, the results of this second model show a significant difference in the first contrast. Specifically, participants in the experimental conditions were more willing to engage in high-impact PEB than those in the control condition. Further, in the second model, results show that the male (vs. female) gender negatively predicts the willingness to engage in high-impact PEB, whereas the non-binary (vs. female) gender positively predicts it.

Table 9. *Model Predicting the Willingness to Engage in Low-Impact PEB.*

	B	**S.E.**	***t***	***p-value***
Frame VS. Control	-0.13	0.08	-1.57	0.12
Gain-Neg VS. Gain-Pos	-0.04	0.09	-0.40	0.70
Age	0.004	0.003	1.30	0.20
Gender Male	-0.14	0.08	-1.66	0.10
Gender Non-binary	-0.13	0.19	-0.69	0.49

Table 10. *Model Predicting the Willingness to Engage in High-Impact PEB.*

	B	**S.E.**	***t***	***p-value***
Frame VS. Control	-0.20	0.10	-2.03	<.05
Gain-Neg VS. Gain-Pos	-0.22	0.11	-1.93	0.05
Age	-0.005	0.003	-1.50	0.14
Gender Male	-0.25	0.10	-2.47	<.05
Gender Non-binary	0.56	0.23	2.48	<.05

4.2.2 Perceived efficacy and objective knowledge

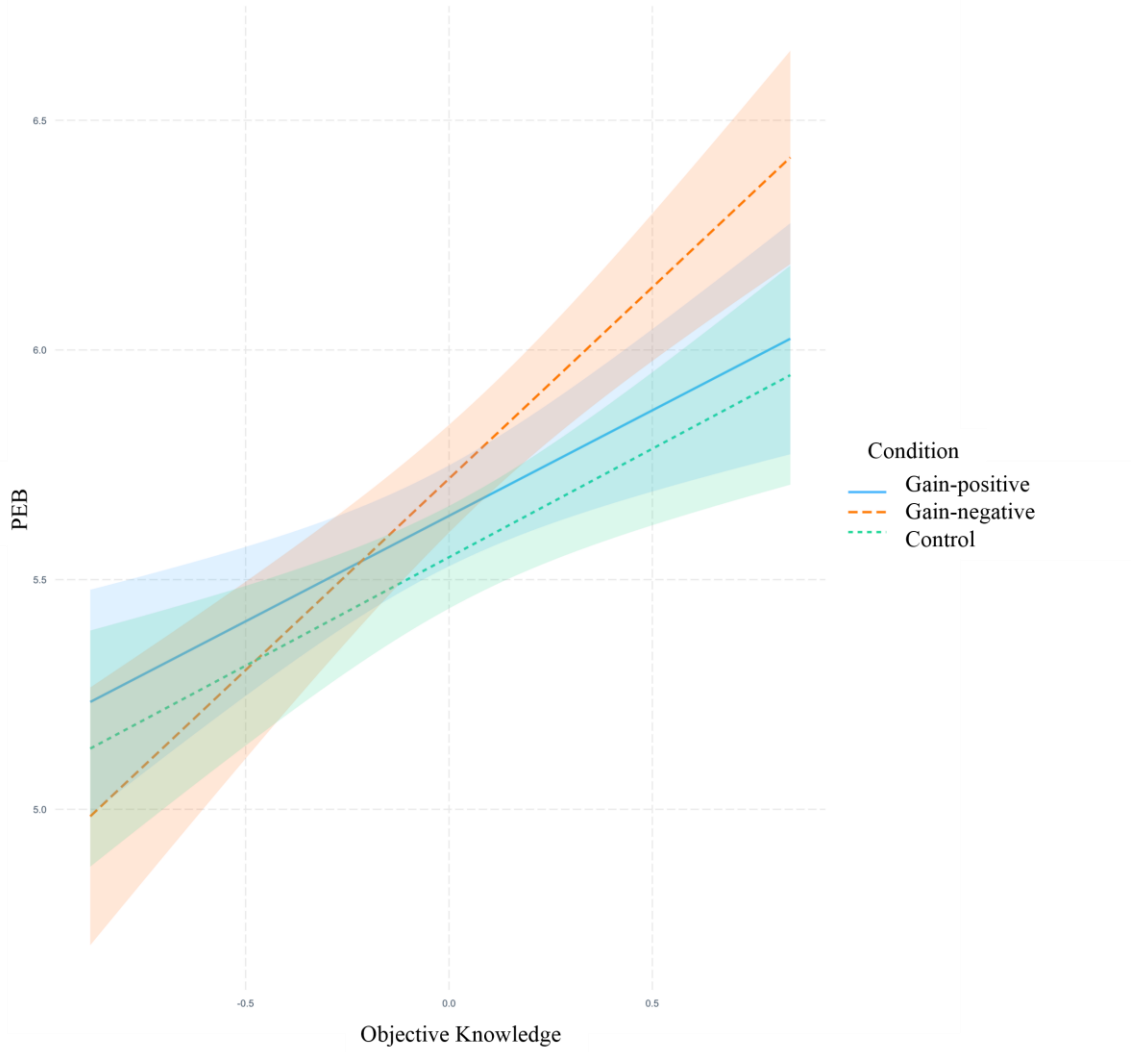
To test hypotheses 2a and 2b, we ran a linear regression model with the willingness to engage in PEB as the dependent variable and objective knowledge, and the contrasts as predictors (R^2_{adj} = .37). Objective knowledge positively predicts the willingness to engage in PEB. Therefore, actual knowledge about the impact of PEB, predicts how likely people are to adopt these behaviors (Table 11). This model shows that there is a significant difference in the first contrast, i.e., participants in the experimental conditions were more willing to engage in PEB than those in the control condition. However, the difference between the two experimental conditions is not significant. It's interesting to notice that the non-binary (vs. female) gender positively predicts the willingness to behave pro-environmentally. Moreover, we found that the perceived mitigation potential significantly predicts the willingness to engage in PEB. Meaning that the higher the perceived potential of PEB, the higher the likeliness to engage in those behaviors. We also found that there is a significant interaction between objective knowledge and the experimental conditions i.e., there was an interaction between the experimental condition participants were in and their level of actual knowledge in predicting the willingness to engage in PEB. To interpret this interaction, we conducted a slope analysis (Figure 5). The effect of objective knowledge is significant when

participants are exposed to messages in a gain-positive frame (B = 0.46, S.E. = 0.13, t = 3.49, p < .001), in a gain-negative frame (B = 0.83, S.E. = 0.14, t = 6.16, p < .001) but also to not-climate-change-related messages (B = 0.47, S.E. = 0.13, t = 3.49, p < .001). The slope analysis revealed that being exposed to a message, regardless of its frame or topic, has an impact as a moderator in the interaction with objective knowledge in determining the willingness to engage in PEB, but such impact is stronger in the case of gain-negative framed messages than the other two messages. Graphical representation of this interaction is reported in Figure 5.

Table 11. *Predicting the Willingness to Engage in PEB While Testing for the Interaction Effect of Objective Knowledge.*

	B	**S.E.**	***t***	***p-value***
Frame VS. Control	-0.13	0.06	-2.04	<.05
Gain-Neg VS. Gain-Pos	-0.08	0.08	-1.08	0.282
Objective knowledge	0.59	0.08	7.59	<.001
PEB potential	0.46	0.03	14.28	<.001
age	0.001	0.002	0.47	0.64
gender male	-0.03	0.07	-0.41	0.68
gender non-binary	0.61	0.15	4.06	<.001
Frame VS. Control*Objective knowledge	-0.17	0.16	-1.08	0.28
Gain-Neg VS. Gain-Pos*Objective knowledge	-0.37	0.19	-2.00	<.05

Figure 5.



Effect of Objective Knowledge by Condition (PEB).

We also ran two different models to assess if the willingness to engage in PEB is different for low-impact and high-impact behaviors. The first model (Table 12) has the willingness to engage in low-impact PEB as the dependent variable and the contrasts and the objective knowledge as predictors (R^2_{adj} = .22). The second model (Table 13) has the willingness to engage in high-impact PEB as the dependent variable and the contrasts and the objective knowledge as predictors (R^2_{adj} = .35). Both models control for the covariates. We found that the perceived mitigation potential significantly predicts the willingness to engage in both low- and high-impact PEB. The first model shows that there is no significant difference in willingness to engage in low-impact PEB when comparing the control condition and the experimental conditions. This is also

shown in the model with the willingness to engage in high-impact PEB. In both models, the difference between the two experimental conditions is also not significant. However, the results of the second model show that higher objective knowledge significantly predicts a higher willingness to engage in high-impact PEB. This was not found in the first model; therefore, higher objective knowledge does not predict higher willingness to engage in low-impact PEB. Moreover, the results of the first model show that there is a significant interaction between the experimental conditions and participants' objective knowledge in predicting the willingness to engage in low-impact PEB i.e., there was an interaction between the experimental condition participants were in and their level of actual knowledge in predicting the willingness to engage in low-impact PEB. To interpret this interaction, we conducted a slope analysis (Figure 6). Despite the interaction being significant in the regression model, the slope analysis shows no significant difference of the effect of objective knowledge when participants are exposed to not-climate-change-related messages (B = -0.27, S.E. = 0.15, t = -1.85, p = .06), when they are exposed to messages in a gain-negative frame (B = 0.22, S.E. = 0.15, t = 1.44, p= 0.15) or in a gain-positive frame (B = -0.24, S.E. = 0.15, t = -1.63, p= 0.10). From the graphical representation, we can observe that objective knowledge moderates the effect of being exposed to a framed message in determining the willingness to engage in low-impact PEB. Specifically, gain-positive framed messages read by participants with high objective knowledge lead to lower willingness to engage in low-impact PEB. Whereas participants with high objective knowledge who read gain-negative framed messages about climate change were more willing to engage in low-impact PEB. Graphical representation of the interaction between conditions and objective knowledge is reported in Figure 6.

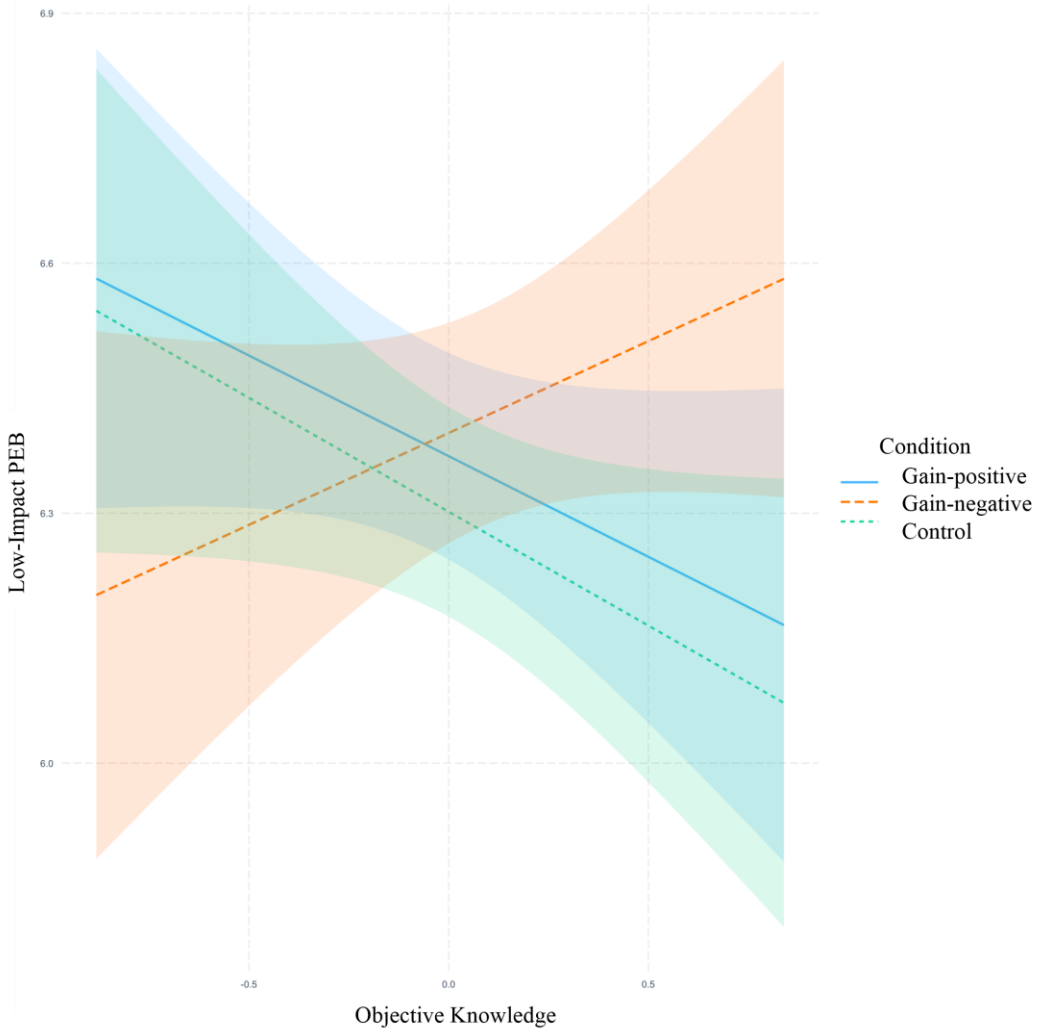
Table 12. *Model Predicting the Willingness to Engage in Low-Impact PEB While Testing for the Interaction Effect of Objective Knowledge.*

	B	**S.E.**	***t***	***p-value***
Frame VS. Control	-0.08	0.07	-1.12	0.27
Gain-Neg VS. Gain-Pos	-0.03	0.08	-0.33	0.74
Objective knowledge	-0.10	0.09	-1.12	0.263
PEB potential	0.39	0.04	10.76	<.001
age	0.004	0.003	1.59	0.114
gender male	0.04	0.08	0.48	0.63
gender non-binary	0.16	0.17	0.93	0.35
Frame VS. Control*Objective knowledge	-0.26	0.18	-1.45	0.15
Gain-Neg VS. Gain-Pos*Objective knowledge	-0.46	0.21	-2.19	<.05

Table 13. *Model Predicting the Willingness to Engage in High-Impact PEB While Testing for the Interaction Effect of Objective Knowledge.*

	B	**S.E.**	***t***	***p-value***
Frame VS. Control	-0.16	0.08	-1.93	0.05
Gain-Neg VS. Gain-Pos	-0.11	0.09	-1.14	0.27
Objective knowledge	0.93	0.10	9.56	<.001
PEB potential	0.50	0.04	12.20	<.001
age	-0.0004	0.003	-0.15	0.88
gender male	-0.06	0.08	-0.71	0.48
gender non-binary	0.83	0.19	4.42	<.001
Frame VS. Control*Objective knowledge	-0.13	0.20	-0.64	0.52
Gain-Neg VS. Gain-Pos*Objective knowledge	-0.33	0.23	-1.41	0.16

Figure 6.



Effect of Objective Knowledge by Condition (Low-Impact PEB).

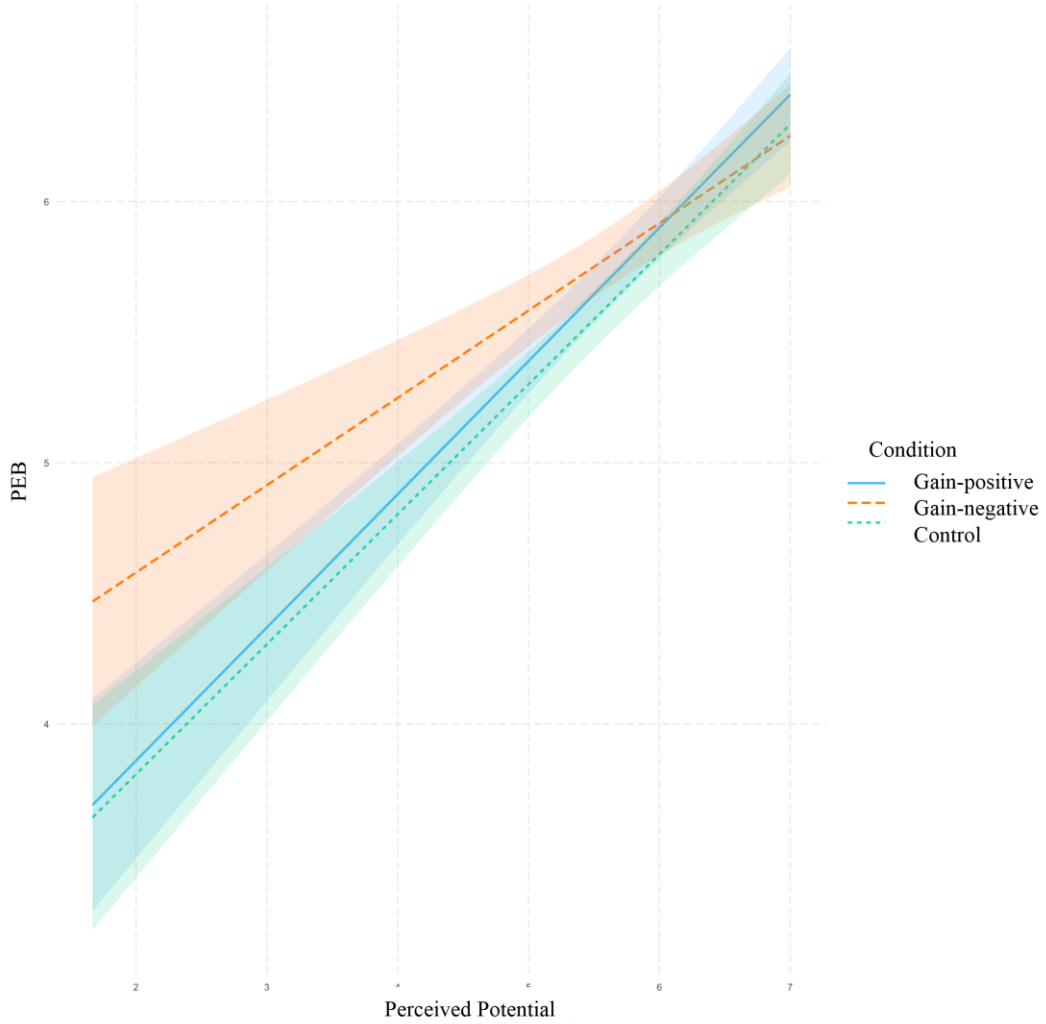
To test hypotheses 2a and 2b, we also ran a linear regression model with the willingness to engage in PEB as the dependent variable and perceived potential, and the contrasts as predictors (R^2_{adj} = .37). Perceived mitigation potential positively predicts the willingness to engage in PEB. Therefore, the perception of potential mitigation on climate change of PEB, predicts how likely people are to adopt these behaviors (Table 14). It's interesting to notice that the non-binary (vs. female) gender positively predicts the willingness to behave pro-environmentally. We found that there is a significant interaction between perceived potential and the experimental conditions i.e., there was an interaction between the experimental condition participants were in and their level of perceived potential in predicting the willingness to engage in PEB. To interpret this

interaction, we conducted a slope analysis (Figure 7). The effect of perceived potential is significant when participants are exposed to messages in a gain-positive frame (B = 0.51, S.E. = 0.05, t = 10.05, p < .001), in a gain-negative frame (B = 0.33, S.E. = 0.06, t = 5.66, p < .001) but also to not-climate-change-related messages (B = 0.50, S.E. = 0.05, t = 5.66, p < .001). The slope analysis revealed that being exposed to a message, regardless of its frame or topic, has an impact as a moderator in the interaction with perceived mitigation potential in determining the willingness to engage in PEB, but such impact is stronger in the case of gain-positive framed messages than the other two messages. Graphical representation of this interaction is reported in Figure 7.

Table 14. *Model Predicting the Willingness to Engage in PEB While Testing for the Interaction Effect of PEB Potential.*

	B	**S.E.**	***t***	***p-value***
Frame VS. Control	-0.56	0.37	-1.52	0.13
Gain-Neg VS. Gain-Pos	-1.07	0.43	-2.48	0.014
PEB potential	0.45	0.03	13.77	<.001
Objective knowledge	0.56	0.08	7.25	<.001
age	0.0004	0.002	0.19	0.85
gender male	-0.04	0.07	-0.64	0.522
gender non-binary	0.61	0.15	4.05	<.001
Frame VS. Control*PEB potential	0.08	0.07	1.14	0.26
Gain-Neg VS. Gain-Pos*PEB potential	0.18	0.08	2.29	<.05

Figure 7.



Effect of Perceived Potential by Condition (PEB).

We also ran two different models to assess if the willingness to engage in PEB is different for low-impact and high-impact behaviors. The first model (Table 15) has the willingness to engage in low-impact PEB as the dependent variable and the contrasts and the perceived potential as predictors (R^2_{adj} = .21). The second model (Table 16) has the willingness to engage in high-impact PEB as the dependent variable and the contrasts and the perceived potential as predictors (R^2_{adj} = .35). Both models control for the covariates. In both models, we can observe that perceived potential significantly predicts the willingness to engage in PEB. Specifically, higher perceived potential of PEB results in higher likeliness to engage in those behaviors (both high- and low-impact PEB). Both models also show that there is no significant difference in willingness to

engage in PEB when comparing the control condition and the experimental conditions. However, the second model shows a significant difference in the second contrast. Thus, participants in the gain-positive condition were more willing to engage in high-impact PEB than those in the gain-negative condition.

In the second model, we can notice that the non-binary (vs. female) gender positively predicts the willingness to behave pro-environmentally. Moreover, results show a significant interaction between the experimental conditions and participants' perceived potential in predicting the willingness to engage in high-impact PEB i.e., there was an interaction between the experimental condition participants were in and their level of perceived potential in predicting the willingness to engage in high-impact PEB. To interpret this interaction, we conducted a slope analysis (Figure 8). The effect of perceived potential is significant when participants are exposed to messages in a gain-positive frame ($B = 0.56$, S.E. $= 0.06$, $t = 8.80$, $p < .001$), in a gain-negative frame ($B = 0.36$, S.E. $= 0.07$, $t = 4.88$, $p < .001$) but also to not-climate-change-related messages ($B = 0.52$, S.E. $= 0.07$, $t = 37.60$, $p < .001$). The slope analysis revealed that being exposed to a message, regardless of its frame or topic, has an impact as a moderator in the interaction with perceived mitigation potential in determining the willingness to engage in high-impact PEB, but such impact is stronger in the case of gain-positive framed messages than the other two messages. Graphical representation of this interaction is reported in Figure 8.

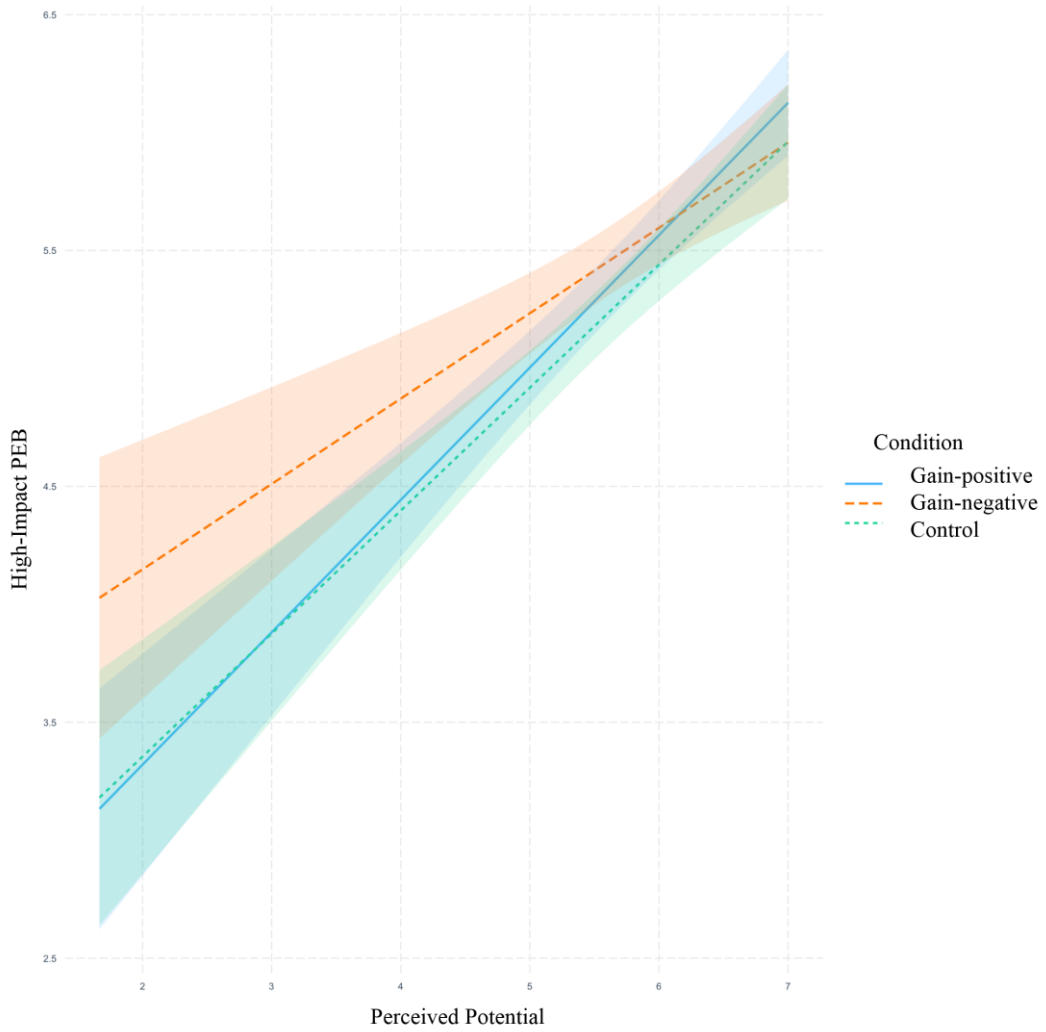
Table 15. *Model Predicting the Willingness to Engage in Low-Impact PEB While Testing the Interaction Effect of PEB Potential.*

	B	**S.E.**	***t***	***p-value***
Frame VS. Control	-0.69	0.42	-1.64	0.10
Gain-Neg VS. Gain-Pos	-0.76	0.49	-1.55	0.12
PEB potential	0.38	0.04	10.29	< .001
Objective knowledge	-0.12	0.09	-1.40	0.16
age	0.003	0.003	1.33	0.18
gender male	0.02	0.08	0.28	0.78
gender non-binary	0.16	0.17	0.93	0.35
Frame VS. Control*PEB potential	0.11	0.08	1.42	0.16
Gain-Neg VS. Gain-Pos*PEB potential	0.13	0.09	1.47	0.14

Table 16. *Model Predicting the Willingness to Engage in High-Impact PEB While Testing the Interaction Effect of PEB Potential.*

	B	**S.E.**	***t***	***p-value***
Frame VS. Control	-0.50	0.47	-1.07	0.29
Gain-Neg VS. Gain-Pos	-1.23	0.54	-2.26	<.05
PEB potential	0.48	0.04	11.80	<.001
Objective knowledge	0.91	0.10	9.29	<.001
age	-0.001	0.003	-0.37	0.71
gender male	-0.08	0.08	-0.89	0.37
gender non-binary	0.83	0.19	4.42	<.001
Frame VS. Control*PEB potential	0.06	0.08	0.72	0.47
Gain-Neg VS. Gain-Pos*PEB potential	0.20	0.10	2.07	<.05

Figure 8.



Effect of Perceived Potential by Condition (High-Impact PEB).

4.2.3 Eco-anxiety

To test hypotheses 3a, we ran a linear regression model with willingness to engage in PEB as the dependent variable and eco-anxiety and the contrasts as predictors (R^2_{adj} = .20). The only significant predictor of the willingness to engage in PEB is the eco-anxiety. Specifically, people with higher levels of eco-anxiety are more willing to behave in a pro-environmental way. However, there is no significant interaction between eco-anxiety and the different conditions (Table 17) i.e., there was no interaction between the condition participants were in and their level of eco-anxiety in predicting willingness to engage in PEB.

Table 17. *Model Predicting the Willingness to Engage in PEB While Testing the Interaction Effect of Eco-anxiety.*

	B	**S.E.**	***t***	***p-value***
Frame VS. Control	-0.12	0.15	-0.82	0.41
Gain-Neg VS. Gain-Pos	-0.11	0.19	-0.59	0.56
Eco-anxiety	0.84	0.16	5.13	<.001
Eco-anxiety^2	-0.14	0.08	-1.90	0.06
Age	-0.0006	0.003	-0.23	0.82
Gender Male	0.12	0.08	-1.56	0.12
Gender Non-binary	0.22	0.17	1.33	0.19
Frame VS. Control*Eco-anxiety	0.002	0.32	0.01	1.00
Gain-Neg VS. Gain-Pos*Eco-anxiety	0.13	0.42	0.30	0.76
Frame VS. Control*Eco-anxiety^2	0.001	0.14	0.01	1.00
Gain-Neg VS. Gain-Pos*Eco-anxiety^2	-0.12	0.20	-0.59	0.55

As for hypothesis 3a, to test hypothesis 3b, we ran two different models. The first model has the willingness to engage in low-impact PEB as the dependent variable and eco-anxiety and the contrasts as predictors (Table 18). The second model has the willingness to engage in high-impact PEB as the dependent variable and eco-anxiety, and the contrasts as predictors (Table 19). The results of the first model (R^2_{adj} = .01) show that higher levels of eco-anxiety do not predict a higher willingness to engage in low-impact PEB. There is also no significant interaction between eco-anxiety and the different conditions. The difference between experimental conditions and control conditions is not significant, as well as the difference between the gain-positive condition and the gain-negative condition. Observing the second model (R^2_{adj} = .24) we can see that higher levels of eco-anxiety significantly predict a higher willingness to engage in high-impact PEB. However, there is no significant interaction between eco-anxiety and the different conditions. Results show no significant difference between experimental conditions and control conditions. The difference between the gain-positive condition and the gain-negative condition is also not significant. It's worth noticing that the second model explains a higher variance (24%) than the others. In the second model, we can also observe that the non-binary (vs. female) gender significantly predicts the

willingness to engage in high-impact PEB. Thus, people who identify as non-binary are more willing to conduct high-impact PEB.

Table 18. *Model Predicting the Willingness to Engage in Low-Impact PEB While Testing for the Interaction Effect of Eco-anxiety.*

	B	**S.E.**	***t***	***p-value***
Frame VS. Control	-0.03	0.16	-0.2000	0.84
Gain-Neg VS. Gain-Pos	-0.07	0.21	-0.34	0.74
Eco-anxiety	0.27	0.19	1.44	0.15
Eco-anxiety^2	-0.04	0.08	-0.51	0.61
Age	0.004	0.003	1.45	0.15
Gender Male	-0.11	0.08	1.26	0.21
Gender Non-binary	-0.18	0.19	-0.92	0.36
Frame VS. Control*Eco-anxiety	-0.23	0.36	-0.62	0.53
Gain-Neg VS. Gain-Pos*Eco-anxiety	0.24	0.48	0.51	0.61
Frame VS. Control*Eco-anxiety^2	0.10	0.16	0.61	0.54
Gain-Neg VS. Gain-Pos*Eco-anxiety^2	-0.5	0.23	-0.67	0.50

Table 19. *Model Predicting the Willingness to Engage in High-Impact PEB While Testing for the Interaction Effect of Eco-anxiety.*

	B	**S.E.**	***t***	***p-value***
Frame VS. Contr	-0.16	0.18	-0.93	0.36
Gain-Neg VS. Gain-Pos	-0.13	0.23	-0.52	0.57
Eco-anxiety	1.13	0.20	5.68	<.001
Eco-anxiety^2	-0.19	0.09	-2.11	<.05
Age	-0.003	0.003	-0.97	0.334
Gender Male	-0.12	0.09	-1.34	0.18
Gender Non-binary	0.42	0.20	2.07	<.05
Frame VS. Control*Eco-anxiety	0.12	0.39	0.30	0.77
Gain-Neg VS. Gain-Pos*Eco-anxiety	0.07	0.51	0.14	0.90
Frame VS. Control*Eco-anxiety^2	-0.05	0.17	-0.27	0.78
Gain-Neg VS. Gain-Pos*Eco-anxiety^2	-0.10	0.24	-0.42	0.67

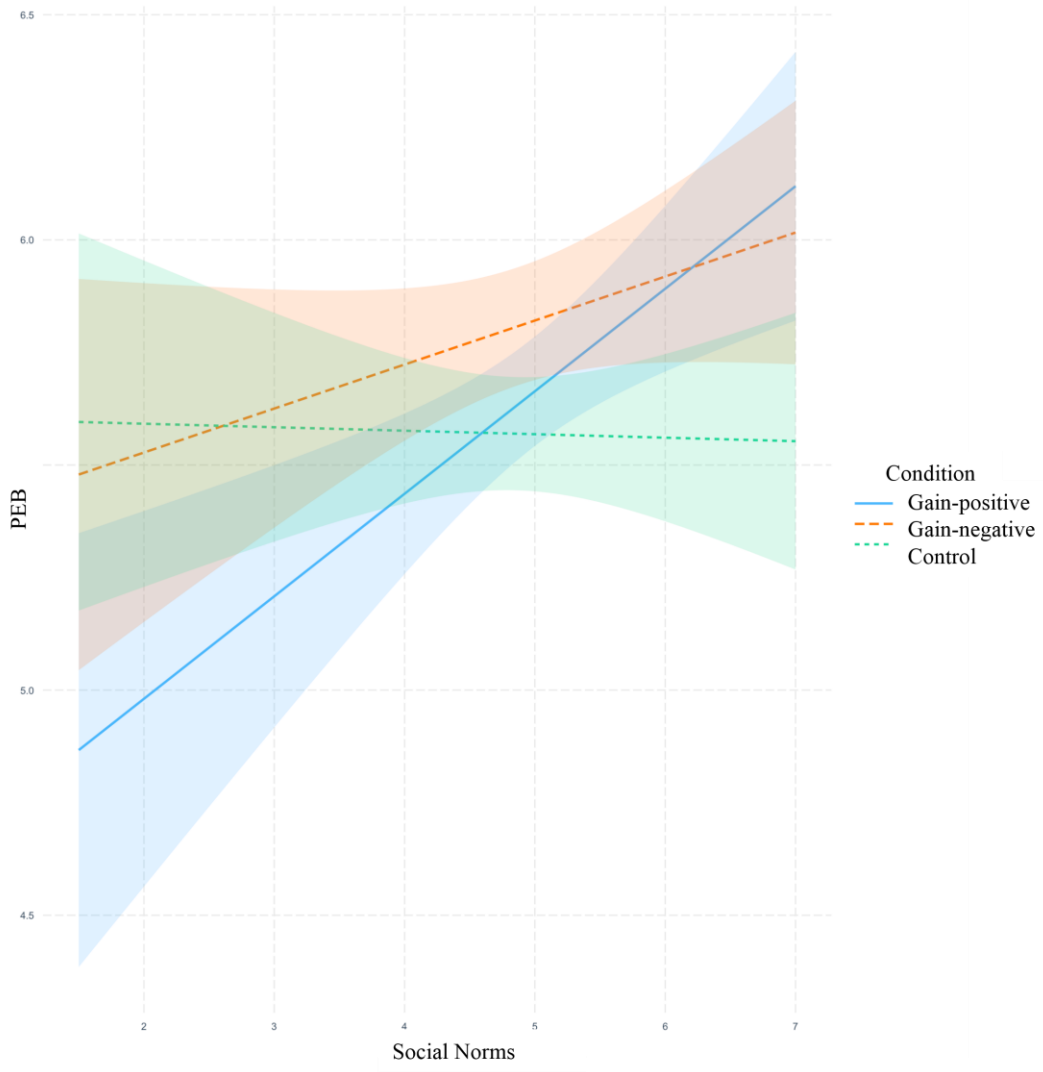
4.2.4 Social norms and personal norms

To test hypotheses 4a and 4b, we ran a linear regression model with willingness to engage in PEB as the dependent variable and social norms and the contrasts as predictors (R^2_{adj} = .06). The results show that higher levels of social norms predict higher willingness to engage in PEB (Table 20). We can also observe that the male (vs. female) gender predicts a lower willingness to conduct PEB. Moreover, there is a significant interaction between the condition and social norms in predicting the willingness to engage in PEB, meaning that higher social norms and experimental conditions lead to a higher willingness to engage in PEB. To interpret this interaction, we conducted a slope analysis (Figure 9). The effect of social norms is significant when participants are exposed to messages in a gain-positive frame (B = 0.23, S.E. = 0.07, t = 3.40, p < .001) but not when they are exposed to messages in a gain-negative frame (B = 0.09, S.E. = 0.06, t = 1.39, p= 0.16) or not-climate-change-related messages (B = -0.1, S.E. = 0.06, t = -0.15, p= 0.88). Therefore, the results suggest that social norms moderate the effect of being exposed to a gain-positive framed message in determining the willingness to engage in PEB. Specifically, higher levels of social norms lead to higher willingness to engage in PEB in the gain-positive condition, even though such relationship is similar (but not significant) in the gain-negative condition. Finally, social norms don't affect at all the willingness to engage in PEB when people are reading not-climate-change-related messages (namely, control condition). The graphical representation of this interaction is reported in Figure 9.

Table 20. *Model Predicting the Willingness to Engage in PEB While Testing for the Interaction Effect of Social Norms.*

	B	**S.E.**	***t***	***p-value***
Frame VS. Control	0.65	0.38	1.73	0.08
Gain-Neg VS. Gain-Pos	-0.88	0.46	-1.90	0.06
Social norms	0.10	0.04	2.79	<.01
Age	-0.003	0.003	-0.95	0.34
Gender Male	-0.20	0.08	-2.51	<.05
Gender Non-binary	0.33	0.18	1.80	0.07
Frame VS. Control*Social norms	-0.17	0.08	-2.21	<.05
Gain-Neg VS. Gain-Pos*Social norms	0.14	0.09	1.56	0.12

Figure 9.



Effects of Social Norms by Condition.

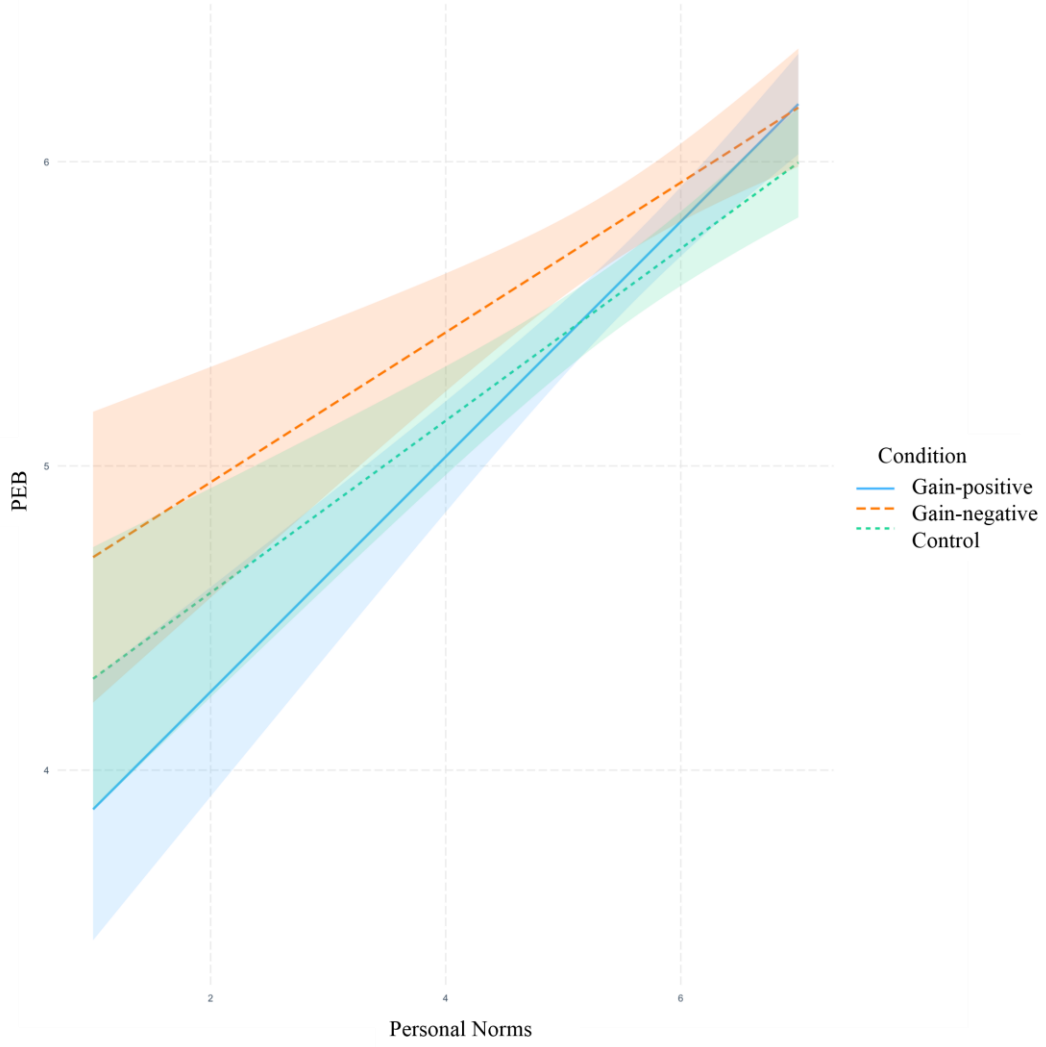
To test hypothesis 5a and 5b, we ran a linear regression model with willingness to engage in PEB as the dependent variable and personal norms and the contrasts as predictors (R^2_{adj} = .26). The results show that higher levels of personal norms predict higher willingness to engage in PEB (Table 21). Older participants were reportedly less willing to engage in PEB, as higher age predicts a lower willingness to engage in those behaviors. The non-binary (vs. female) gender, on the other hand, predicts a higher willingness to conduct PEB. We can also observe that there is a significant difference between the two experimental conditions. Participants in the gain-negative condition were more willing to engage in PEB than those in the gain-positive condition. Results

also show that willingness to engage in PEB can be predicted by the interaction between the two experimental conditions and personal norms. To interpret this interaction, we conducted a slope analysis. The effect of personal norms is significant when participants are exposed to messages in a gain-positive frame (B = 0.39, S.E. = 0.05, t = 8.59, p < .001), in a gain-negative frame (B = 0.24, S.E. = 0.05, t = 4.71, p < .001) but also to not-climate-change-related messages (B = 0.29, S.E. = 0.05, t = 6.30, p < .001). The slope analysis revealed that being exposed to a message, regardless of its frame or topic, has an impact as a moderator in the interaction with personal norms in determining the willingness to engage in PEB, but such impact is stronger in the case of the gain-positive framed message compared to the gain-negative framed message and the not-climate-change-related message. Graphical representation of this interaction is reported in Figure 10.

Table 21. *Model Predicting the Willingness to Engage in PEB While Testing for the Interaction Effect of Personal Norms.*

	B	**S.E.**	***t***	***p-value***
Frame VS. Control	-0.01	0.33	-0.04	0.97
Gain-Neg VS. Gain-Pos	-1.00	0.39	-2.57	<.05
Personal norms	0.31	0.03	11.07	<.001
Age	-0.006	0.003	-2.46	<.05
Gender Male	-0.12	0.07	-1.72	0.085
Gender Non-binary	0.39	0.16	2.43	<.05
Frame VS. Control*Personal norms	-0.02	0.06	-0.41	0.68
Gain-Neg VS. Gain-Pos*Personal norms	0.15	0.07	2.15	<.05

Figure 10.



Effect of Personal Norms by Condition.

4.2.5 NCC and political orientation

To test hypotheses 6a and 6b, we ran a linear regression model with willingness to engage in PEB as the dependent variable and NCC and the contrasts as predictors (R^2_{adj} = .05). The results show that lower levels of NCC predict higher willingness to engage in PEB (Table 22). However, there is no significant interaction between conditions and NCC in predicting the willingness to engage in PEB. We can also notice that the male gender negatively predicts the willingness to behave pro-environmentally.

Table 22. *Model Predicting the Willingness to Engage in PEB While Testing the Interaction Effect of NCC.*

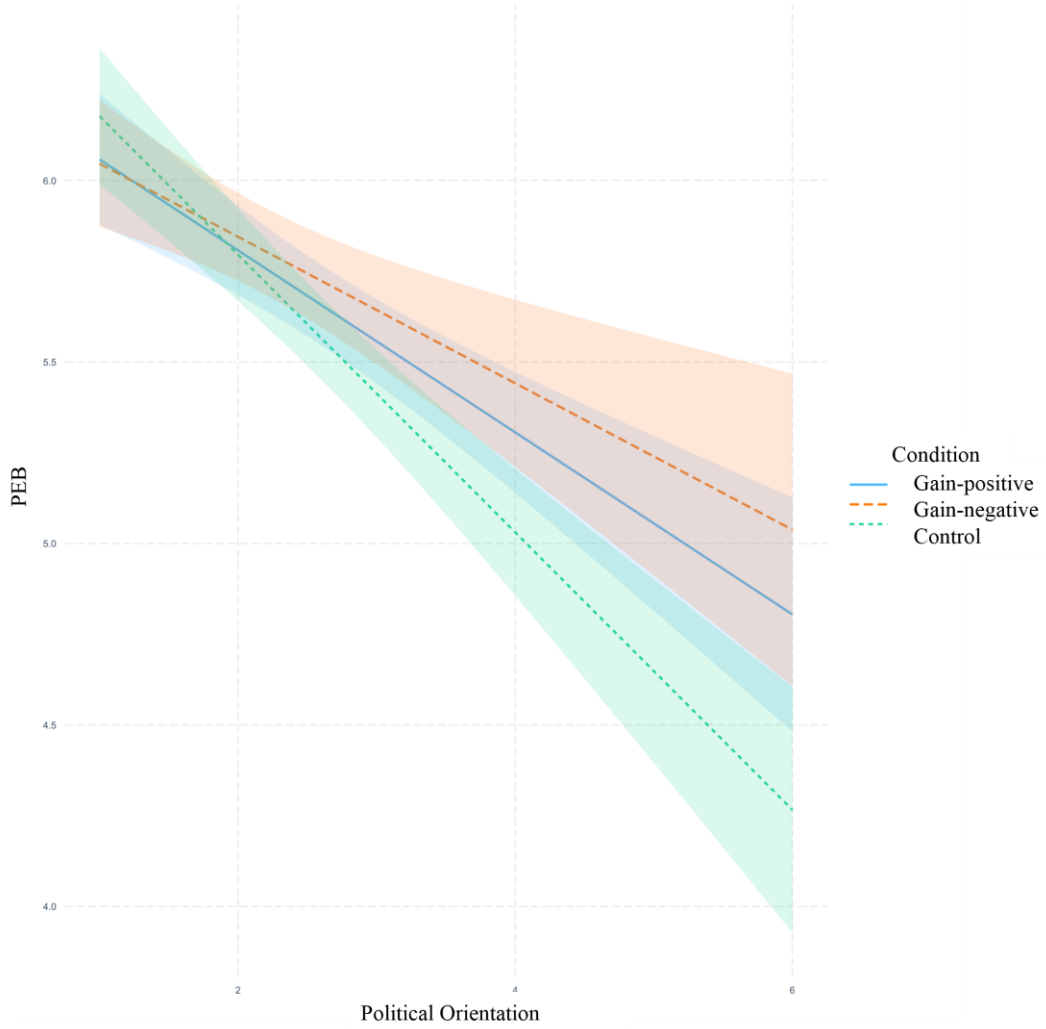
	B	**S.E.**	***t***	***p-value***
Frame VS. Control	0.49	0.42	1.17	0.24
Gain-Neg VS. Gain-Pos	-0.35	0.46	-0.75	0.45
NCC	-0.13	0.04	-2.97	<.01
Age	-0.002	0.003	-0.71	0.48
Gender Male	-0.23	0.08	-2.89	<.01
Gender Non-binary	0.27	0.18	1.46	0.15
Frame VS. Control*NCC	-0.15	0.10	-1.57	0.12
Gain-Neg VS. Gain-Pos*NCC	0.05	0.11	0.49	0.63

To test hypotheses 7a and 7b, we ran a linear regression model with willingness to engage in PEB as the dependent variable and political orientation and the contrasts as predictors (R^2_{adj} = .21). The results show that conservativeness predicts lower willingness to engage in PEB (Table 23). We can notice that the male (vs. female) gender negatively predicts the willingness to behave environmentally. We can also observe that there is a significant interaction between the control conditions, the experimental conditions, and political orientation. Participants in the experimental conditions and left-oriented were more willing to engage in PEB than those in the control condition. To interpret this interaction, we conducted a slope analysis. The effect of political orientation is significant when participants are exposed to messages in a gain-positive frame (B = -0.24, S.E. = 0.05, t = -5.21, p < .001), in a gain-negative frame (B = -0.21, S.E. = 0.06, t = -3.83, p < .001) but also to not-climate-change-related messages (B = -0.37, S.E. = 0.05, t = -7.72, p < .001). The slope analysis reveals that being exposed to a message, regardless of its topic or frame, has an impact as a moderator in the interaction with political orientation in determining the willingness to engage in PEB. Graphically, we can observe that liberals are more willing to engage in PEB, but this impact is stronger in the case of not-climate-change-related messages compared to the framed ones. Whereas conservatives are more willing to engage in PEB after reading a framed message (especially a gain-negative message) compared to a not-climate-change-related message. Graphical representation of this interaction is reported in Figure 11.

Table 23. *Model Predicting the Willingness to Engage in PEB While Testing the Interaction Effect of Political Orientation.*

	B	**S.E.**	***t***	***p-value***
Frame VS. Control	0.24	0.17	1.42	0.16
Gain-Neg VS. Gain-Pos	0.01	0.19	0.03	0.98
Political orientation	-0.27	0.03	-9.39	<.001
Age	0.0005	0.003	0.20	0.84
Gender Male	-0.17	0.07	-2.28	<.05
Gender Non-binary	0.06	0.17	0.37	0.11
Frame VS. Control*Political orientation	-0.14	0.06	-2.36	<.05
Gain-Neg VS. Gain-Pos*Political orientation	-0.03	0.07	-0.42	0.68

Figure 11.



Effect of Political Orientation by Condition.

CHAPTER 5: DISCUSSION

Due to its urgency, climate change calls for immediate action and engaging in PEB could significantly decrease man-made GHG emissions (Wynes & Nicholas, 2017). Thus, it's vital to engage as many people as possible in the climate change fight. For this reason, we decided to investigate how different frames of the same message regarding climate change can elicit willingness to adopt PEB and which frame was the most effective for reaching this goal. The purpose of this study was also to deepen understanding of the construct of eco-anxiety and its effects on PEB. Furthermore, we explored the role of perceived potential and objective knowledge, social norms and personal norms, the need for cognitive closure and political orientation on the willingness to behave pro-environmentally. The aforesaid variables were studied through an experimental manipulation created with three different types of frames. To the best of our knowledge, there is no research exploring the interaction between these variables and framed messages in predicting the willingness to engage in PEB. Therefore, the present study wanted to fill this gap by exploring seven experimental hypotheses.

First, we hypothesized that the experimental condition would impact the willingness to act in a pro-environmental way. According to previous literature (Bilandzic et al., 2017) we created two frames as manipulation, namely the gain-negative frame, and the gain-positive frame. We expected a higher willingness to act pro-environmentally after reading the message about climate change in a gain-negative frame compared to the reading of the message in the gain-positive frame. Moreover, we expected that the control condition, which included the not-climate-change-related message, would lead to an even lower willingness to act pro-environmentally compared to the experimental conditions. Consistently with the hypothesis and previous literature, we found that there is a significant difference between the experimental conditions and the control condition. Suggesting that reading a message related to climate change increases the willingness to engage in PEB. However, we didn't find a significant difference between the two experimental conditions. The willingness to act pro-environmentally wasn't affected by the message's frame. Therefore, the first hypothesis was only partially supported.

We also decided to explore if the experimental condition would influence differently the willingness to engage in low-impact PEB and the willingness to engage in high-impact PEB. We found that there is no significant difference between the experimental conditions and the control condition in predicting the willingness to engage in low-impact PEB. Thus, the frame and the topic of the message read by participants didn't influence their willingness to engage in low-impact PEB. However, we found a significant difference between the experimental conditions and the control condition in predicting the willingness to adopt high-impact PEB. These results expand Bilandzic and colleagues' (2017) findings because not only do the framed messages elicit a higher willingness to engage in PEB (compared to messages about topics not related to climate change) but this is especially true with high-impact PEB. However, we didn't find a significant difference between the two experimental conditions. The willingness to adopt high-impact PEB wasn't affected by the message's type of frame. It's also interesting to notice that we found a genre effect. People who identify as male were less willing to engage in PEB and high-impact PEB than people who identify as female or non-binary.

The second hypothesis explored the role of objective knowledge in predicting the willingness to engage in PEB. Specifically, we expected that higher levels of objective knowledge would have positively predicted the higher willingness to engage in high-impact PEB and negatively predicted the willingness to engage in low-impact PEB. Consistently with the hypothesis and Cologna and colleagues' (2022) findings, we found that objective knowledge positively influences the willingness to engage in PEB. Thus, people who have an accurate depiction of the impact of PEB on climate change are more willing to engage in PEB. As expected, we also found that objective knowledge positively predicts the willingness to engage in high-impact PEB. However, it does not predict the willingness to engage in low-impact PEB. People with objective knowledge of PEB's impact on climate change, are more willing to engage in high-impact PEB, but not in low-impact PEB. Perhaps, being aware of the lower impact and efficiency of the latter leads them to not engage in low-impact PEB but prefer to focus their resources on high-impact PEB. Additionally, we expected that willingness to engage in PEB would be influenced by the perceived mitigation potential of PEB. Specifically, we anticipated that higher levels of perceived potential would have been

associated with a higher willingness to engage in both low- and high-impact PEB. Consistently with the hypothesis, we found that the willingness to engage in PEB is positively influenced by the perceived potential of PEB. Thus, the higher the perceived potential of PEB, the higher the willingness to engage in them. As expected, and consistent with Cologna and colleagues' (2022) results, perceived potential is a predictor of both willingness to engage in high- and low-impact PEB. Therefore, the second hypothesis was partially supported. Lastly, we wanted to explore the interaction between objective knowledge and the conditions and perceived potential and the conditions in predicting willingness to engage in PEB (both high- and low-impact). Expanding previous research by Cologna and colleagues (2022), we found a significant interaction between the experimental condition participants were in and their perceived potential of PEB in predicting their willingness to engage in them. Specifically, people with high perceived potential who read messages about climate change in a gain-positive frame, are more willing to engage in PEB than those who read it in a gain-negative frame. Moreover, participants with lower perceived potential who read messages in the gain-positive frame or not-climate-change-related were less willing to engage in PEB than those who read the gain-negative framed messages. The same interaction was also found in predicting the willingness to engage in high-impact PEB but not low-impact PEB. We also found a significant interaction between the experimental condition participant were in and their objective knowledge about PEB in predicting their willingness to engage in them. Specifically, people with high objective knowledge who read messages about climate change in a gain-negative frame, are more willing to engage in PEB than those who read it in a gain-positive frame. The same interaction was also found in predicting the willingness to engage in low-impact PEB. Despite the interaction being significant in the regression model, the slope analysis didn't show a significant difference of the effect of objective knowledge when participants were exposed to different messages. To better understand this interaction and to test its replicability, future researchers should consider using a bigger sample or a sample more representative of the population.

The third hypothesis evaluated a possible interaction between eco-anxiety and the experimental conditions in predicting the willingness to act pro-environmentally. We also hypothesized that medium eco-anxiety would predict a higher willingness to

engage in PEB, compared to higher and lower levels of eco-anxiety. Our results were not consistent with Stanley and colleagues' (2021) findings and Heeren and colleagues' (2022) study, as we found that higher levels of eco-anxiety predict a higher willingness to act environmentally. Thus, people with higher levels of eco-anxiety are more willing to engage in PEB. Moreover, our results suggest people with higher levels of eco-anxiety are more willing to engage in high-impact PEB than low-impact PEB. However, we didn't find an interaction between eco-anxiety and the experimental conditions. Suggesting that differently framed messages about climate change have the same effect as not-climate-change-related messages on willingness to engage in PEB. Lastly, we didn't find a significant interaction between eco-anxiety and the experimental conditions, when predicting willingness to engage in both high- and low-impact PEB. Therefore, the third hypothesis was not supported.

The fourth hypothesis explored the role of social norms on willingness to act in a pro-environmental way. We expected that higher levels of social norms would predict a higher willingness to act in a pro-environmental way. We also explored a possible interaction between the experimental conditions and the level of social norms in predicting the willingness to engage in PEB. Consistently with previous literature (Farrow et al., 2017; Thøgersen, 2014; Cialdini et al. 1990), we found that participants with higher levels of social norms are more willing to act pro-environmentally. Thus, the fourth hypothesis was supported. Moreover, our results expand the previous literature about social norms, PEB and framing, as we found that there is a significant interaction between the conditions and social norms when it comes to predicting the willingness to engage in PEB. Specifically, our results suggest that people with higher levels of social norms who read a message about climate change in a gain-positive frame are more willing to behave pro-environmentally compared to those who read a message about climate change in a gain-negative frame or a message about other topics.

The fifth hypothesis tested the role of personal norms on willingness to act in a pro-environmental way. We expected that higher levels of personal norms would predict a higher willingness to act in a pro-environmental way. We also explored the possible interaction between the experimental conditions and the level of personal norms in predicting PEB. Consistently with previous studies (Doran & Larsen, 2016; Han et al.,

2018; Harland, 2007; Kim & Seock, 2019), we found that higher levels of personal norms were associated with a higher willingness to act pro-environmentally. Thus, the fifth hypothesis was supported. Our results add to previous literature about PEB, personal norms and framing, as we also found that there is a significant difference between the experimental conditions. Participants who read the message in the gain-positive frame were less willing to engage in PEB than those who read the one in the gain-negative frame. Our results also suggest that there is a significant interaction between the experimental conditions and personal norms in predicting the willingness to engage in PEB. We found that being exposed to a message, regardless of its topic or its frame, has an impact on the interaction with personal norms in predicting the willingness to behave pro-environmentally. Whatever the message is, participants with higher levels of personal norms are more willing to engage in PEB.

Lastly, we hypothesized that NCC and political orientation would influence the willingness to act in a pro-environmental way. Specifically, we expected lower willingness to engage in PEB, when participants reported higher levels of need for cognitive closure and right-wing political orientation. We also explored the interaction between the experimental conditions and NCC in predicting willingness to engage in PEB and the interaction between the experimental conditions and political orientation in predicting willingness to engage in PEB. Consistently with previous findings (Nisbet et al., 2013: Panno et al., 2018), our results show that people with higher levels of NCC are reportedly less willing to behave pro-environmentally. Thus, the sixth hypothesis was supported. However, we didn't find an interaction between the experimental conditions and NCC.

As expected from previous literature (Cotterell, 2003; Neumayer, 2004; Panno et al., 2015), we found that people with conservative views are less willing to engage in PEB. Therefore, the seventh hypothesis was supported. Moreover, our findings also add to previous research about political views, PEB and framing as we found a significant interaction between the conditions and political orientations. Participants who read framed messages about climate change and who defined themselves as left-oriented were also more willing to behave pro-environmentally than those who read messages not related to climate change. Further analysis showed that regardless of the frame and

the topic of the message, being exposed to a message has an impact on the interaction with political orientation when it comes to predicting the willingness to behave pro-environmentally. Particularly, people with liberal views are more willing to engage in PEB regardless of the type of message they read. Whereas people with conservative views are more willing to behave pro-environmentally after reading a framed message about climate change, rather than a message not-climate-change-related.

5.1 Limitations and future research

This study is not without limitations. Online self-report questionnaires have many advantages and for this reason, they are one of the most popular assessment strategies used in psychology (Demetriou et al., 2015). However, they also have some intrinsic limits such as *social desirability bias*, giving answers that are perceived as expected from us but are not truthful (Demetriou et al., 2015). We should also consider the *response bias*, which consists in having the tendency to respond in a certain way regardless of the question. Another limit of online surveys is the completion time. Filling out an online questionnaire gives participants the freedom to read it and complete it at their own pace, which allows some of them to fill it out quickly without paying particular attention (Malhotra, 2008). Additionally, this questionnaire was highly structured which might have led participants to give answers that didn't match their views if they perceived the structure as reflective of the preconception of the researcher. Another limit that we should consider is the sample of participants. While the sample was equally distributed amongst the conditions, the mean age of our participants was lower than the mean age of Italian citizens, which limits the generalizability of the results. We should also consider that the construct of eco-anxiety was assessed using a scale (HEAS-13; Hogg et al., 2021) not yet validated in the Italian context. Thus, results might not be generalizable.

For future research, it would be useful to recruit a bigger and more representative sample of the Italian population. It would also be interesting to investigate the role of images paired with messages. In our study, we decided to use only two experimental conditions, namely gain-positive frame and gain-negative frame, whereas Bilandzic and

colleagues (2017) also included the loss frame, which is one of the most efficient frames when it comes to eliciting the willingness to sacrifice. According to Bilandzic and colleagues (2017), the gain frame is less effective in eliciting PEB because the benefits they underline consist of maintaining the status quo, which is not a strong motivator compared to changes to the positive. Thus, researchers should include the loss frame when investigating the predictors of the willingness to engage in PEB. Moreover, given that in this research, the PEB investigated in the questionnaires were slightly different from the ones in the messages presented, future researchers should consider using the same PEB in both scenarios at the beginning and items in the surveys. Since our findings about eco-anxiety weren't conclusive, future researchers should include in their sample people who are directly affected by climate change, such as indigenous people, non-western countries and people who work daily on topics related to climate change. Coffey and colleagues (2021) also suggest employing diverse methodologies to have a better understanding of their experiences of eco-anxiety. Lastly, future research should focus not only on the willingness to engage in PEB but the actual engagement in PEB.

CHAPTER 6: CONCLUSION

When it comes to climate change, the society-science contract is broken (Glavovic et al., 2022). Despite the scientific consensus about the urgency of climate change, society fails to understand the magnitude of this threat. Both governments and individuals need to take action to shift the inevitable end of the world as we know it today (Glavovic et al., 2022). Our study shows that many variables predict the willingness to engage in pro-environmental behaviors, one of them being objective knowledge. Thus, it is crucial to properly educate about efficient pro-environmental behaviors and the impact of everyone on the climate. This research also shows that framed messages about climate change can elicit a higher willingness to act pro-environmentally, especially by engaging in high-impact behaviors. Thus, governments should invest in campaigns to spread awareness about the most efficient pro-environmental behaviors, while countering misinformation and the false hope around the possibility of a last-minute solution to an imminent threat such as climate change. Science played a crucial role in response to COVID-19, and governments took radical action because of its acute nature (Glavovic et al., 2022). We should focus on reshaping the idea of climate change as an acute problem, instead of a chronic one, so to underline the urgency of this phenomenon and let science lead to an improvement of our current condition. Lastly, regardless of the importance of acting pro-environmentally and, consequently, individuals' actions, governments should still be held accountable not only for the spreading of misinformation about the urgency of this threat and the impact of pro-environmental behaviors but also for their policies about climate change mitigation.

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* = works not directly consulted

APPENDIX

FLYER AND LINKTREE

Figure S1.

Informative Flyer About the Most Impactful Pro-Environmental Behaviors.

Figure S2.

LinkTree: Tips and Insights About Pro-Environmental Behaviors.