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The social representations of climate change: comparison of two territories exposed to the coastal flooding risk

Coastal
flooding risk

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Abstract

Purpose – Based on social representation theory, this study aims to evaluate and analyze the similarities and differences between social representations of climate change held by people living in two territories, which have in common that they are exposed to coastal risks but have different socio-cultural contexts: on the one hand, Cartagena (Colombia) and on the other, Guadeloupe (French overseas department, France).

Design/methodology/approach – A double approach, both quantitative and qualitative, of social representation theory was adopted. The data collection was undertaken in two phases. First, the content and organization of social representation of climate change (SRCC) was examined with a quantitative study of 946 participants for both countries, followed by a qualitative study of 63 participants for both countries also.

Findings – The study finds unicity in the SRCC for the quantitative study. In contrast, the qualitative study highlights differences at the level of the institutional anchoring of the climate change phenomenon in these two different socioeconomic and political contexts.

Practical implications – These results are relevant for a reflection in terms of public policies for the prevention and management of collective natural risks, as well as for the promotion of ecological behavior adapted to political and ideological contexts.

Originality/value – The use of a multi-methodological approach (quantitative and qualitative) in the same research is valuable to confirm the importance of an in-depth study of the social representations of climate change because of the complexity of the phenomenon.

Keywords Social representation theory, Climate change, Coastal flooding, Environmental psychology approach

Paper type Research paper



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1. Introduction

Scientists draw our attention to climate change, to the variation of the climate, which can be identified by changes affecting the variability of its properties, and persisting over long periods, generally decades or more (IPCC, 2012). This worldwide phenomenon has significant repercussions on coastal areas. Indeed, it increases these regions' vulnerability to extreme marine weather events such as coastal flooding (Duvat, 2015; Gattuso and Hansson, 2011).

In this study, we examine the social representation of climate change (SRCC) in a context of exposure to coastal risks. The notion of systemic or global vulnerability includes the degree of exposure to the risk and the multiple, complex and dynamic interactions established between humans and the environment. This conception implies that it is the links established between geographic, historic, sociocultural, economic, psychological, political dimensions of a disaster that explain the vulnerability of a territory and the adaptive capacity of the populations concerned (Adger, 2006; Bankoff *et al.*, 2004; Hilhorst, 2004; O'Brien *et al.*, 2004; Reghezza, 2006).

The social representation theory defended in our study conceives the individual as a socially and culturally located subject-actor, who has a logic of controlling situations, thus enabling greater knowledge of the logic underlying the practices and strategies implemented by individuals and groups (Demarque *et al.*, 2013). In this theory, social representation is defined as an organized set of opinions, knowledge and beliefs, that together play a crucial role in relations and social practices. According to the structural approach of social representation theory (Abric, 1996; Flament, 1994), the elements of the representation are distributed into two complementary systems as follows: the central system (central core) grouping the most consensual cognitions, those which convey the meaning and values of the representation, and the peripheral system, grouping the cognitions submitted to inter-individual and contextual variations.

As social representations are a guide for individual and group actions (Moscovici, 1961), in addition to the interest of the cognitions and beliefs held on the subject-matter, the purpose of studying the social representations of climate change will be to understand the behavior resulting from relations with the phenomenon. Indeed, the coastal areas of the Caribbean Sea are exposed to coastal risks, and therefore, are often impacted by climatic variations, namely, cyclones, tropical storms, major coastal flooding, events resulting from swell phenomena, etc. The context of global climate change is an additional risk factor, with the others being: demographic growth, accelerated urbanization because of a high level of economic and tourist activity, reduced forest area and deforestation, intensive agricultural activity, and finally, the pollution that ensues from all these activities. Realizing the fragility linked to these locations, these places' populations and notably their capacity to adapt to the effects of this phenomenon research studies have been conducted to grasp the perception of climate change. Various studies on the social representations of climate change (Bohn Bertoldo and Bousfield, 2011; Gaynard *et al.*, 2015; Kempton, 1997; Lázaro *et al.*, 2008; Michel-Guillou *et al.*, 2017) have led to concurring results. The central elements of the representation, the most consensual, are organized around the process of temperature rises and global impacts and the peripheral elements are organized around the repercussions at a local level, in other words, differences in the perceptions of local climatic modifications appear according to geoclimatic contexts. For example, in their study, Michel-Guillou *et al.* (2017) propose a comparative

analysis of the social representations of climate change (France compared to Greenland) originating in the environmental problems encountered by contrasted populations, namely, farmers and water managers (two professions impacted by climatic variations). In their study, social representations are tackled in relation to regional exposure to climatic events, proximal stakes and adaptive strategies envisaged by professionals. Firstly, the results highlight consensual elements: climate change is real and underway, through rising temperatures and severe meteorological disturbances. Moreover, according to the context, differentiated perceptions are observed according to the geoclimatic anchoring of the populations, notably regarding the causes, the perception of modifications of the climate or the chronology of environmental evolution. In those studies, social representations explain how these different populations implement similar adaptive strategies that are not structural but limited, as they are linked to an inability of the two populations studied to project themselves in time in an uncertain environment.

Regarding climate change adaptation strategies, according to [Stehr and Storch \(1995\)](#), when the effects of climate change are considered as short-term changes, they trigger involvement and psychological proximity to the phenomenon. However, when climate change is perceived as a global but distant issue with severe consequences, with long-term consequences only, it does not cause a change in behavior, even for the most exposed populations.

Research on coastal risks is also interesting for our research, in that climate change is an aggravating risk factor at a local level. Indeed, [Baggio and Rouquette \(2006\)](#) demonstrate a contextualization of social representation linked to the subjects' involvement (proximity to the risk and perceived importance of the stakes) and flood culture.

The research of [Michel-Guillou et al. \(2015\)](#) on the social representation of coastal risks confirms the results of the effect of location. Furthermore, regarding the content of this social representation, other authors emphasize the generally more normative (rather than functional) nature of the elements of social representations of collective natural risks, i.e. the fact that these representations are composed more of references to values and norms, and less to behaviors ([Baggio and Colliard, 2007](#); [Ernst-Vintila, 2009](#); [Gruev-Vintila and Rouquette, 2007](#)). Regarding normative elements, this was also observed for social representations of climate change. It is also noted that the content of the SRCC is mostly composed of descriptive, evaluative and attributive elements, which make the object concrete but remain normative, and do not necessarily lead to implementing action.

Ultimately, because of its manifestations, climate change is an abstract concept with a social stake that is particularly high for inhabitants of certain territories such as coastal areas, as it highlights a set of ideas, images, information, opinions and values interlinked by a cognitive system depending both on a social object and also a social group ([Bonardi and Roussiau, 1999](#)). The concept is difficult for the non-specialist to grasp, and in addition, numerous scientific uncertainties remain. [Moloney et al. \(2014\)](#)'s study on the social representations of climate change among non-scientists, observes that notions related to adaptation to climate change are absent in the discourse of populations, even though they are exposed to extreme weather effects.

The concept of climate change is, therefore, dependent on forms of socialization and communication ([Flament and Rouquette, 2003](#)). It is the object of scientific knowledge that is conveyed to the general public, with transformations that will ultimately result in a common meaning, enabling non-scientists to grasp the concept and for it to be socially useful. The abstract and complex nature of the "climate

change” object leads to issues around controlling the object and its involvement in daily life, notably in regions that are more vulnerable to climatic variations. Furthermore, identity and political psychosocial processes may give rise to differences between the social representations of this same object. Indeed, as climate change is a highly contested object, it can append itself to other existing political objects, which are similarly conflictual and subjected to the latest ideological debate (Wibeck, 2014). Jaspal *et al.* (2013) explain that social representations of climate change integrate the identity processes and determine the implementation of pro-environmental behavior. According to the authors, identity processes are mediators between social representations and behavior. They propose to question the hegemonic, emancipated or polemical characteristics of the representation. The “hegemonic” social representation is dominant and shared by most members of a group, with normative methods of coercion. “Polemical” social representation is opposed to “hegemonic.” “Emancipated” social representation is related to the specific aspects of the subgroup. Considering that climate change is anthropogenic (hegemonic representation) is opposed to thinking that it is a natural and cyclical phenomenon (polemical representation). The first case implies that there are actions to be taken to mitigate or delay the phenomenon, while the second case maintains that it is an uncontrollable phenomenon. Besides these types of representations, the emancipated representation (for the inhabitants of a region exposed to frequent meteorological hazards), which comes from the hegemonic representation, maybe that climate change can cause the total submersion of the island, even its disappearance.

All these elements justify the comparative study of the social representations of climate change in those two territories, which have similar geo-climatic characteristics but different ways of managing natural risks and climate change. Knowing that the social representation of an object is inserted in a socio-political, historical and geographical context, the aim of this research is to observe whether there is a SRCC common to populations living in areas exposed to coastal risks. In other words, the objective is to discover if, for the two populations, the consensus is organized around the element “global warming,” which are added geoclimatic elements common to coastal territories. The other stake is to observe the role of the cultural and institutional contexts on the organization of the SRCC and to question the identity processes. This will require the analysis of the similarities and the differences between anchorages and objectifications of the object “climate change,” and the actions or responses, which result from the social representation.

The research will be conducted in two phases (four collections of data), the first time on the two sites for the quantitative approach and the second time on the same sites for the qualitative approach (Table 1).

2. Study 1: comparison of the structures and organizational principles of the social representation theory of climate change

2.1 Research methodology

The aim of this study is to compare the social representations of climate change of two populations living in coastal areas at risk of high-tide flooding or in other words, to highlight the common points and the different stances of those two locations. Our hypothesis is that because the populations of coastal areas are exposed to similar disasters and geoclimatic events, they will be strongly involved in the object of “climate change.” Thus, the consensual elements of the SRCC, in a context of exposure

to the coastal flooding risk, will be widened to other geoclimatic manifestations linked to the specific coastal risks, usually submitted to local variations.

2.1.1 Participants. 350 people participated in Colombia, 56.6% were female and 43.4% were male, with a mean age of 39.92 years ($SD = 14.98$). The mean time of residence in Colombia is 29.68 years ($SD = 17.36$) and the mean time of residence in their accommodation is 17.63 years ($SD = 15.11$). Regarding employment status, 48.1% of the sample were in work, and 48.4% of participants had pursued higher education (Table 2).

In Guadeloupe, 596 people participated, 61.4% female and 38.6% male. The mean age was 46.42 years ($SD = 18.93$), the mean time of residence in the region is 20.93 years ($SD = 22.21$) and the mean duration of residence in their accommodation is 17.51 years ($SD = 17.28$). Regarding employment status, 32% of the sample were in work and 48.9% of participants had pursued higher education. The descriptive statistic of the samples is given in Table 2.

2.1.2 Materials and procedure. The study used a characterization questionnaire (Moliner *et al.*, 2002) of the SRCC used by Bohn Bertoldo and Bousfield (2011). For each of the 12 items or constitutive elements of the SRCC, a five-point Likert scale ranging from “definitely not”

Approach Territories	Quantitative approach		Qualitative approach	
	Colombia (Cartagena)	France (Guadeloupe)	Colombia (Cartagena)	France (Guadeloupe)
Participants	$n = 350$	$n = 596$	$n = 33$	$n = 30$
Materials and procedure	Characterization questionnaire		Semi-structured interviews	
Data analysis	Rate of characterization per item CPA		Content analysis	
Comparative method	Comparison of results of each quantitative analysis		Comparison of the content analysis	

Table 1.
Complete research
scheme

Characteristics	Guadeloupe ($n = 596$)		Cartagena ($n = 350$)		
	n	(%)	n	(%)	
Gender	Male	230	38.6	152	43
	Female	366	61.4	198	57
Professional situation	In work	191	32	169	48.1
	Unemployed	189	31.8	31	8.8
	Retired	138	23.2	24	6.8
	Student	44	7.4	41	11.7
	At home	25	4.2	84	23.9
	Other	9	1.6	2	0.6
Education level	None	4	0.7	7	2
	Primary	75	12.6	58	16.5
	Secondary	215	36.1	116	33
	High school leaving certificate	190	31.9	120	34.2
	Undergraduate	76	12.8	46	13.1
	Postgraduate	22	3.7	4	1.1
	PhD	3	0.5	–	–
Other	11	1.8	–	–	

Table 2.
Description of the
sample

(1) to “definitely yes” (5) was proposed. The questionnaires were completed in the presence of an investigator in the participant’s home. The aim of the study was presented to them; after obtaining their consent, the following instructions were given: “for each element of the following list, indicate to what extent it is a characteristic or not of climate change, in your view.”

2.1.3 Data analysis. Three types of analyses were conducted: the calculation of a rate of characterization per item, a similitude analysis and a principal component factor analysis (CPA). The calculation of a characterization rate (Moliner *et al.*, 2002) enables confirmation that certain elements of social representation characterize the object more and that they are consequently more likely to be elements of the central system. A 75% threshold of characterization is established policy in the literature (Dany and Apostolidis, 2002). The CPA, with varimax rotation, permits the organizational principles of a social representation to be identified. Indeed, it pinpoints the covariations between the answers whose interindividual variability is maximal. This method was used to highlight elements of the social representation by grouping data. The objective was to build new dimensions from elements of the social representation, i.e. to highlight the independent factors accounting for the interindividual variations of the representation (Doise *et al.*, 1992).

2.1.4 Results and discussion.

2.1.4.1 Comparison of the characterization rates. The item “temperature rise” is perceived as the most characteristic, and the item “natural event” is the one perceived as the least characteristic of climate change for both territories. Thus, for “natural event,” the characterization rate is only 42.4% in Guadeloupe (under half of the people questioned) and 68.1% in Colombia: this difference is significant ($t = 7.87$; $p < 0.001$), meaning that the Guadeloupe sample believes that this item characterizes climate change less than the Colombia sample does. Furthermore, for Colombia, the item “caused by human actions” obtains 74.6% characterization. As the 75% threshold had been required, the items “caused by human actions” and “natural event” are the least consensual elements of the SRCC in Colombia. Moreover, the great majority of the items (11 out of 12 for Guadeloupe and 10 out of 12 for Colombia) are very characteristic elements of the SRCC for both territories (Table 3).

Characterization items	Guadeloupe ($n = 596$) (%)	Cartagena ($n = 350$) (%)	Student's t	p
1: Impact on the seasons	84.6	82.1	-1.01	0.31
2: Extreme weather	85	85.7	0.28	0.78
3: Causes storms	78.8	77.2	-0.58	0.56
4: Causes glacier melting	77.8	82	1.54	0.13
5: Temperature rise	85.9	86.9	0.43	0.67
6: Sea level rise	79.5	81.2	0.63	0.53
7: Out of control	76.5	81.8	1.90	0.06
8: Global climate disturbance	81.7	78.6	-1.16	0.25
9: Natural event	42.4	68.1	7.87	0.00*
10: Caused by human action	79	74.6	-1.54	0.12
11: Caused by air pollution	82.9	77.8	-1.94	0.05*
12: Caused by deforestation	83.8	75.4	-3.18	0.00*

Table 3.
Comparisons of the
characterization rates
of the SRCC

Note: *Significant > 0.05

Elements of the SRCC	Guadeloupe (<i>n</i> = 596)				Colombia (<i>n</i> = 350)			
	Effects/ consequences	Anthropogenic causes	Natural event	Weather impacts	Anthropogenic causes	Global changes	Natural event	
1: Impact on the seasons	<i>0.80</i>	0.14	-0.06	<i>0.71</i>	0.15	-0.15	0.36	
2: Extreme weather	<i>0.79</i>	0.25	-0.06	<i>0.64</i>	-0.06	0.23	0.03	
3: Causes storms	<i>0.67</i>	0.38	0.03	<i>0.60</i>	0.13	0.18	-0.10	
4: Causes melting of glaciers	<i>0.73</i>	0.32	-0.18	<i>0.59</i>	-0.01	0.20	-0.19	
5: Temperature rises	<i>0.83</i>	0.30	-0.03	0.15	0.01	<i>0.64</i>	-0.04	
6: Sea level rises	<i>0.80</i>	0.26	-0.05	0.41	0.00	<i>0.55</i>	-0.30	
7: Out of control	<i>0.66</i>	0.37	-0.07	0.03	0.40	<i>0.54</i>	0.09	
8: Global climate disturbance	<i>0.69</i>	0.42	0.01	0.14	0.03	<i>0.63</i>	0.20	
9: Natural event	-0.03	-0.00	<i>0.96</i>	-0.04	-0.04	0.10	<i>0.84</i>	
10: Caused by human actions	0.37	<i>0.59</i>	-0.40	0.16	<i>0.56</i>	-0.07	-0.28	
11: Caused by air pollution	0.29	<i>0.84</i>	0.05	-0.04	<i>0.78</i>	0.04	0.05	
12: Caused by deforestation	0.36	<i>0.81</i>	-0.02	0.05	<i>0.72</i>	0.17	0.06	
Eigenvalues	6.52	1.07	0.88	2.60	1.48	1.13	1.01	
% of explained variance	54.33	8.89	7.33	21.69	12.35	9.43	8.39	
α	0.92	0.78	-	0.57	0.52	0.53	-	

Note: Italic data significant for high factor load

Table 4.
PCA of the SRCC
for both sites

2.1.4.2 Comparison of the principal component factor analysis. Regarding the CPA, the Guadeloupe results (Table 4) show good sample adequacy and excellent inter-item correlation ($KMO = 0.934$; $\chi^2 = 4,124.39$ (66), $p < 0.001$). The organization of the items according to two dimensions can be observed, with strong internal consistency for each of them. The first dimension refers to the “effects and consequences” of climate change and is composed of the items “temperature rise”, “impact on the seasons”, “extreme weather”, “causes storms”, “causes melting glaciers”, “sea level rises”, “out of control” and “global climate disturbance”, displaying strong internal coherence, with Cronbach’s alpha (α) at 0.92. The second dimension refers to the “anthropogenic causes” of climate change and is composed of the items “caused by deforestation”, “caused by human actions” and “caused by air pollution,” with an internal consistency of 0.78. The item “natural event” is isolated. The correlations between these dimensions bring to the fore an antagonism between the dimension “natural event” and the dimension “effects and consequences” ($r = -0.11$; $p < 0.001$), as well as the dimension “anthropogenic causes” ($r = -0.15$; $p < 0.001$). The correlation is strong between the latter two dimensions ($r = 0.71$; $p < 0.001$).

The results of the CPA in Colombia (Table 4) display a good sample match and excellent inter-item correlation ($KMO = 0.732$; $\chi^2 = 427.24$ (66), $p < 0.0001$). A three-dimensional organization is observed, in addition to the item “natural event,” which is still isolated. However, these dimensions present an internal consistency that is too low, with Cronbach’s α at under 0.60 for the three dimensions. Nevertheless, these results provide information about the organization of social representation. The first dimension refers to “weather effects” and is composed of the items “impact on the seasons”, “extreme weather”, “causes storms” and “causes melting of glaciers,” with an internal consistency of 0.57. The second dimension refers to the “anthropogenic

causes,” and is composed of the items “deforestation,” “caused by human actions” and “caused by air pollution,” with an internal consistency of 0.52. The third dimension refers to the “global changes” and is composed of the items “temperature rises”, “sea level rises”, “out of control” and “global climate disturbance”, with an internal consistency of 0.53. Between the dimensions “weather effects” and “anthropogenic causes”, the correlation is average ($r = 0.15$; $p < 0.001$). Between the dimensions “weather effects” and “global changes”, the correlation is stronger ($r = 0.42$; $p < 0.001$), and between the latter and “anthropogenic causes”, the correlation is average ($r = 0.22$; $p < 0.001$).

To sum up, for both areas, the CPA suggests the dimension “anthropogenic causes” and the item “natural event.” These are elements of the current ideological debate regarding the natural or anthropogenic causes of climate change. The sites are observed to differ concerning the impacts or the manifestations of climate change. For Guadeloupe, one dimension only groups all of these items; whereas for Colombia, two dimensions organize the items: firstly, the effects of climate change, notably the meteorological phenomena, and secondly, the manifestations of climate change worldwide.

In conclusion, the results obtained in this first study converge toward the existence of a similar SRCC in both areas, organized around elements such as “temperature rises” is a characteristic effect of climate change and “caused by deforestation” the main cause of climate change. These two elements, temperature rises and deforestation, seem to objectify climate change and organize the thinking and social practices associated with the social representation of this object.

3. Study 2: comparison of the opinions, attitudes and beliefs in the social representation of climate change

Through a qualitative approach, the aim of this study was to identify the opinions, attitudes and beliefs, i.e. the fundamental elements of the content of SRCC, in a context of exposure to the coastal flooding risk, to gain a better understanding of the meaning attributed to the elements of which it is formed.

The aim is to highlight the more contextualized beliefs or opinions for each of the territories, which amounts to identifying the variabilities according to the psychological, sociological or psychosocial anchoring, and to appreciate the actualization of the social representation. This identification of opinions and attitudes regarding climate change, the linking with the frequent geoclimatic variations in the zone and the practices, which are established or not, will enable assessment of the relations, which the populations exposed to coastal flooding risks have with climate change, according to the specificities of the cultural and/or institutional context, which varies according to the country.

3.1 Research methodology

3.1.1 Participants. In total, 63 individuals participated in the study: 33 participants were from Cartagena in Colombia, 48.5% female and 51.5% male, with a mean age of 40 years ($SD = 17$) and 30 participants were from Guadeloupe (France), 33.3% female and 66.7% male, with a mean age of 55 years ($SD = 15$). This sample is independent of the first study.

3.1.2 Materials and procedure. Face-to-face semi-directive interviews were conducted in both locations. The people questioned were asked to describe the phenomenon of climate change, its causes, its consequences and its relations with coastal flooding. The following questions were asked:

- Q1. “Do you think that climate change could be related to sea flooding?”
- Q2. “What are the causes of climate change?”
- Q3. “Is it due more to a natural phenomenon or is it linked more to human activity?”

The participants signed informed consent of their participation in the study, also authorizing the audio recording of the exchange.

3.1.3 Data analysis. The interviews were fully transcribed and underwent a content analysis (Bardin, 1996; Berelson, 1952), which was lexical then categorial (identification of the vocabulary and recording of the frequency of occurrences and co-occurrences). The categories that were retained for analysis were the following: the causes (natural and anthropogenic); institutional responsibility; weather phenomena; impacts on the environment; impacts on biodiversity and human health; attitudes; emotions; ecological practices; and the relations between climate change and coastal flooding.

3.2 Results

3.2.1 In Guadeloupe. For the 30 participants, we retained 217 occurrences or significant linguistic elements, and 317 co-occurrences, which we validated as a corpus. The causes of climate change make up 43.92% of the corpus (including 40.81% corresponding to anthropogenic causes) and the impacts of the phenomenon form 29.9% of the corpus. In total, 23 out of 30 participants focused on describing causes rather than consequences when they express themselves on the subject. A minimal attribution is made not only to natural causes (3.11% of the corpus) but also to a natural phenomenon linked to or accelerated because of anthropogenic action (1.25% of the corpus).

Climate change as a natural and cyclical phenomenon: People who perceive climate change as a natural event consider that it is a normal process; they find explanations accounting for the phenomenon, such as this participant who explains in her own way (with metaphors) that climate change is cyclical:

[...] it's a bit like the planet's wear-and-tear [...] a natural cycle meaning that somehow a saturation requires destruction in order to reboot [...] And we're in the process of reaching this saturation (EGuad 10).

Anthropogenic causes (pollution and deforestation): pollution represents 9.97% of the corpus. It is described through marine pollution, which appears as a local issue directly connected to climate change.

Climate change is always because there's a disturbance in the sea as it's exploited by certain groups of people who go beyond the boundaries of their territories and spoil [...] the environment, the sea [...] (EGuad 7).

Pollution linked to human activity in general forms 9.35% of the corpus. It seems to be described with relatively vague limits, is associated with environmental issues, as well as economic or even institutional ones. The statements are accusing the government and industrialists. Governmental responsibility, the non-respect of international conventions by the major powers and the wealthiest industrialists, and an absence of ecological policies are denounced. As this participant explains: “climate change is because of people's greed [...] wealthy countries, superpowers [...] they

always want to be on top [...]” (EGuad 13). Some participants justify their lack of trust in their institutions with implicit theories close to conspiracy. For example:

[...] the military experiences of the government as well, in certain zones, that’s a case in point. Submarine bombings, all that, all that, all that, those are the causes[...] the things they don’t tell us at all, that they hide from us [...] They don’t say a thing (EGuad 2).

Deforestation: the action of humans on nature is presented as exclusively polluting and destructive. Indeed, various elements linked to anthropogenic pressure are also mentioned as being at the origin of climate change, namely, deforestation (2.80% of the corpus), nature destruction (2.49% of the corpus), over-rapid urbanization and unauthorized buildings (1.56% of the corpus), but also the abusive exploitation of natural resources and the fact that the waste released does not have enough time to be eliminated by the planet (4.68% of the corpus). The primary idea is that human beings fail to respect nature and its cycles. EGuad 13 says:

There is warming, of course, but it’s because of the factories that release their gas all day long, so there you are. For me, it’s totally due to humankind. It’s nothing to do with climate.

The effects: climate change is described through its effects, which can be distributed in three categories, namely, meteorological phenomena (13.71% of the corpus), environmental impact (12.77% of the corpus) and consequences on biodiversity or even on humankind (3.42% of the corpus). Regarding weather impacts, the participants cite excessive temperatures, temperature rises, climate disturbance, disappearing of the seasons and influence on cyclones. The people surveyed perceive climate modifications locally.

I say yes, it’s warming up, and likewise, when it’s cold, it’s really cold. To prove it, in Guadeloupe people are wearing pullovers in December, something I’ve never seen before [...] For the past five or six years, we’ve been wearing pullovers in December. So, it’s really hot just like it’s really cold (EGuad 6).

To make the phenomenon of climate change concrete, it is introduced contextually, in reference to what the people surveyed perceive in their ecosystems:

There’s no smoke without fire. If now in Guadeloupe we’re [...] as soon as the heatwaves arrive, you see seaweed, tons and tons of seaweed on the beaches, it’s not for nothing. Before, we saw maybe this much [...] we didn’t even see all of that, we saw maybe two small branches, two little things, but now it’s[...] now it’s all year, you know. It proves there’s a disruption, something’s happening (EGuad 9).

The environmental impacts are also described in relation to floods, storms and cyclones: “it’s obviously climate change that makes the sea come in like this [...] those things melting in Antarctica [...] everything’s melting [...] obviously this water goes somewhere” (EGuad 27). Thus, the phenomenon is appropriated on the basis of local manifestations. Indeed, a systematic connection is made between climate change and flooding (four out of the five people interviewed attribute floods occurring in Guadeloupe to climate change, and one out of four of them systematically mention climate change as the cause of the floods). They explain this phenomenon by the fact that owing to a volume effect, the melting of glaciers provokes a rise in sea levels that results in floods.

Attitudes and emotions toward the phenomenon: the attitudes and emotions emphasized are forms of anger against institutions and large industrial groups (5.91% of the corpus). At

the same time, there are very few suggestions for fighting the phenomenon, and very few actions implemented to face up to it (2.80% of the corpus).

Behavior: the climate change phenomenon is perceived as an issue that is incumbent upon politicians, industrialists, etc., to solve. There is a strong denunciation of their governments' lack of action, in the view of the participants. The latter do not feel concerned personally; they believe they can do nothing about it, that they are powerless and that on their level, it is useless to modify their behavior, which they consider tiny in impact in view of the overall situation. The responsibility lies with the powerful, the polluting industrial groups and with political leaders, who people leave be because of economic interests. The respondents consider that if there were a political willingness to act for this cause, then raising awareness and educating populations can lead individuals to change their behavior in daily life. To conclude, overall there is a very negative perception of humankind, seen as destructive of nature, through pollution and the excesses for which only humans are responsible. However, these comments are not accompanied by proposals in terms of actions to be implemented to bring about change.

To conclude, anthropogenic causes (pollution and deforestation) are preponderant in the SRCC; effects and environmental consequences are barely touched upon the elements expressed are informative and descriptive on the whole, and very few functional elements are to be found in this corpus. Many juxtapositions of stereotyped expressions originate in social communications on the subject of climate change. Misunderstandings of the phenomenon are sometimes noted, even though it is perceived as real. There are few climate change skeptics: the existence of the phenomenon seems to be acquired knowledge. The feeling of vulnerability is not general, but many statements expressing a certain fatalism or powerlessness are reported. The insufficient lack of commitment to a dynamic of evolving to face climate change may be explained by the fact that on an individual level, participants consider any action useless as long as those who are "responsible" for climate change continue to pollute. The socio-political and economic anchoring of the concept dominates. Climate change is a problem for which mainland France is directly responsible, all the more so as it is a worldwide issue. Media overkill adds to marine weather events, which for this population are no longer an exception. The population reacts as if it were simply to be facing another climate event.

3.2.2 In Colombia. Likewise, in the corpus of the Colombia participants, an over-representation of the causes of climate change (53.13% of the corpus) in contrast with the effects of the phenomenon (26.68%) is observed. This is confirmed by the higher number of participants who mention the causes rather than the consequences (70% of the participants mention the causes). The blame is set more squarely on anthropogenic causes (50.68% of the corpus) than on natural causes (2.30% of the corpus).

Anthropogenic causes (pollution and deforestation): industrial pollution is given as the primary cause of climate change (11.32% of the corpus and 70% of the participants), followed by the absence of waste management (5.57% of the corpus and more than two-thirds of the participants). The other anthropogenic causes mentioned are daily human activity (2.95% of the corpus but two-thirds of the participants), destruction of nature (3.84% of the corpus, and more than half of the participants), the conversion of marshes into grazing lands, the destruction of the mangrove swamp, fast urbanization, over-population and illegal constructions (3.26% of the corpus and one-third of the participants). To quote ECart 11:

[...] they destroy the mangroves to build, for projects, for whatever you want, people don't get it and keep doing it, littering and waste dumping, polluting the environment, all of this causes climate change, it's because people lack awareness.

The participants mention different forms of pollution, namely, domestic pollution, industrial pollution, pollution related to means of transport, pollution related to litter in the streets, water pollution, etc. This pollution would appear to be the consequence of increased industrial development, overpopulation, booming tourism, the accumulation of waste, the discharge of toxic waste in the sea, the construction of buildings near the sea, the absence of legislation and corrective measures, etc. Pollution is held up as aggression of nature, which in response could react, and climate change could be a form of nature's reprisal toward humankind because the latter has committed too much abuse. This discourse about climate change seems to be linked to the participants' value systems and cultural theories. This relation to climate change, influenced by their vision of nature, is the reason why they adopt pro-environmental behavior. Two-thirds of the participants mention the idea of implementing strategies or types of behavior to protect nature and fight against climate change.

I'd say that these questions wake up the human being in me, as a person and as a community leader, because we work with children, we're leaders and we can campaign on how to be careful with our environment, our fauna (ECom 15).

Effects: regarding the consequences of climate change, in the first position the participants mention global warming (4.99% of the corpus for around two-thirds of the participants); then, the consequences on ecosystems and biodiversity (3.82% for 42% of the participants); next, the category grouping rising water levels (3.65% for 42% of the participants); glacier melting (2.5% of the corpus for one-third of the participants); and finally, climate disturbance (2.5% of the corpus for one-third of the participants). The Colombia participants describe a feeling of excessive heat. The most common explanation given is that climate change is a natural phenomenon triggered by human behavior and materialized by climate disturbance, the modification or disappearance of seasons, frequent storms, heavier rainfalls, strong winds, hurricanes or more frequent forest fires. The phenomenon is considered as being worldwide and the local manifestations on the environment are the rise in sea level with the various episodes of high-tide flooding and the frequent floods, with an increase in the number of flood-risk zones or even the permanent flooding of certain areas.

Affects: in Colombia, the representation of climate change is anchored in the affective relation with nature, the environment and the city. Pollution is a true issue. The participants think that they must reconcile with nature in their close surroundings. The distant manifestations of climate change, over which they have no control (the melting of glaciers, for instance), do not destabilize them as much as the pollution they endure day to day. The perception of climate change seems to be made from a more functional and concrete angle, generating strategies and practices.

Behavior: thus, from the identified causes, the Colombia participants express their desire to fight against climate change. They think that each person needs to act at their own level, that the starting-point must be to clean up the city, sort domestic waste, become personally involved in waste management, educate children and families regarding the cleanliness of the city, take care of nature: in sum, protect the ecosystem at their level. They also mentioned other environmental projects at a more institutional level such as producing alternative energies, reducing gas emissions, recycling waste, wastewater management, repression against the biggest polluters and more adapted buildings.

4. General discussion and conclusion

Climate change is a complex social object. Scientists have been communicating about this phenomenon since only relatively recently (the early 2000s). Difficult to grasp in local terms as it is a global phenomenon, it is very present in social communication, for reasons that include manifestations on the ecosystems, the ecological disasters attributed to it or even its anthropogenic causes described by the experts, who are alarmist to a greater or lesser degree.

In this research, our aim was to compare the social representations of climate change of two populations residing in territories exposed to coastal flooding, on the basis of a multi-methodological approach. Starting from a quantitative study, we were able to identify a common organization of the elements of the SRCC, with a central part grouping the great majority of the items proposed. Indeed, in the 2011 study by Bertoldo and Bousfield, which examined the structure of the SRCC of a Parisian population, the most consensual elements were “warming”, “glacier melting”, “sea level rises”, “global climate disturbance” and “caused by human actions”, whereas the elements “storms,” “deforestation,” “modification of the seasons”, “pollution”, “natural climate transformation”, “acceleration of the transformations” and “climates becoming more extreme” were less consensual.

Given the proximity of the studied population with the object of representation (population exposed to coastal flooding risk), it is possible that there is an over-activation of all the peripheral elements, i.e. “storms,” “deforestation”, “extreme weather”, “impact on the seasons”, “air pollution” and “out of control effects”, which are consensual in this context of coastal flooding risk. Only the item “natural event” is isolated and appears as peripheral. This contextual effect can be explained by heightened vulnerabilities linked to the geophysical and climatic characteristics of these environments. The environmental inequalities in exposure to natural risks because of the proximity of the marine environment, the complexity of the risk factors specific to coastal territories and the local adaptive strategies such as anthropogenic habits and adaptations linked to a context heightening the likelihood of disasters, all contribute to the establishment of a social identity around these at-risk territories. However, the over-activation of the peripheral elements could be attributed to the fact that there is a dynamic or as yet unstabilized, social representation. Besides the environmental inequalities, the populations may think that the impact of climate change, at a global and local level, merge. This would explain a stronger sense of involvement, leading to a modification of the central system of the social representation (Bohn Bertoldo and Bousfield, 2011).

Regarding the organization of the items within this central part of the representation, the latter seems established, rigid even, in Guadeloupe. Indeed, there is a very strong consensus around the descriptive (description of the effects of the phenomenon) and attributive (causes of the phenomenon) elements. The descriptive items aggregate around temperature rises and the attributive items around deforestation. However, in Colombia, the organization seems less established, but there is no opposition. The descriptive elements are split into two poles, one around temperature rises and the other around extreme weather conditions. Thus, a rather detailed vision of the effects of climate change is observed in Colombia, whereas in Guadeloupe there seems to be a global vision of the impacts. The detailed vision observed in Colombia shows a division in the concept of climate change, which enables the population to simplify it and access it, to implement strategies at an individual and social level. In Guadeloupe, the global vision favors institutional-like

strategies to face climate change. Indeed, looking for anchors (social, cultural, institutional or even historical) is the basis of an important stake in the study of the SRCC, because representations, collective memory and values play a critical role in the mediation of public policies (Baggio and Rouquette, 2006). In Guadeloupe, a socio-political anchoring (leaders, industrialists, etc.) of the SRCC is observed.

Indeed, the central issue of this phenomenon seems to be rooted in pre-existing and predominant socio-political problems, namely, the relations between the great neighboring powers or the relations with mainland France. The level of knowledge on this subject is very high, which also enables an overall grasp of the phenomenon, with people considering it as a global environmental problem, which cannot be treated in a fragmented way. Climate change is thus perceived as an issue, which needs to be dealt with collectively, and either personally or individually. The social representation is strongly formed, and the nature of its elements is more normative (with a low practical orientation) than functional (i.e. less prescriptive of behavior). Climate change in Colombia, in turn, seems to be objectified through the notion of pollution in general. The populations have appropriated this social object through the concept of pollution, which is a more practical and meaningful concept for them, maybe on the basis of analogical reasoning.

In any case, this simplified and more functional vision leads to the elaborating of strategies at a human scale to suggest types of behavior to be established regarding the phenomenon of climate change. Let us remember that social representation is not merely the reflection of reality, but functions as an interpretative system of reality organizing the relations between individuals and their environment and influencing their practices (Jodelet, 1993), and also that objectification enables the grouping of the sorted, selected, decontextualized and modified elements to adapt to the cultural and social context of the group (Rouquette and Rateau, 1998). Furthermore, an anchoring in pre-existing environmental and ecological problems is observed, with an affective dimension, and even a sacred vision of nature. This rather affective dimension has this functional aspect linked to it and which can imply the implementation of possible behavioral modifications.

In sum, our results show that there is no polemic social representation within these territories exposed to coastal risks. The hegemonic (dominant) representation is that of the anthropic cause of climate change, and for Guadeloupe, emancipated social representation is very present in speeches, with a fear of total submersion of the island. However, there is no discourse in favor of adaptation to climate change, but rather a rejection of responsibility on the government and the neighboring big powers (the USA and China). In the case of Guadeloupe, identity processes in relation to the threat posed by climate change (by possibly causing the disappearance of the island) lead to the implementation of identity strategies. Residents are fatalistic about this issue and see themselves as “incompetent” with a very weak sense of self-efficacy and no control over the situation. Furthermore, the identity strategies put into place are the rejection of the fault on others, the rejection of any possibility of action on their part and the phenomena of categorization of industrialists or governmental and international organizations perceived as being primarily responsible and of whom action will be demanded on climate change.

Regarding the elaboration process of the SRCC in the two countries, there are common anchors such as the depletion of the ozone layer, extreme weather events (climate change) and disasters (fires and floods), which support the hegemonic representation. In addition, there are specific anchors: for Cartagena, the SRCC is anchored in the pollution of the city

while in Guadeloupe (in Pointe à Pitre), it is rather anchored in sea pollution. Regarding objectification, several differences exist: for Cartagena, we note a personification of the planet, figuration in words (religious metaphors linked to divine punishment) and an ontologization of the object “climate change” (city waste, smoke, industrial pollution linked to the incompetence of institutions and corruption) while for Guadeloupe we note a personification of the sea (anger of the sea), little figuration, but an ontologization (gradually destroyed marine environment, coral destruction, abandonment of institutions linked to their remoteness and the size of their island, etc.).

In our study, the results found regarding Guadeloupe confirm those of [Moloney et al. \(2014\)](#) on social representations of climate change among non-scientists, which point out that notions related to adaptation to climate change are absent in the discourse of populations although they are exposed to extreme weather effects. The recent study by [Ferrari et al. \(2019\)](#) proposes to set up training courses adapted to the general public, which would bring the representation of climate change in populations closer to that of experts, to trigger behavior that adapts to the phenomenon. However, according to [Bonatti et al. \(2019\)](#), the absence of adaptive behavior can be explained by the fact that these populations do not associate their vulnerability to climate change because of the psychological barrier linked to a perception of risk, which hinders the implementation of adapted pro-environmental behaviors. [Chen's \(2019\)](#) work shows, however, that the concept of risk linked to climate change is emerging among populations, because of media coverage, and the fact that the influence of the media plays a large part in this SRCC. Other factors remain, such as psychological distance and behavioral intention, and are to be taken into account in research. Questions deserve to be addressed on the impact of the media on psychological distance and how to transform behavioral intention into effective behavior.

One of the limits of this research can be found in the characterization questionnaire, which presents only the descriptive and attributive aspects of climate change. A tool with other items (attitudes, for example) would have enabled access to a far wider representational field of climate change. Finally, in our study, media coverage seems to be higher in Guadeloupe than in Colombia: it might be interesting to compare the levels of media coverage of climate change in these two countries.

To conclude, this research enabled the exploration of the sphere of social representations of climate change in two territories exposed to coastal flooding risks. As [Sotirakopoulou and Breakwell \(1992\)](#) advise, this study combines quantitative and qualitative methods. The quantitative one provides that the social representation is almost identical for both sites (Colombia and Guadeloupe) and the qualitative methodology enabled us to identify more functional and affective elements and to show psychological, social and cultural anchoring of the climate change phenomenon, specific to each territory, whose functioning is organized from beliefs, opinions and attitudes.

This research is original because it highlights that residents living in two areas subject to the same geographic realities may not build the same social representation of the risk linked to climate change, and this could explain differences in risk perception or perceived vulnerability between these populations. This confirms the concept of systemic vulnerability and that local specificities must be considered in research concerning adaptation to the phenomenon of climate change.

These aspects seem relevant to enrich the reflections of public policies on the prevention and management of natural collective risks, as well as on the promotion of ecological behaviors. Indeed, these differences seem to be linked to identity processes and could be

informative, to improve political strategies and climate governance in each country by applying different instruments according to people's features, because of cultural diversity and different effects based on geographical conditions.

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Further reading

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