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Article title: How do we adapt when we are faced with the effects of climate change?

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How do we adapt when we are faced with the effects of climate change?

Abstract

As humanity faces the increasingly intense effects of climate change, it seems crucial that individuals adapt to this environmental issue. The means of assessing climate change and its impact are linked to the manner of adapting to the situation. It is pertinent to take place attachment into account in order to understand how an individual assesses and adapts to their environment. As the effects of climate change are various, different risky situations should be studied. Thus, this study aims to establish the relations between psychological distance regarding climate change, risk perception, place attachment and adaptation, when humans are exposed to the effects of climate change (flooding, droughts). 626 inhabitants of Santa Marta (Colombia), of whom 317 are rather exposed to flooding and 309 to droughts, participated in this research. The results show that low psychological distance relative to climate change is linked to higher risk perception and to adaptive behavior. Furthermore, place attachment can explain how an individual assesses their environment and adapts to it. These relations are direct or indirect, according to the risk under consideration. These various elements lead us to discuss the importance of considering the specificities of the environment in which individuals live and the pertinence of making climate change concrete in the eyes of the populations that are concerned.

Key words

Adaptation; Climate change; Psychological distance; Flooding; Risk perception; Droughts

1. INTRODUCTION

The IPCC's latest report shows that the effects of climate change will become increasingly intense (IPCC, 2014). Weather-related events such as droughts and flooding will become more and more frequent and extreme (IPCC, 2014). It is thus essential to understand how populations adapt to this hazard-inducing environmental issue (France's Ministry of Ecological and Inclusive Transition, 2016).

Given that research shows that the way individuals assess their environmental context influences how they adapt to it (Evans, Milfont, & Lawrence, 2014; Jones, Hine, & Marks, 2017; McDonald, Chai, & Newell, 2015; Milfont, Evans, Sibley, Ries, & Cunningham, 2014; Spence, Poortinga, Butler, & Pidgeon, 2011; Spence, Poortinga, & Pidgeon, 2012), it is relevant to study how an individual characterizes climate change. Moreover, studies show that the relation between an individual and their environment plays an essential role in how the surrounding risks are assessed, and in the associated behavior said individual produces (Bonaiuto, Alves, De Dominicis, & Petrucci, 2016). Given all these elements, this research paper aims to study the various relations between the manner of assessing climate change and one of the environmental hazards (flooding or droughts), place attachment, and adaptive behavior on a global level (climate change) and a local level (flooding or drought). **More specifically, this research aims to analyze the relations between psychological distance related to climate change, risk perception (flooding or droughts), adaptation to climate change (pro-environmental behavior) and its local effects (protective behavior, preventive behavior, acceptance of institutional measures), and place attachment for two distinct populations: one more exposed to droughts, and one rather to flooding.**

1.1 Assessment of climate change and its effects

People assess an environmental situation differently according to whether it is close to or far from

them, from a temporal, social or spatial point of view (Fleury-Bahi, 2008; Gifford et al., 2009; Trope & Liberman, 2010; Uzzell, 2000). This observation leads us to consider the psychological distance model. The psychological distance model stems from the construal level theory (Trope & Liberman, 2010). According to this theory, individuals represent an object mentally according to its degree of abstraction. The higher the position of mental representation on construal levels, the more the object in question will be perceived as abstract. This degree of abstraction is illustrated by what is referred to as psychological distance. Thus, psychological distance refers to the distance we establish regarding an object. This distance is modulated by four interdependent barriers: spatial, social, temporal, and the uncertain nature of the object (Trope & Liberman, 2003, 2010). Individuals are likely to perceive climate change as a rather abstract phenomenon because it is not observable directly, only through its effects (Milfont, 2010; Pawlik, 1991). Some studies show consistent results with the construal level theory: individuals may have an abstract representation of climate change when they perceive its effects as distant (Akerlof, Delamater, Boules, Upperman, & Mitchell, 2015; McDonald, Chai, & Newell, 2015). Research also shows that individuals tend to evaluate the negative effects of environmental situations as being distant temporally (Carmi & Kimhi, 2015; Gifford et al., 2009; Milfont, Abrahamse, & McCarthy, 2011; Soliman, Alisat, Bashir, & Wilson, 2018; Uzzell, 2000), spatially (Gifford et al., 2009; Maiella et al., 2020; Milfont et al., 2011; Schultz et al., 2012), and socially (Fleury-Bahi, 2008; Singh, Zwickle, Bruskotter, & Wilson, 2017).

As climate change is noticeable through its impact, it is pertinent to take an interest in how individuals assess the associated risks. It is thus essential to study how lay individuals evaluate these risks, as they do not do so in the same way as experts (Slovic, 1987, 2000). Risk perception is all the more interesting to consider as it could explain how individuals face a risk (Aitken, Chapman, & McClure, 2011; Lin, Shaw, & Ho, 2008; Slovic, 2000). According to the

psychometric paradigm, risk perception is composed of two factors: knowledge of the risk and perceived fear (Fischhoff, 2009; Slovic, 1987, 2000). While the misconception of a risk is related to unobserved, unknown and/or new events, fear designates lack of control and the catastrophic aspect of the situation (Slovic, 2000).

Although certain studies show no relation between how climate change is assessed and the risks that are associated with it (Brody, Zahran, Vedlitz, & Grover, 1008; Whitmarsh, 2008), other research demonstrates significant relations between the two concepts (Guillard, Navarro, & Fleury-Bahi, 2019; Maiella et al., 2020; Milfont et al., 2014; Spence et al., 2011). In parallel, some studies show that individuals clearly associate the consequences of climate change to the phenomenon (IPSOS, 2015; Michel-Guillou, 2014; Michel-Guillou, Richard, & Weiss, 2017). Climate change can notably manifest in the increasing number of ever more extreme weather events (IPCC, 2014), which is why we have taken a specific interest in the phenomena of flooding and droughts.

In conclusion, the assessment of climate change and its effects could be associated to the way people adapt to it (Evans, Milfont, & Lawrence, 2014; Guillard & al., 2021; Jones, Hine, & Marks, 2017; Maiella et al., 2020; McDonald, Chai, & Newell, 2015; Milfont, Evans, Sibley, Ries, & Cunningham, 2014; Spence, Poortinga, Butler, & Pidgeon, 2011; Spence, Poortinga, & Pidgeon, 2012). However, to our knowledge, no research has studied these relations via the construal level theory and the psychometric paradigm of risk perception.

1.2 Relations between assessment of the environmental context and adaptation to climate change and its effects

Given the abstract nature of climate change (Milfont, 2010; Pawlik, 1991), it can be difficult to encourage individuals to adopt appropriate behavior (McDonald et al., 2015). Indeed, adaptation to climate change gives rise to benefits on strong temporal and social scales: such situations are known as social and temporal dilemmas (Clayton et al., 2015; Fleury-Bahi, 2010; Hardin, 1968; Milfont & Gouveia, 2006; Milfont, Wilson, & Diniz, 2012; Milinski, Sommerfeld, Krambeck, Reed, & Marotzke, 2008; Rubens, Gosling, & Moch, 2011). According to Van Valkengoed and Steg (2019), “adaptation to climate change [*is*] defined as the process of adjustment so that negative impacts of climate change can be reduced or avoided”. Several typologies and theoretical concepts could be used to study the way we adapt to climate change and its effects (Klößner, 2013; Schultz & Kaiser, 2012; van Valkengoed & Steg, 2019). The literature shows that adaptation to climate change can refer to adaptation to the global situation (intention to mitigate the phenomenon) as well as to the local situation (adaptive behavior to the risks) (Haden, Niles, Lubell, Perlman, & Jackson, 2012; IPCC, 2014; Semenza, Ploubidis, & George, 2011). Thus, two levels could be considered: the intention to act to mitigate the phenomenon (pro-environmental behavior) and the intention to adapt to its local effects (IPCC, 2014). It is difficult to give a precise definition of pro-environmental behavior, and several theoretical approaches could be used to do so (Schultz & Kaiser, 2012). For the present study, we consider that pro-environmental behavior illustrates a single latent factor related to environmentally-friendly behavior comprising general behavior (e.g. discussing environmental problems) and specific behavior indicators (e.g. recycling waste, mobility) (Vaske & Kobrin, 2001). Then, regarding adaptation to these risks, specific behavior related to the risk in its local context (protective behavior, preventive behavior, and acceptance of institutional measures) are considered (Lin, Shaw, & Ho, 2008; van Valkengoed & Steg, 2019).

Many studies show significant relations between climate change assessment and adapting to the phenomenon (Acharibasam & Anuga, 2018; Corner, Whitmarsh, & Xenias, 2012; Corral-

Verdugo, Joaquin, Tapia-Fonllem, & Frias-Armenta, 2017; Evans et al., 2014; Guillard, Fleury-Bahi, & Navarro, 2021; Haden et al., 2012; Jones et al., 2017; Maiella et al., 2020; McDonald et al., 2015; Pahl & Bauer, 2013; Singh et al., 2017; Spence et al., 2012; Wang, J. Hurlstone, Leviston, Walker, & Lawrence, 2019). On the one hand, part of this research shows that the more concretely an individual perceives climate change, the more they will tend to adopt pro-environmental intentions or behavior (Acharibasam & Anuga, 2018; Jones et al., 2017). More precisely, individuals are likely to adapt more when they perceive climate change as being close from a viewpoint that is spatial (Evans et al., 2014), social (Guillard & al., 2021; Pahl & Bauer, 2013; Spence et al., 2012), temporal (Guillard & al., 2021; Jones et al., 2017; Spence et al., 2012) and/or hypothetical (Corner et al., 2012; Wakslak, 2012; Weber, 2006). On the other hand, some research shows that high psychological distance regarding climate change may be associated with coherent adaptive strategies (Brügger, Dessai, Devine-Wright, Morton, & Pidgeon, 2015; Pahl, Sheppard, Boomsma, & Groves, 2014; Rabinovich, Morton, & Postmes, 2010). Furthermore, it appears that there are links between how risks are perceived and how people adapt to them (Akompab et al., 2013; Blennow, Persson, Tomé, & Henewinkel, 2012; Bubeck, Botzen, & Aerts, 2012; Carlton et al., 2016; Evans et al., 2014; Lin et al., 2008; López-Vázquez & Marván, 2003; Slovic & Weber, 2011). For example, the more an individual perceives flooding risk in terms of probability of occurrence, the more they will tend to adapt to it by producing protective behavior (Bubeck et al., 2012; Lin et al., 2008).

In sum, as no study has focused both on assessment and adaptation to climate change in general and to its effects more specifically, we propose to take this angle into account. The literature has highlighted the association between environmental assessment, adaptation to climate change and some psychosocial dimensions. More precisely, place attachment has been identified as a factor that could influence the way people assess an environmental phenomenon and adapt to it (Bernardo, 2013; Billig, 2006; Bonaiuto et al., 2016; Guillard et al., 2019; Weiss,

Girandola, & Colbeau-Justin, 2011). Consequently, taking into account this specific link between the individual and the place where they live could be pertinent when focusing on adaptation to climate change.

1.3 Place attachment, context evaluation, and adaptation to climate change

Place attachment is one element in how individuals assess the place they live in (Bernardo, 2013; Bonaiuto et al., 2016; Ruiz, 2013). Place attachment is the “emotional link that individuals establish with specific places, in which they have a tendency to stay and where they feel safe” (Hernández, Hidalgo, Salazar-Laplace, & Hess, 2007, p. 310). Place attachment is a concept defined and studied by different approaches (Billig, 2006; Hernández, Hidalgo, Salazar-Laplace, & Hess, 2007; Hidalgo & Hernández, 2001; Lewicka, 2011; Williams & Vaske, 2003). In our case, we consider place attachment as a multi-dimensional concept (Devine-Wright & Howes, 2010; Kyle, Graefe, & Manning, 2005; Low & Altman, 1992; Manzo & Devine-Wright, 2013, Scannell & Gifford, 2013). That means that place attachment is considered through different aspects (Manzo & Devine-Wright, 201). More specifically, according to Low and Altman (1992), the following aspects could be considered : place attachment (cognition, affect, practices), places and their level, actors involved, relationships and temporal aspect. For the current study, place attachment will be considered as a construct with two dimensions: place attachment (emotional bonds with social and physical environments) and place identity (sense of belonging to a place) (Ruiz, Hernández, & Hidalgo, 2011).

Place attachment appears to depend, among other factors, on the individual's duration of residence (Fleury-Bahi, Félonneau, & Marchand, 2008; Hernández et al., 2007). Moreover, research shows that place attachment can be linked to the perception of one's environment and to the feeling of preoccupation (Scannell & Gifford, 2010). However, no consensus is observed regarding the direction of the relation between place attachment and risk perception (Bonaiuto et

al., 2016). While a strong place attachment index can sometimes be associated with lower perception of social risk (Billig, 2006), this index is generally associated with a stronger perception of natural risks (Bonaiuto et al., 2016; Guillard, Navarro, & Fleury-Bahi, 2019).

Thus, research on the natural risks that can be associated with climate change highlights that strong place attachment is related to higher risk perception and to a greater acceptance of those risks (Bonaiuto et al., 2016; Weiss, Girandola, & Colbeau-Justin, 2011). Moreover, attachment is likely to be associated with strong risk perception when the situation is perceived as highly probable (climate change, pollution...) (Bernardo, 2013). Other relations could also exist between place attachment and adaptation to climate change and its effects (Bonaiuto et al., 2016; Scannell & Gifford, 2010). In this sense, studies show positive relations between place attachment and adaptation to climate change (Vaske & Kobrin, 2001) or **risk perception relative to the effects of climate change, such as flooding (Guillard et al., 2019; Mishra, Mazumdar, & Suar, 2010) or droughts (Bonaiuto et al., 2016).**

This state of the art highlights a lack of consensus and information regarding the relations between place attachment, assessment of the environmental context and adaptation to climate change. In view of this, it is pertinent to study the role of place attachment in order to analyze how individuals exposed to the effects of climate change adapt to the situation.

1.4. Objectives and hypotheses

The aim of this research is to study how individuals adapt to climate change and its effects when they are particularly exposed to one of them (flooding or droughts). In order to do so, two sub-studies were conducted. More specifically, the objective is to establish a relation between place attachment, risk perception, psychological distance linked to climate change and **adaptation to climate change in general and its effects more specifically.** The originality of this work lies in

how we focus on the way individuals adapt to climate change and its effects by considering pro-environmental behavior (aiming to reduce the impact of the global phenomenon) and adaptive behavior regarding the local effects (aiming to reduce the negative impacts of the local risk on well-being). Moreover, we study how individuals assess drought, a consequence of climate change that has been little studied until now. We also take place attachment into account in order to gain a better understanding of its role in how individuals assess and adapt to climate change.

Various hypotheses were tested for each of the sub-studies conducted. These hypotheses are also represented in the form of a model for greater clarity (Figure 1):

- H1: Given that psychological distance linked to climate change explains flooding risk perception (Guillard et al., 2019), we hypothesize that the lower the psychological distance regarding climate change, the greater the perception of flooding or drought risk will be.
- H2: Psychological distance and risk perception can explain the way people adapt to it (Acharibasam & Anuga, 2018; Aitken et al., 2011; Carlton et al., 2016; Evans et al., 2014; Haden et al., 2012; Guillard et al., 2021; Jones et al., 2017; Maiella et al., 2020; McDonald et al., 2015; Pahl & Bauer, 2013; Spence et al., 2012). Thus, the lower the psychological distance relative to climate change, the more frequent pro-environmental and adaptive behavior to the risk will be (H2a). We also hypothesize that the greater the perception of the risks associated to climate change (flooding or droughts), the more frequent pro-environmental and adaptive behavior to the risk will be (H2b).
- H3: Research shows that individuals who are strongly attached to their place of residence have greater risk perception regarding the environment (Bonaiuto et al., 2016; Weiss et al., 2011) and produce more adaptive behavior (Bonaiuto et al., 2016; Mishra et al., 2010; Vaske & Kobrin, 2001). Thus, we hypothesize that the greater an individual's place attachment, the lower the psychological distance related to climate change (H3a) and the

stronger the risk perception of flooding or drought (H3b) will be. Moreover, the greater the place attachment, the more frequent the **pro-environmental** behavior (H3c) and **adaptive behavior to the risk** (H3d) will be.

- H4: Research shows that duration of residence can explain the degree of place attachment (Fleury-Bahi et al., 2008; Hernández et al., 2007). We thus hypothesize that the longer individuals have lived in their neighborhood of residence, the more attached to it they are.

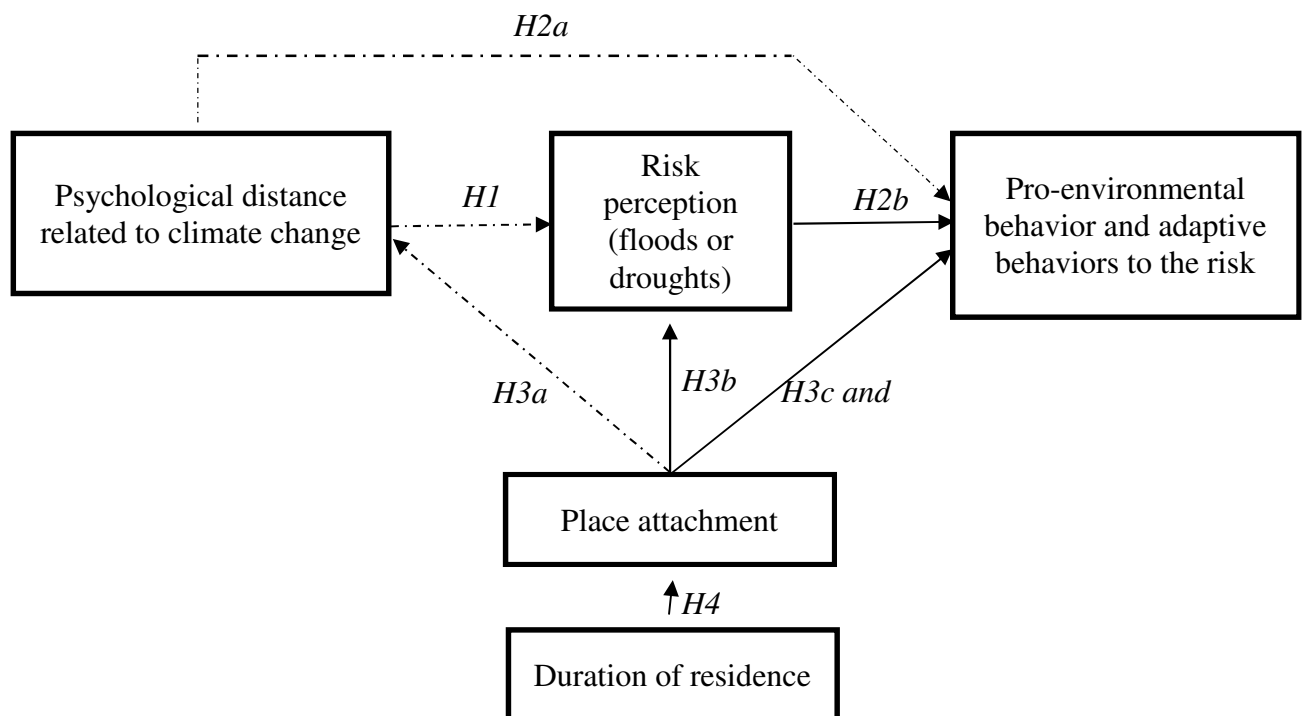


Figure 1 – Hypotheses of the studies, presented in a model

Note: dotted line: negative relations; full line: positive relations.

2. METHODOLOGY

2.1. Selected sites and participants

We wished to conduct this study on a population that was strongly impacted by the effects of climate change (e.g. flooding, droughts). We thus selected the town of Santa Marta (Colombia).

Santa Marta is a city located in the north of Colombia, on the Caribbean coast. With a surface area of 2,393 km² (55.10 km² of urban areas, and 2,338 km² of rural areas, this city is the third largest urban center in the Caribbean (Alcaldia de Santa Marta, nd). This territory is regularly impacted by violent floods (with the latest major flood in November 2017¹) and is also faced with water issues (the most recent drought occurred in April 2014², and a water crisis occurred in October 2017³). On the basis of institutional documents (Alcaldia de Santa Marta, nd; Colombian Ministry of the Environment and Sustainable Development, 2015), we selected seven neighborhoods which have been more specifically impacted by flooding (Bastidas, Chimila, El Parque, Malvinas, Maria Cristina, Pescaito, Rodadero, and Santa Ana), and one neighborhood that is more impacted by drought (Ciudad Equidad). A map is proposed in order to give the approximate location of the neighborhoods according to the risk to which they are exposed (Figure 2). Our total sample is composed of 626 participants, including 317 who answered a questionnaire specific to flooding and 309 who answered one that was specific to drought. Lastly, 4.2% of the participants stated that they did not know what climate change was. Their answers to the questions regarding climate change were thus not considered during data analysis.

¹ <http://www.eltiempo.com/colombia/otras-ciudades/lluvias-causan-inundaciones-en-33-barrios-de-santa-marta-149528>

² <http://www.elcolombiano.com/colombia/santa-marta-se-enfrenta-otra-vez-a-la-sequia-que-trae-el-nino-DA1741014>

³ <http://www.elmundo.com/noticia/Santa-Marta-lucha-ejemplarmente-contracrisis-hidrica-en-Latinoamerica/360659>

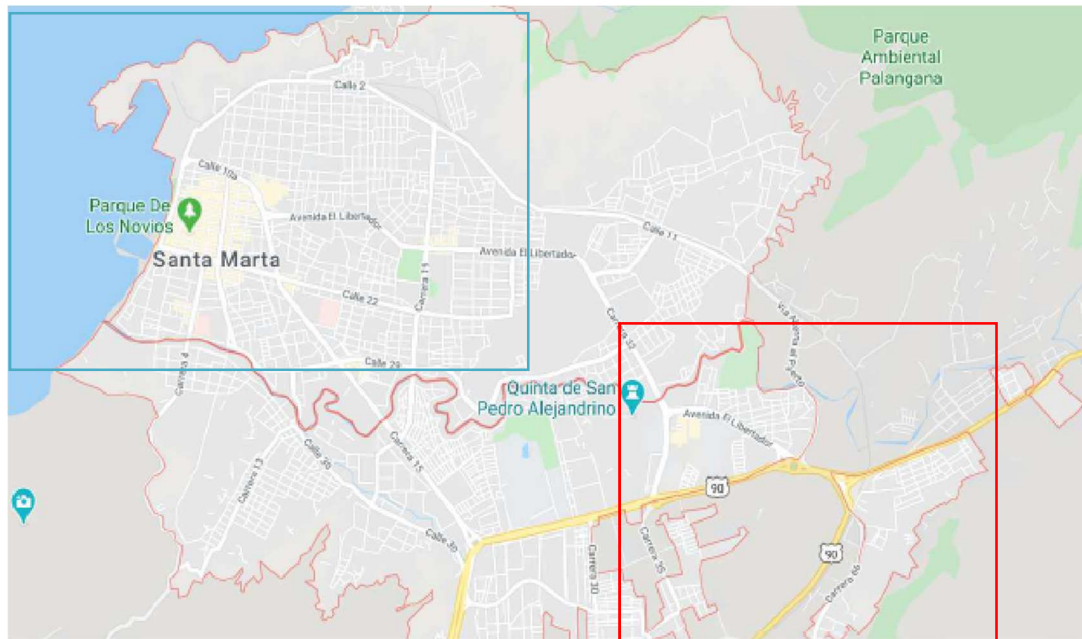


Figure 2: map of Santa Marta representing the neighborhoods exposed to flooding (blue frame) and to droughts (red frame)

The participants who answered the questionnaire adapted to the issue of flooding lived in the neighborhoods that are more significantly exposed to flooding. This sample is not representative of the general population and the participants were recruited in their homes. More precisely, the mean age of the participants is 43.14 years ($SD = 16.57$), 55.2% female and 44.8% male. 46.7% of the participants have a professional activity, 29% are stay-at-home parents, 9.8% are students, 7.9% are unemployed, and 6.6% are retired. The participants have been living in their neighborhood of residence for an average of 19.06 years ($SD = 15.66$) and living in their current home for an average of 17.93 years ($SD = 15.54$). Furthermore, 92.5% live in a house with at least one floor and only 6.6% live in an apartment. Lastly, 90.9% consider that they are exposed to flooding, 85.5% state that they have experienced a flood, and 84.5% say that certain close friends and relatives have also experienced flooding.

The participants who answered the questionnaire adapted to the drought issue lived in the neighborhoods which are more significantly exposed to droughts. This sample is not

representative of the general population either and the participants were recruited in their homes too. More precisely, the mean age of the participants was 37.24 years ($SD= 13.59$), 59.9% female and 40.1% male. 35.9% of the participants have a professional activity, 40.6% are stay-at-home parents, 11.3% are students, 10.7% are unemployed, and 1.3% are retired. The participants have been living in their neighborhood of residence and in their current home for an average of 3.57 years ($SD = 0.75$; $SD= 0.76$). All the participants live in a house with at least one floor. Lastly, 97.7% consider that they are exposed to droughts, 97.5% state that they have experienced a drought, and 97% say that certain close friends and relatives have also experienced droughts.

2.2 Material

The questionnaire includes a total of six scales. All the measures proposed include 5-point Likert-type responses in terms of agreement (ranging from “1” *do not agree at all*, to “5” *completely agree*), apart from those regarding pro-environmental and adaptive behavior, which cover answers in terms of frequency (from “1” *Never*, to “5” *Always*). Given that the cultural context varies within the referenced studies, exploratory factorial analyses have been conducted for each scale. Moreover, the entire sample was considered for the general scales (place attachment, psychological distance) but each of the two sub-samples were considered for these psychometric analyses depending on if they are more exposed to droughts or floods (risk perception, risk reduction governmental measures, adaptation to risk).

In order to study place attachment, a scale composed of nine items and validated in Spanish was selected (Hernández et al., 2007; Ruiz et al., 2011). Previous validations of this scale in different contexts found that this scale is composed of two factors (Hernández et al., 2007; Ruiz et al., 2011): neighborhood attachment (item example: “I like living in this neighborhood”; $\alpha =.94$) and spatial identity (item example: “I feel like I belong to this neighborhood”; $\alpha =.95$). In

our case, our exploratory factor analyses led to the identification of one sole factor. The internal coherence of this scale is satisfactory ($\alpha = .93$).

Next, a scale measuring psychological distance relative to climate change was proposed to the participants (Jones et al., 2017). Initially, this scale has good internal coherence ($\alpha = .94$) and is composed of 16 items distributed in four dimensions: social barrier, temporal barrier, spatial barrier, and uncertain nature. This scale was translated from English to Spanish by a bilingual and tested by experts in social and environmental psychology. Our exploratory factorial analysis led us to remove six items⁴ and enabled us to identify two dimensions and one isolated item: temporal and social barriers (six items, $\alpha = .84$, item example: “Currently, climate change impacts people all over the world”), spatial barrier (three items, $\alpha = .76$, item example: “The worst effects of climate change will be felt in countries far away from where I live”, and the uncertain nature of climate change (isolated item: “The majority of scientists don’t agree on the impacts of climate change”). Given that this last dimension is composed of only one item, we will not consider it in the following statistical analyses. The reliability of the global scale is satisfactory ($\alpha = .78$).

Regarding risk perception, we took the Risk Perception scale, which had already been validated in Spanish by Navarro, Chaves-Castaño, Noreña Betancur, and Piñeres-Sus (2016). This scale has good internal coherence ($\alpha = .75$) and is composed of 15 items. The authors identify four dimensions, including one with an isolated item: perceived fear, risk-related knowledge, risk exposure and risk augmentation. We adapted this scale to drought risk for part of our sample. We did not consider the dimension “risk increase” as it is only composed of one item (Navarro et al., 2016). Firstly, for the flood risk perception scale, we conducted an exploratory factorial analysis which led to the identification of four dimensions: risk exposure (five items, $\alpha = .81$, item

⁴ Items 3, 5, 7, 10, 12, et 14

example: “Future generations will be more and more exposed to flood risk”), expert knowledge (three items, $\alpha = .78$, item example: “For experts, flood risk is well known”), perceived fear (three items, $\alpha = .71$, item example: “When I think of flooding, I feel anxious”), and general knowledge (3 items, $\alpha = .58$, item example: “The authorities inform me well regarding flood risk in my region”). It is noted that the global reliability of the scale is satisfactory ($\alpha = .81$). Secondly, for the drought risk perception scale, our exploratory factorial analysis led to the removal of one item⁵ and to the identification of the same four factors that we identified for the flood risk perception scale: risk exposure (five items, $\alpha = .80$, item example: “Future generations will be more and more exposed to drought risk”), expert knowledge (three items, $\alpha = .86$, item example: “According to experts, drought risk is well known”), perceived fear (three items, $\alpha = .66$, item example: “When I think of drought, I feel anxious”), and general knowledge (two items, $r = .59$, $p < .01$, item example: “The authorities inform me well regarding drought risk in my region”). It is noted that the global reliability of the scale is satisfactory ($\alpha = .80$).

In order to measure pro-environmental behavior, we selected a short version of the General Ecological Behavior (GEB) scale (Corral-Verdugo et al., 2009; Kaiser, 1998; Tapia-Fonllem, Corral-Verdugo, Fraijo-Sing, & Durón-Ramos, 2013). This uni-dimensional scale has good internal coherence ($\alpha = .72$) and is composed of 16 items (item example: “I recycle empty plastic bottles”). We conducted a factorial analysis which enabled us to identify six factors. However, the different dimensions identified partly concern the same type of behavior. For example, factorial analysis shows that factor 1 concerns recycling behavior, as does factor 2. The dimensions identified do not permit a specific type of pro-environmental behavior to be studied. For these reasons, it seems preferable to consider this scale in its entirety. We analyzed the reliability of this scale, which is satisfactory, as Cronbach’s alpha stands at .76.

⁵ Item 10

Finally, to study the way people exposed to droughts or flooding deal with these events, items inspired by previous studies have been created. Indeed, to our knowledge, no study has been led on the validation of scales measuring acceptance of institutional measures or preventive and protective behavior relative to droughts and floods. Therefore, we first wished to question individuals on how they perceived the risk reduction measures implemented by the government. In order to do so, we proposed five items originating in the work of Lin et al. (2008) (item example: “I agree with the government plan aiming to alert populations of a zone exposed to flood/drought risk”). The items were translated from English to Spanish by a bilingual. The translation was tested by experts in social and environmental psychology. In a first instance, regarding the scale relative to flooding, the exploratory factorial analysis led to the removal of one item⁶ and highlighted one sole factor. The overall internal coherence is .66, which is satisfactory for a scale composed of four items (Loewenthal, 2001). In a second instance, regarding the scale measuring adaptation to drought at an institutional level, the exploratory factorial analysis also led to the removal of the same item⁷ and highlighted one sole factor. The overall internal coherence is .70. Secondly, we questioned individuals on how they adapted to the effects of climate change. Thus, we took into account the practices they adopted in order to avoid the actualization of the flood or drought risk, and the protective behavior they established during the actualization of the phenomenon. For each of the two risks studied, 11 items were created on the basis of the institutional recommendations regarding flooding⁸ (item example: “I clean the gutters located near my residence”) and droughts⁹ (item example: “I stock water in recipients specifically made for this use”). Firstly, when we consider the scale regarding flooding, the

⁶ Item 2

⁷ Item 2

⁸ <http://www.eltiempo.com/archivo/documento/CMS-8375581> ;
http://www.cali.gov.co/dagma/publicaciones/51511/cmo_prevenir_inundaciones_y_avalanchas_en_poca_de_lluvias/

⁹ <http://comunidadplanetaazul.com/agua/tips-planeta-azul/medidas-de-prevencion-contr-la-sequia/>

exploratory factorial analysis led to the removal of six items¹⁰ and highlights two factors: one refers to protective behavior implemented during a flood (three items, $\alpha = .74$, item example: “I have chosen a safe place to stay, in the event of a flood”), while the other refers to preventive behavior regarding flooding (two items, $r = .45$, $p < .01$, item example: “I clean the gutters located near my residence”). The overall coherence of the scale is satisfactory ($\alpha = .71$). Lastly, the exploratory factorial analysis of the scale measuring adaptation to droughts led to the removal of two items¹¹ and highlights just one factor illustrating all the protective and preventive behavior (nine items, $\alpha = .89$, item example: “I stock water in containers specifically made for this purpose”, or “I avoid contaminating water sources”).

2.3 Procedure

Data was collected during March and April 2018. In order to do so, our partner, the Psychology Department of the University of Magdalena, collected the data. Their team pre-tested the questionnaire before distributing it. The interviewers went to the selected neighborhoods, according to the information given by the town hall of Santa Marta, to distribute the questionnaires. Participants were thus recruited in their homes using a door-to-door approach. The questionnaires were printed and were then filled out by the interviewers, which took about 20 minutes.

2.4 Data analysis

Relations between the scales are analyzed with the help of structural equation models, via the software Amos (version 23). In order to check the model’s adjustment, we complied with the following recommendations (Byrne, 2013; Hooper, Coughlan, & Mullen, 2008): $\chi^2 = ns$ or χ^2/df

¹⁰ Items 2, 3, 6, 7, 8, 5

¹¹ Items 5, 11

between 1 and 3; GFI > .90; CFI > .90; RMSEA < .08; SRMR < .08. For both studies, the different relations between the place attachment scale, the psychological distance scale, the pro-environmental scale, the risk perception scale (for flooding or drought) and the adaptation to risk scale (at an individual or institutional level) were studied. Because there is a significant difference ($t(620) = 23.05, p = .00$) in the durations of residence of the inhabitants of the neighborhood at flood risk ($M = 19.06, SD = 15.66$) and the inhabitants of the neighborhood exposed to droughts ($M = 3.57, SD = 0.75$), this variable is controlled during data analysis.

3. RESULTS

3.1. Adaptation to climate change and to flooding

Broadly speaking, Table 1 shows significant correlations between the scores associated with the different variables. The place attachment scores are positively correlated with those of risk perception ($r = .30, p < .01$), pro-environmental behavior ($r = .22, p < .01$), acceptance of institutional measures ($r = .18, p < .01$), and protective ($r = .27, p < .01$) and preventive behavior ($r = .16, p < .01$). Moreover, the higher the attachment scores, the lower the psychological distance scores ($r = -.27, p < .01$). Negative correlations are also observed between the psychological distance scores and the scores of risk perception ($r = -.43, p < .01$), pro-environmental behavior ($r = -.44, p < .01$), acceptance of institutional measures ($r = -.38, p < .01$), and preventive behavior ($r = -.31, p < .01$). Finally, the risk perception scores are also correlated with those of pro-environmental behavior ($r = .25, p < .01$), acceptance of institutional measures ($r = .47, p < .01$), and protective ($r = .13, p < .05$) and preventive behavior ($r = .13, p < .05$).

Table 1: Correlations between the scores obtained on the scales measuring place attachment, psychological distance, flood risk perception, acceptance of institutional measures, and pro-environmental, protective and preventive behavior.

	1	2	3	4	5	6	7
1. Place attachment	—	-.27**	.30**	.22**	.18**	.27**	.16**
2. PD linked to CC		—	-.43**	-.44**	-.38**	-.31**	-.10
3. Flood risk perception			—	.25**	.47**	.13*	.13*
4. Pro-environmental behavior				—	.29**	.42**	.10
5. Acceptance of institutional measures					—	.30**	.16**
6. Prevention						—	.34**
7. Protection							—

** $p < .01$; * $p < .05$

We then tested the structural equation models on the basis of the theoretical model presented above. In order to do so, we took into account the sub-dimensions identified for each of our scales. Figure 3 shows a model with goodness-of-fit: $\chi^2(27) = 45.49$, $p = .01$; $\chi^2/df = 1.68$; CFI = .97; GFI = .97; RMSEA = .05; SRMR = .06.

Firstly, the scores for certain dimensions of psychological distance relative to climate change provide an explanation for those regarding flood risk perception (H1) and adaptive behavior (H2a). More precisely, the scores for social and temporal barriers explain those for risk exposure ($\beta = -.39$), expert knowledge ($\beta = -.44$) and perceived risk ($\beta = -.13$). Regarding the relations between risk assessment and adaptation, only the scores relative to the social and temporal barriers can explain those for the scale of pro-environmental behavior ($\beta = -.59$). In addition, the

spatial barrier scores explain the scores on the scale measuring acceptance of institutional measures ($\beta = -.18$) and the preventive behavior regarding flooding ($\beta = -.15$). In parallel, the scores obtained on the flood risk perception scale explain the scores relative to adaptive strategies (H2b). Indeed, the scores for acceptance of institutional measures are explained notably by those of expert knowledge ($\beta = .33$) and perceived fear ($\beta = .14$).

Furthermore, the place attachment scores shed light on the scores for psychological distance relative to climate change (H3a) and flood risk perception (H3b). More specifically, the place attachment scores explain those of the spatial barrier of psychological distance ($\beta = -.16$), the social and temporal barriers ($\beta = -.26$), flood risk exposure ($\beta = .16$) and perceived fear ($\beta = -.15$).

The place attachment scores explain the scores for adaptive strategies regarding climate change (H3c) and its impact (H3d). Indeed, an indirect relation is noted between the place attachment scores and those for pro-environmental behavior ($\beta_{\text{indirect}} = .15$). This relation probably mediates the scores obtained for the social and temporal barriers concerning climate change. The place attachment scores also explain those relative to preventive ($\beta = .19$) and protective ($\beta = .15$) behavior regarding flooding.

Lastly, duration of residence also explains the place attachment scores ($\beta = .34$) (H4).

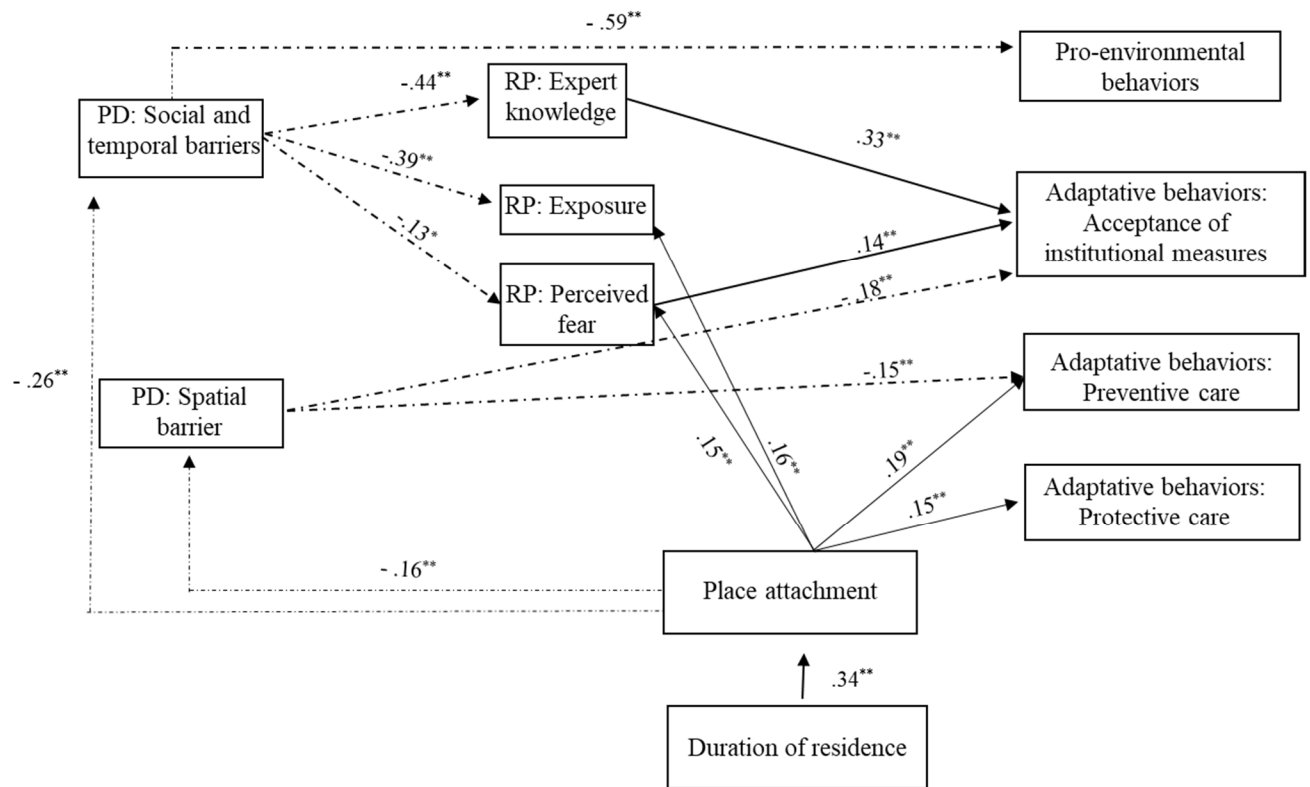


Figure 3: Model of adaptation to climate change and flooding

Post-adjustment indices: $\chi^2(27) = 45.49, p = .01$; $\chi^2/df = 1.68$; CFI = .97; GFI = .97; RMSEA = .05; SRMR = .06

Note: dotted line: negative relations; full line: positive relations. PD: Psychological Distance; RP: Risk Perception

3.2 Adaptation to climate change and droughts

Overall, Table 2 shows significant correlations between the scores related to the different variables. We thus observe that the place attachment scores are positively correlated with those of risk perception ($r = .27, p < .01$), pro-environmental behavior ($r = .25, p < .01$) and adaptation to droughts ($r = .13, p < .05$). The higher the attachment scores, the lower the psychological distance scores ($r = -.16, p < .01$). Furthermore, negative correlations are observed between the scores for psychological distance and for risk perception ($r = .35, p < .01$), pro-environmental behavior ($r = -.33, p < .01$), acceptance of institutional measures ($r = -.17, p < .01$), and adaptive behavior to

droughts ($r = -.25, p < .01$). Lastly, the scores for risk perception are also correlated with those for pro-environmental behavior ($r = .38, p < .01$), **acceptance of institutional measures** ($r = .36, p < .01$), and adaptation to droughts ($r = .43, p < .01$).

Table 2: Correlations between the scores obtained on the scales of place attachment, psychological distance, drought risk perception, acceptance of institutional measures, and of pro-environmental, protective and preventive behavior

	1	2	3	4	5	6
Place attachment	–	-.16**	.27**	.25**	.04	.13*
PD linked to CC		–	-.35**	-.33**	-.17**	-.25**
Drought risk perception			–	.38**	.36**	.43**
Pro-environmental behavior				–	.31**	.21**
Acceptance of institutional measures					–	.36**
Individual adaptation						–

** $p < .01$; * $p < .05$

We also tested structural equation models on the basis of the theoretical model which is presented above. We took into account the sub-dimensions identified for each of our scales. Figure 4 shows a model showing goodness-of-fit: $\chi^2(31) = 58.93, p = .02$; $\chi^2/df = 2.28$; CFI = .96; GFI = .96; RMSEA = .05; SRMR = .06.

Firstly, the scores for psychological distance concerning climate change explain those for drought risk perception (H1) and adaptive strategies (H2a). More precisely, the scores for general knowledge of droughts are explained by those for the spatial barrier ($\beta = -.35$) and the social and temporal barriers of climate change ($\beta = .12$). Moreover, the social and temporal barrier scores explain those for risk exposure ($\beta = -.31$), expert knowledge ($\beta = -.23$), and perceived fear ($\beta = -.19$). On another note, an indirect relation between the spatial barrier scores and the pro-

environmental behavior scores is observed ($\beta_{\text{indirect}} = -.16$). It is thus probable that the general knowledge dimension mediates this relation. It is also observed that there are indirect relations between the social and temporal barrier scores and those relative to acceptance of institutional measures ($\beta_{\text{indirect}} = -.13$) and adaptive behavior to the risk at an individual level ($\beta_{\text{indirect}} = -.15$).

Moreover, the scores obtained on the drought risk perception scale explain the scores on the scales relative to adaptive strategies (H2b). Indeed, the pro-environmental behavior scores are explained by the scores for exposure ($\beta = .25$) and general knowledge ($\beta = .46$). The scores obtained to measure adaptation to drought risk at an individual level are explained by the scores for risk exposure ($\beta = .25$), expert knowledge ($\beta = .16$), and perceived fear ($\beta = .19$). Lastly, the scores for acceptance of institutional measures are explained by risk exposure ($\beta = .15$) and expert knowledge ($\beta = .37$).

Next, the place attachment scores do not enable prediction of the scores for psychological distance relative to climate change (H3a) but they do explain those for drought risk perception (H3b). More specifically, the place attachment scores explain those for risk exposure ($\beta = .17$), perceived fear ($\beta = .14$), and general knowledge ($\beta = .22$).

The place attachment scores explain the scores for adaptive strategies to climate change (H3c) and its impact (H3d). Indeed, the place attachment scores can explain those of pro-environmental behavior ($\beta = -.19$). Even if there is no direct relation between the place attachment scores and those for acceptance of institutional measures and adaptation to droughts at an individual level, we note indirect relations between those measures. In this sense, an indirect relation is observed between the place attachment scores and those for acceptance of institutional measures ($\beta_{\text{indirect}} = .02$) and adaptive behavior at an individual level ($\beta_{\text{indirect}} = .07$). Lastly, duration of residence explains the place attachment scores ($\beta = .19$) (H4).

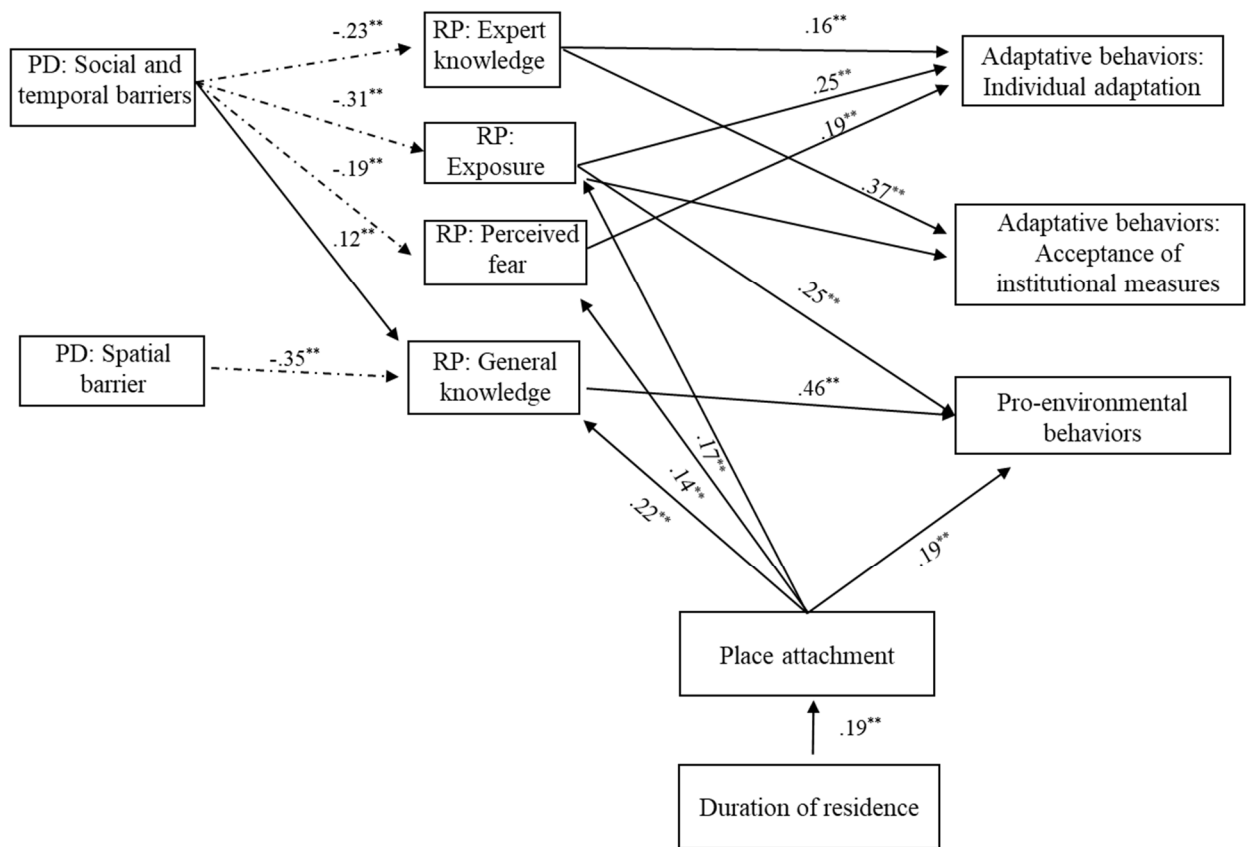


Figure 4: Model of adaptation to climate change and droughts

Post-adjustment indices: $\chi^2(31) = 58.93, p = .02$; $\chi^2/df = 2.28$; CFI = .96; GFI = .96; RMSEA = .05; SRMR = .06

Note: dotted line: negative relations; full line: positive relations. PD: Psychological Distance; RP: Risk Perception

4. DISCUSSION

This research highlights some similarities and differences between the two risks that were studied. These results are discussed below according to hypothesis order: the links between assessments of climate change and its associated risks (4.1); the association between assessment and adaptation to climate change and associated risks (4.2); the implication of place attachment in the assessment of and adaptation to climate change and associated risks (4.3); and finally, a synthesis of the differences observed for each risk studied (4.4).

4.1 Assessment of climate change and its associated risks

Even though we observe specificities according to the risk under consideration, the hypothesis that psychological distance relative to climate change explains risk perception (of flooding or droughts) is validated (H1).

More specifically, when we consider flood risk, when climate change is characterized as being close from a social and temporal point view, this is associated with individuals who perceive expert knowledge on flooding more, feel more exposed, and express more fear about this subject. However, no relation is observed between the spatial barrier of climate change and the sub-dimensions of flood risk perception. Moreover, a relation is noted between the temporal and social barrier of climate change and expert knowledge regarding flood risk. Thus, when climate change is perceived as currently occurring, individuals may have a tendency to confer the government with responsibility for their safety when faced with flooding (Harries, 2008).

Regarding drought risk, we observe certain relations between the dimensions that are not identified when studying flood risk. Indeed, the fact that droughts are well known is associated with perceiving climate change as spatially close but distant on a temporal and social level. On the one hand, perceiving climate change as being geographically close could lead individuals to take a greater interest in the effects that could occur in their environment (Clayton, Manning, & Hodge, 2014; Safi, Smith, & Liu, 2012). On the other hand, high scores for the social and temporal barriers are associated with higher scores on general knowledge regarding droughts. These results could be explained by the notion that a psychologically distant object, located at high construal levels, could also be associated with more complete and structured representations (Brügger et al., 2015; Trope & Liberman, 2010; Trope, Liberman, & Wakslak, 2007). In parallel, perceiving climate change as being close from a temporal and spatial viewpoint is also associated with an individual feeling exposed to drought risk. Droughts are continual phenomena (Reser &

Swim, 2011), which means they occur over a relatively long period of time. It is thus possible that individuals easily associate droughts with climate change, which is often presented as global warming. In this sense, research shows that individuals associate droughts with climate change and that their risk perception is higher when they establish this link (Gaymard, Kay, & Etoundi, 2015; Safi et al., 2012).

Overall, low psychological distance regarding climate change is associated with better risk perception. Whether this concerns flooding or droughts, perceiving the impact of climate change as being socially and temporally close is associated with greater expression of fear and better perception of expert knowledge. Thus, the more climate change is perceived as concrete, the more individuals refer to experts and the more they express fear regarding the effects of climate change (flooding or drought). Some authors suggest that climate change can be perceived as abstract given the gap between the cause and the consequences (Milfont, 2010; Pawlik, 1991). Our results go in that direction, because perceiving climate change as being concrete leads individuals to better perceive its consequences. As other research shows, individuals probably establish the link between climate change and its impact (Milfont et al., 2014; Terpstra, Gutteling, Geldof, & Kappe, 2006).

4.2 Assessment of climate change and its impacts and ways of adapting to it

The hypotheses according to which the manner of assessing climate change and its effects (flooding or droughts) can explain general and specific adaptive behavior are partially validated (H2a and H2b).

Regarding flood risk, relations are observed between psychological distance concerning climate change and taking up adaptive behavior (H2a). Thus, perceiving climate change as being close from a temporal, social, and geographical viewpoint is associated with more preventive behavior

when confronted with flood risk and with greater acceptance of institutional measures. Moreover, perceiving climate change as being close from a social and temporal viewpoint is associated with more pro-environmental behavior. Thus, perceiving climate change as concrete leads individuals to adapt their behavior towards the issue at a level that is both global (Reser, Bradley, Glendon, Ellul, & Callaghan, 2012; Spence et al., 2012; Whitmarsh, 2008) and local (Corral-Verdugo et al., 2017; Evans et al., 2014). Furthermore, relations between flood risk perception and adaption to the risk are observed (H2b). Thus, the more the individual perceives expert knowledge and expresses fear regarding flooding, the more they will tend to accept institutional measures. Here again, it appears that regarding flooding, individuals tend to rely on experts and the authorities.

Regarding drought risk, only indirect relations are observed between psychological distance relative to climate change and adaptive behavior (H2a). Thus, we note an indirect relation between perceiving climate change as close from a geographical viewpoint and adopting pro-environmental behavior. In this sense, it would seem that perceiving climate change as being close may be associated with more general knowledge linked to droughts, which would in turn explain pro-environmental behavior. We also observe indirect relations between perceiving climate change as close from a temporal and social viewpoint and adapting to droughts (acceptance of institutional measures and risk-adaptive behavior). Here again, psychological distance could explain risk perception, which in turn explains adaptation to droughts. Moreover, different links are observed between drought risk perception and adaptive behavior to this risk (H2b). These results are in line with the work highlighting that risk perception is a strong predictor of behavior (Aitken et al., 2011; Akompab et al., 2013; Kellens, Terpstra, Schelfaut, & De Maeyer, 2013; Lin et al., 2008; O'Connor, Bord, & Fisher, 1999). Moreover, individual adaptation is associated with perceiving expert knowledge, the feeling of exposure and perceived fear. Thus, the more individuals perceive drought risk, the more they take up adaptive behavior

when facing that risk. Acceptance of institutional measures is all the more significant when individuals perceive expert knowledge and feel exposed to droughts. When individuals feel strongly exposed to droughts, they apparently tend to trust the authorities and accept institutional measures more easily. Thus, by being aware of the impacts and the consequences of this risk, individuals could accept diverse adaptive measures (Clayton et al., 2015; Evans et al., 2014; Liu & Sibley, 2012; Miceli, Sotgiu, & Settanni, 2008).

For both risks studied, these results show that establishing the link between the local situation and the global context may lead individuals to adapt to the risks that they face daily (de Boer, Botzen, & Terpstra, 2016; Haden et al., 2012). This data also corroborates with other studies showing positive relations between risk perception and adaptive behavior (Bubeck et al., 2012; Lin et al., 2008). Other research also shows that risk perception can be associated with more behavior, but it is not always adapted to the situation (Grothmann & Patt, 2005; Milne, Sheeran, & Orbell, 2000; Tucker, Eakin, & Castellanos, 2010). It is thus pertinent to measure the adapted and non-adapted behavior that is taken up in order to face a risky situation.

4.3 Implication of place attachment in assessment and adaptation to climate change and its impacts

Even though there are notable specificities according to the risk under consideration, the hypotheses according to which place attachment can explain how the environmental situation relative to climate change is assessed and how individuals adapt to it are partially confirmed (H3).

Regarding flooding, place attachment is directly associated with how climate change and flood risk are assessed. Indeed, a strong attachment to one's neighborhood is associated with

perceiving climate change as close from a temporal, social and spatial viewpoint (H3a). Place attachment is also linked to higher risk perception, by feeling more exposed to flood risk and by expressing more fear (H3b). In parallel, an indirect relation is observed between place attachment and pro-environmental behavior (H3c). Thus, the more the individual is attached, the more they perceive climate change as being close from a social and temporal viewpoint, and the more they adopt pro-environmental behavior. Furthermore, place attachment is associated with adaptive behavior regarding flood risk (prevention, protection) (H3d). In general, it appears that place attachment is an essential element to take into account in order to understand how an individual adapts to climate change and flooding. This goes in the direction of other studies led with inhabitants of flood-prone zones, which show positive relations between place attachment and behavioral engagement (Bonaiuto et al., 2016; Bonaiuto, De Dominicis, Fornara, Cancellieri, & Mosco, 2011; De Dominicis, Fornara, Ganucci, Cancellieri, Twigger-Ross, & Bonaiuto, 2015). Furthermore, and given our results, strongly attached individuals may perceive climate change as being more concrete.

Regarding droughts, place attachment can explain risk perception (H3b) but not assessment of climate change (H3a). As for flooding, attachment to one's neighborhood is associated with the feeling of being more exposed and experiencing more fear. Place attachment is associated with more general knowledge regarding droughts. It seems that when the individual is strongly attached, they take greater interest in surrounding risks and adapt to them more (Bonaiuto et al., 2016). Moreover, a direct relation is observed between place attachment and the adoption of pro-environmental behavior (H3c). Indeed, place attachment could explain how individuals adapt to climate change (Vaske & Kobrin, 2001). However, only indirect relations are noted between place attachment and adaptation to droughts (acceptance of **institutional** measures, adaptive behavior at an individual level) (H3d). Thus, it seems that attachment to one's neighborhood

leads to better risk perception, which also leads to more adaptive behavior towards the risk. In further studies, it would be interesting to analyze to what extent risk perception mediates the relation between place attachment and adaptation to droughts.

Consequently, **the results obtained for the two sub-studies** show that place attachment may be associated with behavior aiming to protect one's environment. In this respect, some authors are enquiring into the role of environmental values and connection to nature, which could also encourage individuals to protect their environment (Scannell & Gifford, 2010).

4.4 A type of risk, a way of assessing it, a way of adapting to it

The results lead us to discuss the specificity of the risk studied in this research. Indeed, when it comes to flooding, the way climate change is perceived is directly associated with how individuals adapt to flooding. In contrast, we observe no direct association between the assessment of climate change and adaptive behaviors in our study of drought risk. These differences can potentially be linked to the risk characteristics or even to the participants' neighborhood of residence, which differ for each phenomenon studied.

Our hypothesis according to which the duration of residence explains the level of place attachment is also validated (H4). In this respect, our research shows that how individuals assess their local environment depends on various factors including duration of residence (Burningham, Fielding, & Thrush, 2008; Fleury-Bahi et al., 2008) and the type of risk under consideration (Bernardo, 2013; Bonaiuto et al., 2016). On the one hand, in the present research, the inhabitants of the neighborhoods exposed to flooding events had been living there for around 20 years, whereas those exposed to droughts had been living in their neighborhoods for around three years, as they are new residential zones. Our results show that the duration of residence of the

inhabitants explains the level of place attachment to the neighborhood, which could influence the manner of assessing and adapting to climate change and its effects. The neighborhoods of residence can be distinguished through various criteria such as the type of neighborhood or the risks present. In subsequent studies, it would therefore be pertinent to collect more information regarding the neighborhood of residence. The aim would be to gain better understanding of the role of the contextual characteristics associated with the place of residence, which could be involved in assessing and adapting to climate change (e.g. raising environmental awareness in neighborhoods, mutual aid and support during disasters, local residents' associations, etc).

On the other hand, the differences observed between the results of the two studies can stem from the type of risk under consideration. As mentioned above, flooding could be considered as a discrete menace whereas droughts could represent more of a constant threat (Reser & Swim, 2011). Given that droughts are of a constant nature, even if they can be more or less severe, they are part of everyday life for individuals over a given period. Being attached to their neighborhood, individuals know this phenomenon well, as it is part of their living conditions. These elements could potentially explain the direct relations between attachment and risk perception. Regarding floods, the most notable explanation for risk-adaptative behavior is the way climate change is described. This type of risk may be perceived as hard to control, which could explain why individuals refer more to authorities and institutions (Harries, 2008).

Moreover, it would be interesting to study the representations of droughts, floods, and climate change. Indeed, this environmental situation may feature one phenomenon more than another. For instance, studies show that individuals define climate change notably by disturbance in the seasons (such as heatwaves) and temperature rises (Bertoldo & Bousfield, 2011; Michel-Guillou, 2014).

5. Limits

This work has enabled the identification of different relations between the assessment of climate change and its effects, and the manner of adapting to it. However, many limits need to be acknowledged. First of all, factorial analysis led us to identify a sole factor of place attachment whereas research shows it to be a multidimensional concept (Devine-Wright & Howes, 2010; Kyle et al., 2005; Scannell & Gifford, 2013) and the tool used was also composed of two dimensions (Hernández et al., 2007; Ruiz et al., 2011). Furthermore, factorial analysis of the psychological distance scale did not permit identification of the dimension relative to the uncertain nature of climate change. However, the psychological distance model is composed of this dimension (Trope & Liberman, 2010). Likewise, the dimension of general knowledge of the risk was identified for the drought risk perception scale but not for the scale concerning flooding. In view of these elements regarding the structure of the scales, it is important to conduct complementary research in order to propose more stable scales. **Moreover, exploratory analyses have been provided: it would also be relevant to replicate this study with a view of confirming our results.** Lastly, many neighborhoods were selected to study flood risk, whereas only one was identified to study drought risk. It is possible that awareness of a risk varies according to the neighborhoods. It would thus be necessary to collect more information on this subject (e.g. communication on protective behavior and on climate change; awareness-raising events).

6. Conclusion and perspectives

The results of these two studies enable us to identify the relations between psychological distance, risk perception and adaptation to the environmental context while taking place attachment into account. Whatever the risk under consideration, the perception of climate change and its impacts is related, directly or indirectly, to adaptive strategies. In parallel, place attachment provides an explanation of how individuals assess and adapt to their environment. In

this respect, it would be pertinent to consider different spatial levels in order to gain a more thorough understanding of the role of place attachment.

Finally, the results of this research have practical targets. On the one hand, it would be important to heighten the awareness of individuals by reducing their psychological distance, so that they perceive the risks in their neighborhood more and adopt more pro-environmental and protective behavior. This would be possible by communicating about the consequences of climate change at a local, temporal, and spatial level. On the other hand, the discourse should be adapted to the local situation, by taking into account the specificities of neighborhoods (neighborhood history, new neighborhood, present risks, etc.)

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