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The social construction of coastal risks in two different cultural contexts: A study of marine erosion and flooding in France and Canada

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The social construction of coastal risks in two different cultural contexts

In contemporary Western societies, coastlines are attractive and coveted spaces [1] and as such, are marked by a growing human presence: 40 per cent of the world's population now live within 100 kilometres of the coast [2]. Over time, this concentrated human activity has profoundly altered the functioning of this natural space both physically and culturally, and has given rise to numerous issues and challenges. It cannot be denied that behind the idyllic image of the coastline lies a myriad of issues and challenges that, when considered holistically, call into question people's lifestyles. The proliferation of human-pressure related coastal issues, that are also exacerbated by climate change [3], is a contributing factor in the emergence of numerous natural risks [4], coastal risks in particular. However, risk perceptions are not the same for everybody and vary according to what people value. In other words, how people perceive risk depends on the importance they place on the issue at stake. For example, property developers may see coastal territories as potential opportunities to develop multiple tourism infrastructures, environmentalists as a campaign cause against artificialization, fishers as a place of work, and citizens as a family holiday destination or a perfect retirement place.

This article sets out to gain a deeper understanding of sense of place and representations in the context of a coastal environment by focusing on its inhabitants and examining their representations of their living environment and the risks issues (that may or may not include coastal risk). Therefore, the objectives of this research are to study: 1) coastal community inhabitants' attachment (in the broadest sense of the word) to their living environment; 2) the representations of the risks issues, including or not coastal risk. To take into account the socio-cultural context in which these representations of place exist, an international quantitative (questionnaires) study was conducted in France and Canada. At the global level, most countries with coastal territories are affected by coastal risks (erosion and flooding), however, once this trickles down to the local level, each country is impacted differently because of the variation in how these risks are taken into account. This variability depends, among other things, on coastal usage, management and the national policies in force. One of the main differences lies in the inequalities between "rich" and "poor" countries, particularly in terms of financial resources [5-6]. The results of the research presented in this article are not based on the economic differences between France and Canada, but rather on their cultural differences as regards their approaches towards risk management. For example, the French government plays a major role in coastal risk management and has adopted a

protectionist stance (there has been heightened regulation since storm Xynthia (2010)) [7], whereas the Canadian government's involvement in coastal risk management is very low or non-existent (regulation is mainly liberal which transfers responsibility for the damage to the individual [8-9]. Both of these countries were chosen for the study as they provide good examples of the coastal risk issues faced by Western countries and portray two different national strategies used to combat such risks.

1. Coastal risks: marine erosion and flooding

1.1. A global issue

Climate change results in rising sea levels and an increase in the number of storms [3, 10], which makes coastal areas subject to a higher risk of marine erosion and flooding, or in other words, an increase of coastal risks [3]. Although these two hazards, which influence each other, are basically natural phenomena, human action also impacts their occurrence. Erosion, which is naturally wind- and/or wave-induced, can be exacerbated by human actions [11-12]. Similarly, coastal protection measures implemented locally to limit the effects of erosion, e.g. riprap, may have the opposite effect and accentuate it by destabilizing the hydro-sedimentary system [12-13]. This phenomenon is both global and local as these risks affect each coastal area differently depending on the coastal usage and the risk management, protection and prevention policies in place [5-6]. Numerous studies report the various consequences of coastal disasters in different countries around the world [e.g. [14], or see literature review on the global consequences of floods on human health [15]]. Another example is the company Maribus [16-17] created by Mareverlag publishers in Hamburg; this non-profit focuses on the state of the oceans and works in partnership with the International Ocean Institute (IOI) and the non-profit Ocean Science and Research Foundation (OSRF). Nevertheless, most studies describe local situations or individual cases [14], which make generalizations about the adaptation process [18] difficult because data are presented on a case-by-case basis. However, some researches have adopted international comparative approaches that take into account countries' local specificities. For example, in the ARTisticc project, researchers from various disciplines in the natural and human and social sciences have come together to examine adaptation to climate risks

among seven communities from seven different countries[1] [19-20]. This research shows how people from different geographical locations and cultural contexts face the phenomenon of coastal risks, and highlights how these different actions bring about different perceptions/representations of risk and adaptation strategies.

These diverse representations are not based on individual variables (age, gender, socio-economic status, etc.), but are subject to a social construction process that is linked to the cultural and local context. This may go some way to explaining why it is difficult to study perceptions and adaptations to coastal risks and why human factors are not always taken into account. This has influenced the conception of vulnerability in the natural sciences as the tendency is to focus on hazards and stakes and to define vulnerability in terms of the level of possible risk to infrastructure [21-22]. This also explains the dominance of technical management approaches towards coastal risk based on "hard" sea defences. However, these longstanding risk management systems have their limitations: their effectiveness and relevance from a geomorphological perspective of hazards [11-12] and from a social perspective [23] is questionable. When the social and cultural dimensions are omitted or minimized, this hinders the provision of sustainable solutions to enduring issues and calls for a more general discussion about a territory's vulnerability conditions.

1.2. Towards the study of systemic vulnerability

The conception of risk in the natural sciences has had a significant influence, both theoretically and practically. At the theoretical level, in the main risk research approach of the twentieth century, vulnerability was regarded as a component of risk [21-22, 24-25], referred to the ecosystem's sensitivity to hazards, and was expressed in terms of the level of possible risk to infrastructure. However, vulnerability, as it is understood in this paradigm, has clearly since been relegated to the background, partly because it is a polysemous term [26] that is difficult to grasp and operationalize. At the practical level, this approach has had a major impact on the management policies implemented to combat risk. For the most part, this has led to avoidance policies or hazard-focused policies in which risk management is a response to risk, its intensity, and its frequency [27]. However, when similar hazards have different consequences according to context and society, it is difficult to see how a purely

[1] In the Arctic circle: Wainwright in Alaska, Uummannaq in Greenland, Tiksi in Russia. In the temperate zone: Brest in France, Cocagne/Grande-Digue in Canada. In the tropics: Mbour in Senegal, Kanyakumari in India.

technical solution can be put forward as the only option. A failure to take into account human, economic and political dimensions is a limitation of the hazard-centred approach. In such circumstances, new approaches have emerged that more closely involve the social sciences to encourage a more global approach [21]. Thus, vulnerability is understood to be more than just a character attributed to infrastructures, territories, technical systems, etc., as it also becomes the capacity of societies to cope with disasters or deal with crisis situations [28]. Vulnerability has a new dimension. It is now dynamic, circulating, moving and transmitting. It refers to the possibility, or even capacity, of societies to generate, influence or withstand dangerous events [28]. Ultimately, the aim of this approach is to recognize vulnerability factors, or societal conditions, prior to the event that will increase or decrease a society's susceptibility to suffer damage [21]. This concept of vulnerability has fostered interdisciplinarity [22] or transdisciplinarity [20] and in doing so, paved the way for the development of different theoretical models.

1.3. Systemic vulnerability

The "systemic vulnerability" model deals with risk comprehensively by integrating natural and anthropogenic elements within a single system [29]. As such, hazards and vulnerability are no longer differentiated because hazards are considered to be a constituent element of the "vulnerability system". On this basis and inspired by the work of d'Ercole and et al.'s [21, 25], this interdisciplinary theoretical model was developed at the beginning of the 2000s in the context of research on coastal erosion and marine flooding risks [29]. Practically, this model comprises the following four main components, all of which interact with each other: hazards, issues, management and representations/perceptions [22, 30]. The term *hazards* relates to natural phenomena, sometimes influenced by human action, such as cliff erosion, breaching of dune ridges, and flooding; *issues* refers to persons and property exposed to hazards; *management* means, inter alia, public prevention, protection and crisis management policies, and sea defence systems; and *representations/perceptions* refers to awareness and memory of risk, uses of and attachment to exposed places, and knowledge of geographical areas, etc.

A feature of this model is that it includes an aspect that has not received much research attention, namely people's representations/perceptions [31-32] and it is through this approach that social psychology addresses these risks.

2. Social psychology approach to the study of coastal risks

Within systemic vulnerability, the "representations"[2] component, which is the focus here, aims to identify the physical, psychological, social and cultural factors that play a role in how individuals conceive risks [33-34]. Emphasis is placed on the context, living conditions, relationship to place and experience of risk, in other words, the role that the inhabitants' own life history plays in the construction of these representations [35-36]. All of these different factors enhance understanding of "perceived vulnerability", that is, people's assessment of risk situations and their capacity for social and individual responses.

As for risks, research on representations has found that the socio-cognitive elaboration of the risk serves the specific function of providing psychological protection against danger [37-38]. This social representational process enables individuals to symbolically integrate risk [39], which on a practical level, means that they can live with a risk in their living environment by constructing an acceptable risk representation [35-36] which they share with their local community they live in. Consequently, the links (meaning, attachment, etc.) that an individual builds with their community are very important in the process of the social construction of their living environment [40-42]. In this respect, place attachment [43-47] is an important variable in research on the construction of risk.

In the literature, place attachment is commonly defined as a positive emotional bond between an individual and their living place. However, there is some disagreement surrounding the dimensions of this concept and the tools for measuring it [43-44], and these different theoretical viewpoints have led to operational difficulties [40, 47-48]. For example, Hernandez and et al.'s (2007) showed that the concepts of attachment and place identity are sometimes considered as one and the same, sometimes as an element of the other, and sometimes as a dimension of the sense of place [49]. The ambiguity may partly explain why studies conducted within this framework have produced contradictory results: some authors have posited that people who show a strong link with their living place underestimate its potential risks [50-53].]. A local context in which inhabitants value their living environment for its natural aspects, tranquillity and amenities are all strong arguments for maintaining

[2] The use of the term "representation", and not "perception", is intentional. The concept of "representation" is not confined to an individual process linked to the senses. It refers to a long socio-cognitive work of social construction [37], a collective process of elaboration of a representation that will allow the individual to make sense of their environment and their practices.

154 this lifestyle. Other authors have suggested that a strong attachment may also lead to a
155 "better" consideration of risk, notably through the acceptance of individual responsibility
156 and the adoption of preventive and/or protective behaviours [43-44, 54]. These coastal risk
157 management-related protective and/or preventive behaviours, appear to be a significant
158 element in risk representations because, for the residents, coastal risks do not only involve
159 the hazards that threaten the issues, but also how these risks are managed [35]. Therefore,
160 the main place-related concept in this article covers both "place attachment" and more
161 generally "sense of place"(SOP), as defined by Jorgensen and Stedman (2006) and which
162 focuses on the relationship to a particular place in different aspects [46]. SOP includes
163 cognitive, affective and conative dimensions and is relevant to our study as it encompasses
164 place attachment, place identity, sense of community, rootedness and belonging. The
165 affective dimension deals with a person's emotional connection to a particular place and is
166 always present in the place attachment. Rootedness is a type of spatial anchoring often
167 expressed and reinforced by the length of residence, but also by memories,
168 intergenerational transmission and inheritance [55].
169 Coastal risks are natural risks that are territorialized (i.e. apply to specific areas only) and are
170 quite often non-tangible (i.e. do not occur on a daily basis or are not immediately visible in
171 the environment) [34, 36]. In this context, visibility still needs to be worked on; constructing
172 a representation makes the object visible. In this respect, communication plays a key role in
173 people's understanding of risk [39]. Therefore, it is thought that making coastal risks visible
174 helps them to emerge in the individual's representational universe and contributes to their
175 concrete expression in the living place. This visibility can potentially lead to changes in
176 people's attitudes and behaviour: how information is presented, disseminated and repeated,
177 and the communication channels used (different types of media, social networks,
178 interpersonal relationships, etc.) both have an impact on the visibility of the risk for the
179 individual and determine levels of engagement in prevention practices.
180
181 3. Research problematic and objective
182 The flow of people moving to the coast has intensified over the last few decades. In a
183 context marked by climate change, this demographic movement has led to a proliferation of
184 coastal issues: economic (e.g. preservation of the local economy through local activities such
185 as fishing and tourism), political (e.g. management of urban development, building permits),

social (e.g. gentrification, social diversity, preservation of businesses) or environmental (e.g. preservation of zones for endangered species).

Risk studies do not often take representation/perception into account despite it being a key element for gaining an understanding of these issues. Human behaviour can have an impact on hazards, and in turn hazards can have serious consequences for humans, a fact that places individuals at the heart of the coastal risk problematic. From an integrated management perspective, the present study proposes to examine the vulnerability of geographical areas and populations as a system. It is situated within the systemic vulnerability approach [22, 29] and more particularly the "representations" component of this approach. One of the aims of this component is to identify how people concerned by coastal risk collectively construct a representation of their living environment and how they perceive the risks in their surroundings. The present study is quantitative and was conducted in Canada and France. In Canada, the province of New Brunswick is particularly concerned by coastline retreat, with an estimated 70% marine erosion rate [56-57]. In metropolitan France, almost 22% of the coastline is retreating due to marine erosion, and 1.5 million inhabitants live in potential flood risk areas due to marine flooding.

Going into further detail, in France, the coastline is a highly urbanized area: the French National Institute of Statistics and Economic Studies (INSEE) census figures for 2017 showed that the average population density on the coast was 285 inhabitants per km², which is 2.5 times higher than the national average [58]. There is therefore a lot of pressure to build in these areas – it is three times greater than in the rest of metropolitan France. The attractiveness of coastal areas in today's world has created a coastal economy that is increasingly turned towards residential environments (shops, personal services, construction and public works) [59] and a rise in land prices that has consequences for socio-demographic distribution. According to France's national sea and coastline monitoring centre (ONLM), pensioners and people from the higher socio-professional classes are over-represented in these geographical areas compared with the national average. In terms of coastal risk, management is essentially the responsibility of local authorities (*collectivités*). This involves coastal land use planning and risk prevention plans (PPR). For coastal land use planning, current legislation includes the Coastal Law of 3 January 1986 that regulates and restricts coastal construction; the coastal zone management operational tools (PPRs) implemented in 1995 for the early prevention of the impacts of hazards on citizens and infrastructures and

for the establishment of action/prevention methods in at-risk *communes*. The Bachelot Law (2003) extends this Coastal Law by creating an obligation to inform future owners or tenants that a property is located in a PPR-designated risk zone. Furthermore, a European Directive requires the French government to assess and manage flood risks and maintain coastal protection work. All of this legislation formed the regulatory basis for risk management in France until the 2010 storm Xynthia [7, 60] that caused the deaths of several dozen people. As a consequence, different Circulars have since been issued to strengthen the perimeter of at-risk zones and to ramp up the implementation of PPR in the concerned *communes*. In the 2003 Circular, the national integrated coastal management strategy [61] advocated a paradigm shift by relocating the most exposed properties inland [62].

Currently, Canada's 243,000-km coastline is the longest in the world [63]. It is a highly urbanized area. The impact of climate change on these densely populated areas is a major concern [56]. In 2006, 23% of the population lived on the coast, mainly in the large cities. This coastline has gradually adapted to world trade [63] – a colonial inheritance, and is an essential part of the country's economy that has developed accordingly (urbanization and urban reconversion, port developments, etc.). This dynamism has enhanced these geographical areas, but they have also experienced negative consequences, especially at the environmental level (disappearance of beaches, more intense and frequent storms, destruction of coastal roads, etc.). Canada has set up national conservation programmes (e.g. the 2002 Canada National Marine Conservation Areas Act) as part of a general approach towards environmental protection, covering climate change in particular. Furthermore, in Canada, coastal territories and activities are managed by federal and provincial governments, each with their own specific areas of action. Coastal construction and urbanization are managed at the provincial level, thus considerably reducing the federal government's involvement in coastal risk management [56]. In New Brunswick, the provincial government actively became involved in a coastal space protection policy in the late 1990s (initiated in 1996 and finalized in 2002) with the particular objective of regulating construction activities. However, this policy is ineffective insofar as its application is at the discretion of local governments [64]. In addition, the policy is only applicable in municipalized *communes*. In reality, there are very few municipalized *communes*, so coastal territories in New Brunswick are managed by Local Service Districts (LSDs) which are decentralized provincial bodies with no administrative powers. As a result, property owners

250 are entirely responsible for the protection of their own properties, which considerably
251 increases the rate of coastal artificialization (e.g. riprap) as owners endeavour to protect
252 themselves and their properties [8, 13]. Local risk management approaches are also being
253 developed based mainly on associative and scientific networks. These networks are actively
254 involved in the management of erosion and flooding risks, in particular through
255 implementing information procedures and consultation activities for inhabitants and
256 stakeholders concerned by the risk [65]. These now popular approaches enhance knowledge
257 and raise awareness about risks and ultimately initiate practical risk prevention measures
258 and risk protection provisions [56].
259 The next section will present the study methodology and set out the results, highlighting
260 how respondents defined their living place and appropriated, identified and became
261 attached to it. The coastal risks problematic will then be examined in more detail, with a
262 focus on how this was evaluated in relation to other risks and how much attention
263 participants personally gave to this risk. We examine the individuals' level of concern and
264 the measures they implemented, as well as their assessment of the how the problematic is
265 collectively managed. Finally, we try to establish a link between assessment of the coastal
266 risk problematic and relationship with the living place.
267
268 ## 4. Methodology
269 ### 4.1. Fields of study
270 The study was carried out in coastal communities exposed to erosion and/or marine flooding
271 risks in Acadian communities in Canada in the province of New Brunswick (Grande-Digue and
272 Tracadie-Sheila), and in France in Brittany (Île-Tudy and Dieppe), and their surrounding
273 areas. The communities were chosen, in agreement with OSIRISC project researchers
274 (geomorphologists, geologists, economists, etc.), mainly because they are places that are
275 highly exposed to coastal hazards.
276 A survey was conducted among people likely to be concerned by coastal risks, including
277 individuals who did not necessarily live in one of the risk zones but may have been indirectly
278 impacted, notably through the implementation of protective and/or preventive measures.
279 The inclusion of these individuals meant that it was possible to carry out a comparative
280 analysis; all study respondents are likely to be concerned by coastal risks through local

281 management of protection or prevention measures, but not all would be exposed to coastal
282 risks. The study site characteristics are presented in Table 1.
283
284 Table 1. Study site characteristics

	Grande-Digue	**Tracadie-Sheila**	**Île-Tudy**	**Dieppe**
Geographical location	Southeastern New Brunswick	Northeastern New Brunswick	Brittany (South Finistère)	Normandy (North Seine-Maritime)
Surface area, density, inhabitants	46 km², 47 inhab/km², 2182 inhabitants, 53% permanent homes	6 km², 527 inhab/km², 3184 inhabitants, 62% permanent homes	1 km², 591 inhab/km², 745 inhabitants, 29% permanent residences	11.7 km², 2568 inhab/km², 29965 inhabitants, 90% permanent residences
Main economic activities	Tourism, exploitation of natural resources (agriculture, fishing, forestry, etc.)	Services (health, education, construction, etc.), fishing, agriculture, tourism	Tourism	Trade, transport and miscellaneous services
Coastal risks	Coastal flooding (surrounded by the sea and the Cocagne river) and erosion	Coastal flooding (surrounded by the Gulf of Saint Lawrence and the Tracadie and Petit-Tracadie rivers)	Dune erosion (5 km of beaches) and flooding of the polder (former peninsula)	Marine flooding (pebble beach, 11200 inhabitants concerned) and gradual erosion (chalk cliffs)
Preventive measures	No legal status to implement a coordinated risk management policy, which is the responsibility of the academic and nonprofit sectors	Study of risk areas by request of the municipality for urban development planning, investment by the academic community	Plans to construct a dyke behind the dune barrier, sand recharging of the dune barrier, publication of the *Plan Communal de Sauvegarde* (Emergency Action Plan)	Natural risk prevention plan for improved urban planning control

285 Note: Figures taken from INSEE and Statistics Canada.
286
287 4.2. Study population

Data collection consisted of 190 questionnaires, 94 in Canada (Grande-Digue, n=40 and Tracadie-Sheila, n=54) and 96 administered in France (Île-Tudy, n=43 and Dieppe, n=53), which were completed in full. At this stage of the survey, the quantitative questionnaire method was chosen to quantify the diversity of these points of view, a diversity which had already been identified in a qualitative exploratory stage of the survey. Table 2 lists the main respondent characteristics of the sample. It is important to note that the mean for the characteristic "average distance of the issue from the sea" was calculated from a sample containing individuals exposed to coastal risk as well as those concerned by it. Inclusion of "concerned" individuals therefore increased the average distance.

Table 2. Sample characteristics

	Canada	France	Total/Mean
Status			
Owner	83	62	145
Tenant	11	34	45
Type of residence (owners only)			
Main/Permanent	76	44	120
Secondary	7	18	25
Time lived in the commune (in years)			
Average	27	31	29
Presence or absence of a sea view			
Presence	47	26	73
Absence	47	70	117
Distance of the issue from the sea (in metres)			
Mean	921	1187	1054
Professional activity			
Working	68	65	133
Not working	28	29	57

4.3. Constructing and administering the questionnaire

The questionnaire was constructed on the basis of semi-structured interviews conducted during the exploratory research phase and as part of other research studies carried out on

303 the same topic [35]. It identified four main themes: lifestyle, life trajectory, place
304 relationship and coastal risks.
305 *Lifestyle* was intended to capture the following general data on residence and the resident:
306 *commune* of residence, length of residence, residence status (owner/non-owner), type of
307 residence (main/second home) and presence/absence of a sea view. *Life trajectory* aimed to
308 identify the reasons for choice of residence. Respondents answered one multiple choice
309 question by choosing their main reasons for living where they did (e.g., family, practicality,
310 environment). Past residential information (living by the sea) was also assessed. The
311 question also made it possible to study place rootedness and belonging in relation to Sense
312 of Place (SOP). *Place Relationship* was measured using a scale based on different items
313 drawn from coastal hazard research and previously used scales [46]. Jorgensen and
314 Stedman's conceptual model of SOP consists of three dimensions: place attachment, place
315 identity and place dependence. Place attachment concerns the measure of the emotional
316 bond between an individual and their living place ("I am very attached to my home"; "I
317 would feel very sad if I had to leave my home"). Place identity refers to how individuals
318 define themselves in relation to place ("Many things in this community bring back personal
319 memories"; "From the outside, this is a prestigious *commune*"; "This *commune* can easily be
320 recommended to tourists"). This dimension is related to social value which allows
321 inhabitants to distinguish themselves from the inhabitants of other places or *communes*
322 [66]. Place dependence means level of satisfaction with the uses offered by the place of
323 residence ("A large part of my life is organized around this *commune*"; "I have plans for the
324 future in this *commune*"). *Coastal risks* were examined through various questions that
325 measured the respondent's assessment of the potential for different risks to happen in the
326 *commune* (including coastal risks – erosion and/or flooding). This made it possible for us to
327 put a given risk into perspective in relation to other risks. Respondents were also questioned
328 about the following: direct or indirect experience of risk (flood or erosion for the former, and
329 observation, discussion between individuals, reading articles in the press and other sources
330 for the latter), level of involvement in the coastal risk problematic (concerned or not), level
331 of worry about risk of damage to one's home, actively seeking information and sources of
332 information and assessment of collective measures. The questionnaire ended with the
333 sociodemographic section: level of education, profession and family situation.
334

The questionnaires were administered between July and September 2018 for France and between May and July 2018 for Canada. The questionnaire took between 10 and 20 minutes to complete. It was mainly distributed online. For the dissemination, authors used their own local knowledge, the support of locally-based associations in the targeted geographical areas, and social networks (e.g. publication of the link on Facebook groups' news pages) to distribute the questionnaire in both countries. In addition, a few questionnaires were also distributed by post.

5. Results

The living place analysis results will be presented first, followed by a focus on how coastal risks were understood, and the section concludes by making a link between living place representations and coastal risks representations; representations are defined here as a social construction. The following tests were carried out: frequencies comparison test (Chi-square), means comparison tests when the data had a normal distribution (e.g. Student's-t) or non-parametric tests for non-normal distribution, and finally correlation calculations.

5.1. Relationship to living place

In line with the objectives, we set out to identify the lifestyles of the coastal populations surveyed, the "why" behind respondents' choice of residence, the residence characteristics of and the representations these populations had of their living place in terms of identification, attachment and place dependence.

5.1.1. Reasons for choice of residence

Based on the semi-structured interviews conducted during the exploratory phase of the study, different reasons emerged for choice of residence. These reasons were listed in one multiple choice question, where the respondents were asked to choose the main reason for living where they did from the following options: social value of the place, quality of life, place attachment, functional location, relaxation, the sea. Table 3 presents a comparison of the Canadian and French results in this regard.

Table 3. Reasons for choice of residence (frequency)

	Canada	France	Chi-squared test
Social valorization			
It's a good investment	22	13	ns
It's located in a highly reputable place	2	8	ns
Quality of life			
It offers security and tranquillity	**33***	21	p<.05
It's pleasant	43	38	ns
Rootedness and belonging			
I've always lived here	21	19	ns
It's close to my family	30	32	ns
It's a family inheritance	9	17	ns
I wanted to return to my community of origin	9	6	ns
Functionality			
It's well located (close to the town centre, shops, etc.).	39	33	ns
It's close to work	25	22	ns
It's practical	21	19	ns
Relaxation			
I wanted to spend my retirement here	**27***	11	p<.005
I wanted a holiday home	6	9	ns
Sea			
It's close to the sea	47	54	ns

Note: the numbers in bold and marked with an asterisk (*) correspond to significant over- or under-representations.

The results did not show many differences in reasons for choice of living place between France and Canada. The "sea" appears to have been the main reason in both countries because it was chosen by over half of the total number of respondents. However, the Canadian and French respondents differed on two aspects, namely the safety and tranquillity of the place ($\chi^2(1, N = 190) = 4.09$, $p = .04$) and choice of residence for retirement purposes ($\chi^2(1, N = 190) = 8.85$, $p = .003$). These two criteria were significant preferences for the Canadians.

5.1.2. Residence characteristics

There were several differences between the Canadian and French respondents in this respect. The Canadians were more likely to report having a sea view ($\chi^2(1, N = 186) = 6.31$, $p = .01$). However, this does not mean that they felt closer to the sea, because French respondents reported that they lived closer to the sea (M_{Canada} = 1187 metres, M_{France} = 921 metres; $U = 3916.5$, $p = .46$).

On the other hand, the Canadian homeowners outnumbered the French homeowners in the sample ($\chi^2(1, N = 184) = 12.19$, $p = .0005$). In addition, the Canadians were more likely to own their main residence ($\chi^2(1, N = 138) = 9.88$, $p = .002$). This result was consistent with the reasons for choice of residence because more Canadian respondents had chosen to live where they did during their retirement years and had therefore fully integrated into the place. More French respondents reported that they had always lived by the sea ($\chi^2(1, N = 186) = 5.43$, $p = .02$). We can therefore assume that their knowledge of the seaside had been built up over the long term. However, there was no difference in length of residence at current dwelling between the two countries (M_{Canada}=27 years, M_{France} = 32 years) ($t(184) = 1.69$, $p = .09$).

Finally, with regard to coastal risks, the Canadian respondents defined themselves as being in non-risk zones more than the French respondents ($\chi^2(2, N = 161) = 10.49$, $p = .005$). All these results are summarized in Table 4.

Table 4. Residence characteristics

	Canada	France	Tests
Sea view	**41***	26	p<.05
Perceived distance	1187 m	921 m	ns
Owners	**77***	31	p<.005
Main residence	**71***	44	p<.005
Lived all their life by the sea	39	58	p<.05
Residence in risk zone	**19***	**27***	
Residence outside risk zone	**65***	**38***	p<.01
Residence in a zone with unknown status	**3***	**9***	

Note: The numbers in bold and marked with an asterisk (*) correspond to significant over- or under-representations.

5.1.3. Relationship to living place: sense of place

Sense of place was measured through three dimensions: attachment, identity, dependence. The most significant result here was that all respondents reported a strong link; they are all very much attached to their living place (M_{Canada} = 5.52, M_{France} = 5.32; $t(188) = 1.25$, $p = .21$). This result can be found in other coastline studies [e.g. [32]].

However, there were a number of differences on some very specific dimensions. For example, Canadian respondents reported being more attached to their residence than French respondents (M_{Canada} = 5.84, M_{France} = 5.40; $U = 3616.5$, $p = .02$), and the results showed they would feel sadder if they had to leave (M_{Canada} = 5.89, M_{France} = 5.33; $U = 3483.5$, $p = .009$). However, the French respondents attached more importance to the prestige of the place than the Canadians (M_{Canada} = 4.91, M_{France} = 5.53; U=3625, p =. 02) (see Table 5).

Table 5. Sense of place

	Mean Canada	Standard deviation	Mean France	Standard deviation
Sense of place (global scale)	*5.52*	*1.09*	*5.32*	*1.13*
I'm very attached to my home	**5.84**	**1.48**	**5.40**	**1.50**
I'd feel very sad if I had to leave this coastal community	**5.89**	**1.59**	**5.33**	**1.70**
Many things in this coastal community bring back personal memories for me	5.53	1.85	5.31	1.98
From the outside, this is a prestigious coastal community	**4.91**	**1.81**	**5.53**	**1.60**
A large part of my life is organized around this coastal community	5.28	1.60	4.90	1.68
I have future plans in this coastal community	5.03	1.94	4.95	1.53
This coastal community can easily be recommended to tourists	6.14	1.26	5.83	1.51

Note: The means were calculated on a 7-point scale ranging from "not at all" (1) to "completely" (7). The figures in bold highlight significant differences.

The results therefore highlighted a strong relationship to living place among both populations, but there was more of a focus on the affective dimension in Canada, and on the prestigious dimension in France. Irrespective of location, we now look at what the surveyed populations thought about coastal risks.

5.2. Relationship to coastal risks

5.2.1. Assessment of risks in the *commune*

First, we tried to identify the importance of this problematic for the *commune* in comparison to other issues for Canadian and French respondents. It should be remembered that the survey was conducted on individuals both exposed to and concerned by coastal risks. Our objective was to study coastal risks whatever they may be, with erosion- and flooding-related risks being assessed together. The aim was to examine if individuals perceive that one of these risks may happen in their commune. The same is true for economic risks (closure of shops, etc.) or technological risks (industrial, chemical, etc.), etc. Table 6 lists their assessments.

Table 6. Assessment of risk issues for the *commune*

	Mean Canada	Standard deviation	Mean France	Standard deviation	Wilcoxon Signed Rank test
Coastal risks	**3.90**	**2.29**	**5.00**	**2.21**	**p<.001**
Economic risks	4.06	2.40	4.23	2.11	ns
Technological risks	**2.09**	**1.82**	**3.43**	**2.63**	**p<.005**
Health risks	2.12	1.94	2.29	1.95	ns
Natural risks (other)	**2.61**	**2.06**	**1.51**	**1.43**	**p<.00005**
Social risks	**2.52**	**1.86**	**3.21**	**1.56**	**p<.001**
Pollution risks	**2.23**	**1.87**	**3.35**	**2.07**	**p<.0001**

Note: The means were calculated on a 7-point scale ranging from "not at all" (1) to "completely" (7). The figures in bold highlight significant differences.

The results highlighted differences between the two countries in assessing these problematics. Thus, in France, coastal risks stood out significantly compared to other problematics (e.g. $M_{\text{Coastal risks}} = 5.00$, $M_{\text{Economic risks}} = 4.23$; Wilcoxon Signed Rank test, $Z = 6.13$, $p < .0001$). In Canada, economic risks ($M = 4.06$) and coastal risks ($M = 3.90$) were assessed almost identically (Wilcoxon Signed Rank Test, $Z = 0.24$, $p = .81$) and were both distinguished from other risks (e.g. $M_{\text{Coastal Risks}} = 3.9$, $M_{\text{Natural Risks}} = 2.61$; Wilcoxon Signed Rank test, $Z = 4.42$, $p < .0001$). In the comparison between the two countries, there was no difference in economic risk assessment ($U = 4408$, $p = .78$), but there was a difference in coastal risk assessment, with the French respondents' risk assessment being significantly higher ($M_{\text{Canada}} = 3.90$, $M_{\text{France}} = 5.00$; $U = 3201.5$; $p = .0005$). There were other differences between the two

447 countries in regard to what were considered to be lesser risks (technological, social and
448 pollution risks). All French respondents had a higher assessment of the probability that these
449 risks would appear in their *commune* than Canadian respondents.
450 Only "other natural risks" were considered higher by Canadian than French respondents
451 (M_{Canada} = 2.61, M_{France} = 1.51; $t(188) = 4.27$, $p = .00003$), who classed them as virtually
452 improbable. These other natural risks referred to fires, earthquakes, and so on.
453
454 5.2.2. Assessment of coastal risks
455 To measure how much general attention the surveyed populations paid to the issue of
456 coastal risks in particular, the respondents were questioned on several aspects of coastal
457 risks related to the following cognitive, affective and conative dimensions: involvement ("Do
458 they feel concerned or not?"), level of worry at the idea that their homes might undergo
459 damage, experience of these risks, potential to seek out information on the subject, and
460 confidence in local risk management.
461
462 The results showed no distinction between France and Canada. The respondents felt
463 moderately concerned by coastal risks (M_{Canada} = 4.59, M_{France} = 4.31; $U = 334.5$, $p = .47$) and
464 not very worried by them (M_{Canada} = 2.89, M_{France} = 2.86; $U = 3547$, $p = .86$). Nevertheless,
465 only 29% of those surveyed said that they "lived in a risk zone" (see Table 7).
466
467 Table 7. Number of people according to perceived risk zone (frequency)

	In risk zone	Outside risk zone	No comment
Canada	19	65	10
France	27	38	31

468
469 We therefore decided to carry out this inter-country comparison according to perceived risk
470 zone (see Table 8).
471
472 Table 8. Attention paid to coastal hazards according to perceived risk zone

Canada			France		
In risk zone	Outside risk zone	No comment	In risk zone	Outside risk zone	No comment

Concerned						
Mean	5.53	4.48	2.40	5.48	3.53	4.18
Standard deviation	1.61	2.36	2.07	1.70	2.45	2.17
Worried about issues						
Mean	5.42	2.17	2.60	3.67	2.39	2.63
Standard deviation	1.54	1.63	1.14	1.78	1.87	1.75

Note: The means were calculated on a 7-point scale ranging from "not at all" (1) to "completely" (7).

The results differed according to the risk zone regardless of country. In both France and Canada, inhabitants who reported living "in a risk zone" (M_{Canada} = 5.53, M_{France} = 5.48) felt significantly more concerned than those who reported living "outside a risk zone" (M_{Canada} = 4.48, M_{France} = 3.53) and those who did not express an opinion (M_{Canada} = 2.40, M_{France} = 4.18). While this latter result for France was quite high, it did not significantly differ from the result for Canada (M_{Canada} = 2.40, M_{France} = 4.18; U = 21.5, p = .14). There was also no significant difference between the two countries according to risk zone.

As for the level of worry about issues, which was previously considered to be low, the results differed significantly between the two countries. In France, respondents were slightly worried, regardless of the housing zone, although those who reported living in a risk zone differed slightly from the other inhabitants (Kruskal-Wallis test, H(2, N = 81) = 9.82; p = .007). In Canada, on the other hand, those who reported living in a risk zone clearly stood out from those who reported living outside a risk zone and those who did not express an opinion (Kruskal-Wallis test, H(2, N = 89) = 32.91, p < .0001). This level of worry from inhabitants living in risk zones clearly differed between French (M = 3.67) and Canadian (M = 5.42) respondents (U = 116, p = .002).

Despite the fact that almost a third of the study population lived in at-risk areas, their direct experience of an erosion or flooding episode was low. Only 9 out of the 190 respondents reported having been concerned by this type of hazard. Indirect experience (measured by people who reported having heard/seen something in their *commune* or read in the press about coastal hazard-related events) was higher (see Table 9). However, this indirect experience did not differ between the Canadian and French respondents (χ^2(2, N = 190) = 1.36, p = .51).

Table 9. Direct/indirect experience of risks (frequency)

	Canada	France	Total
Direct experience	5	4	9
Indirect experience	56	65	121
No comment	33	27	60
Total	94	96	190

Regarding attention paid to coastal hazards, there was no difference between type of experience (direct/indirect) and feeling more or less concerned by this problematic ($M_{\text{Indirect exp.}}$ = 4.81, $M_{\text{Direct exp.}}$ = 6.1; U = 12.5, p = .67). In contrast, the level of concern about the problematic varied ($M_{\text{Indirect exp.}}$ = 2.85, $M_{\text{Direct exp.}}$ = 5.11; U = 1.5, p = .05), and the level of concern was higher among Canadian respondents. Moreover, the Canadians reported more individual protection measures than the French respondents ($\chi^2(1, N = 190) = 7.18$, p = .007) (see Table 10). These measures included, for example, raising electrical or heating installations above water, raising floor levels, installing water-resistant materials, making an opening in the roof to facilitate evacuation, creating a refuge area inside the residence and installing anti-flooding devices and non-return valves. However, the number of measures put in place did not vary between the two countries. Twenty-nine Canadian respondents reported having put in place 48 individual measures, and 14 French respondents reported having put in place 22 individual measures.

Table 10. Implementation (or not) of individual protection measures against coastal hazards (frequency)

	Canada	France	All Grps
Have not put in place individual measures	65	82	147
Have put in place individual measures	29	14	43
Total	94	96	190

The respondents were also surveyed on coastal risk management. They were asked questions about their level of trust in the management institutions and their opinion on collective actions.

On the question of collective actions, the respondents were asked to assess the effectiveness of several actions out of a list of actions usually implemented at the collective level to limit the impact of flooding and/or marine erosion. The results are presented in Table 11.

Table 11. Assessment of the effectiveness of collective measures

	Canada Mean	Standard deviation	France Mean	Standard deviation
Strengthening of protective systems	4.59	1.65	4.92	1.82
Construction of protective systems/structures	4.40	1.80	4.89	1.76
Housing demolition and retreats	**5.14**	1.75	**4.20**	2.12
Dune strengthening, rehabilitation and restoration	5.91	1.33	5.48	1.60
Alert and evacuation when the risk arises	5.35	1.67	5.49	1.70
Non-construction areas in risk zones	6.38	1.30	5.85	1.87
Beach recharge (sandy beaches)	4.62	2.05	4.18	2.28
Reopening of land to the sea	3.14	1.85	3.57	2.16
Knowledge of safety precautions	5.23	1.61	5.45	1.71
Improvement of crisis management procedures	5.39	1.38	5.39	1.60

Note: The means were calculated on a 7-point scale ranging from "not at all" (1) to "completely" (7). The figures in bold highlight significant differences.

The effectiveness of measures was judged to be more or less equal in France and Canada, with the exception of housing demolition and retreats, a measure deemed to be significantly more effective by Canadian than the French respondents (U = 1516, p = 0.01). It should be noted that this measure had already been implemented in Canada. Contrary to popular belief, the building of permanent structures or the strengthening of these structures was not deemed to be particularly effective.

Finally, respondents were asked about their level of trust in the people or institutions likely to be concerned by such management (see Table 12).

Table 12. Degree of trust in the persons/institutions responsible for coastal risk management

	Canada Mean	Standard deviation	France Mean	Standard deviation	Wilcoxon Signed Rank test

Local non-profit associations	**5.49**	**1.49**	**4.60**	**2.00**	**p<.05**
Scientists	5.99	1.38	5.66	1.69	ns
Municipality	4.82	1.63	4.46	1.93	ns
State/Federal government	**4.43**	**1.72**	**3.25**	**1.84**	**p<. 0005**
Insurance companies	**3.81**	**1.71**	**3.03**	**1.62**	**p<.01**
You	**5.46**	**1.51**	**4.54**	**1.43**	**p<. 0005**
Permanent residents	4.67	1.72	4.52	1.59	ns
Second-home residents	**4.08**	**1.89**	**3.33**	**1.74**	**p<.05**
Region	**4.70**	**1.62**	**4.10**	**1.73**	**p<.05**
Province	4.09	1.88	4.13	1.77	ns

Note: The means were calculated on a 7-point scale ranging from "not at all" (1) to "completely" (7). The figures in bold highlight significant differences.

Overall, in Canada, respondents placed their trust in local non-profit associations, scientists and themselves, in short, the people or institutions involved in day-to-day risk management in Canada. This result was significant and was clearly/significantly differentiated for scientists (e.g. Associations/Scientists; Wilcoxon Signed Rank Test, $Z = 2.78$, $p = .005$). In France, scientists were also trusted sources of information and were differentiated from all other institutions (e.g. Associations/Scientists; Wilcoxon Signed Rank Test, $Z = 3.54$, $p = .0004$). Overall, the level of trust was greater in Canada than in France ($M_{Canada} = 4.75$, $M_{France} = 4.16$; ANOVA Wilks, $F(10, 93) = 5.51$, $p < .0001$).

In summary, as regards coastal risks, the results showed that in Canada, respondents reported being just as concerned as their French counterparts as regards risk management, especially if they lived in a risk zone. However, there were differences in the levels of concern about the possibility of sea damage to residences, with respondents from Canada living in risk zones expressing the greater concern. Although almost a third of the surveyed population stated that they lived in a risk zone, any direct experience of erosion or flooding was rare. This did not, however, prevent the respondents in both France and Canada from putting in place individual protection measures. The effectiveness of collective measures was judged to be fairly good overall, but the demolition and retreat of dwellings was not considered a popular measure in France. Finally, while the respondents in France were generally more cautious about placing their trust in any institutions, those in Canada fully

566 trusted local actors such as local non-profit associations and scientists who were very active
567 in the field as well as themselves.
568
569 However, this way of constructing a representation of risk (a problematic classed as greater
570 for the *commune* in which the respondent lived than for other *communes*) was not linked to
571 the respondent's relationship with their living place. It was linked instead to the culture of
572 risk, which the management methods (e.g. the role of the government) depended on, such
573 as it was anchored in both countries.
574
575 5.3. Living environment and risks
576 5.3.1. Sense of place and assessment of coastal risks
577 An analysis of the correlations between the different items measuring "sense of place" and
578 the "assessment of risk in the *commune"* showed strong associations between the
579 dimensions of relationship to place on one hand, and assessment of risk on the other.
580 However, there was no association between this relationship to place and the assessment of
581 coastal risk (see Table 13).
582
583 Table 13. Correlations between the assessment of coastal risk and relationship to place

	Canada								France							
	CR issue	Attached	Sad	Memory	Prestige	Life	Projects	Tourist	CR issue	Attached	Sad	Memory	Prestige	Life	Projects	Tourist
CR issue	1.00								1.00							
Attached	0.12	1.00							0.08	1.00						
Sad	-0.20	***0.61***	1.00						-0.10	***0.37***	1.00					
Memory	-0.15	***0.34***	***0.49***	1.00					0.02	***0.27***	***0.58***	1.00				
Prestige	0.05	***0.43***	***0.44***	***0.41***	1.00				0.04	***0.27***	***0.44***	***0.38***	1.00			
Life	-0.13	0.20	***0.32***	***0.31***	***0.28***	1.00			0.04	0.05	***0.41***	***0.31***	***0.36***	1.00		
Projects	-0.05	***0.22***	***0.44***	***0.26***	***0.24***	***0.51***	1.00		0.04	0.16	***0.59***	***0.34***	***0.31***	***0.58***	1.00	
Tourist	0.00	***0.24***	***0.30***	***0.23***	***0.41***	0.15	***0.21***	1.00	0.13	0.13	***0.46***	***0.44***	***0.51***	***0.38***	***0.40***	1.00

584 Note: the items in this table concern the dimension of "sense of place" (cf. table 5) and the issue of coastal risks (CR issue; cf. table 6).
585
586 Furthermore, the link between assessment of coastal risk and risk zone showed that the
587 assessment of the issue was not influenced by the fact of living inside or outside a risk zone
588 but by the different way in which this problematic was considered within each country, as
589 already shown (5.2.1. Assessment of risks in the *commune*). The analysis of variance

conducted to measure the assessment of this problematic according to declared risk zone and country highlights this result (see Table 14).

Table 14. Analysis of variance of the coastal risks problematic assessment according to country and residential area

	Sum of squares	Degrees of freedom	Mean square	F	P
Country	41.55	1	41.55	8.15	p<.005
Risk zone	22.12	1	22.12	4.34	p<.05
Country* Risk zone	0.20	1	0.20	0.04	ns
Error	739.07	145	5.10		

Moreover, there were almost no significant differences in the assessments of the risks problematic in the results for the place variables. Thus, having a sea view did not affect this assessment either overall (U = 3807, p = .61) or by country, nor did it affect either the reasons for choice of place of residence dictated by the sea (U = 3830.5, p = .08), or being an owner or non-owner (U = 3135.5, p = .90), or type of residence (permanent or second-home) (U = 1110.5, p = .23). The experience of living by the sea, which was different for the respondents in France and in Canada (see 5.1.2. residence characteristics), did not vary overall, but it did differ among respondents in Canada who had not always lived by the sea (U = 740, p = .04). Finally, assessing this problematic according to distance or number of years of residence did not appear to be very informative. In Canada, there was no positive correlation, and in France, the result was self-evident, that is, the greater the distance from the sea, the lower the assessment of the coastal risks problematic.

6. Discussion and interpretation of results

In recent decades, population density in coastal territories has increased and there has been a corresponding boom in economic activity. These coastal areas have become increasingly artificialized, whether through the development of tourist infrastructures or the rise in second homes [4]. In a context marked by climate change, evidenced among other things by rises in sea levels [3], these areas are subject to new adaptation challenges [18-19]. Coastal risks (flooding and erosion) are a major issue, affecting different sections of society,

including the economic (e.g. maintenance of the tourist offer), political (e.g. management of urbanization and risks) and civil (e.g. users and inhabitants of these areas) sectors.

Although the human factor is a key element, it is often neglected in risk studies [e.g. [21-22]]. However, from an integrated management perspective, a person-centred approach is recommended as it places the populations impacted the most by these risks (the inhabitants themselves) at the very heart of the system. Because they know their living environment, they have valuable local knowledge and experience to combat these risks, and ultimately leading to a better management of the risk itself [19]. It is in this context that we focus on the social construction of the living environment, paying particular attention to the psycho-social and cultural aspects that could influence this construction [33, 35-37]. Drawing on a psycho-social approach, the objective of this study was therefore to understand respondents' (including those concerned by these risks) representations of their living environment, the sense of place (including coastal risks) in different cultural contexts. In order to do this, surveys were conducted in two Western countries (France and Canada) that are both impacted by coastal risks. Results highlighted both theoretical and practical implications.

6.1. Theoretical implications: Studying the social construction of risks

The main focus was on the inhabitants' representations of their living environment (see 5.1.3. Relationship to living place: sense of place). The results showed that this living environment was described in a highly positive way by the respondents, who considered it to be a very pleasant living environment. These results are commonly found in coastline studies [31, 53, 67]. It became apparent that in both countries, the sea was the main reason for their choice of living place and therefore a central element in the respondents' residential environment, and that the environmental amenities contributed to the attractiveness and uniqueness of these coastal areas. The respondents' attitudes towards their coastal living environment was consistent with the widespread view of this type of environment as an "object of attractiveness" [55] or a prestigious object, a value that seemed to be particularly important in France. This place enhancement can contribute to the construction of an individual's identity because individuals are influenced by their spatial belonging [66, 68-69]. The results also revealed the affirmation of a positive sense of place,

and particularly a positive environmental identity, in Brittany (France) and in New Brunswick (Canada).

We assumed that it was highly probable that representations of coastal risks were related to this particular relationship to living environment, because place of residence is an important anchorage point for individuals and because it plays a protective function psychologically speaking as a protection against outside threats [47]. Representing a risk, whatever it may be, allows the individual to symbolically "control" it and protect themselves from it [38-39]. The results of this study highlight an ambivalence in the representation of these risks. While respondents from both Canada and France reported being equally concerned by risks and their management, those from Canada appeared to be much more worried about these risks, more so if they lived in a risk zone. However, for the assessment of local issues (5.2.1. Assessment of risks in the *commune*), coastal risk, in relation to other issues, was considered more important in France than in Canada. It is highly likely that the difference in risk management and the media coverage of this issue influenced the construction of these representations because no direct association was identified between place relationship and coastal risk assessment. In France, extensive media coverage of flooding phenomena (particularly since storm Xynthia in 2010 [7]) may explain why respondents assess the coastal risk problematic to be a high-risk issue for their *commune*. The representation of a risk is constructed in interpersonal relations, but also in media communication [39]. In France, coastal risks are a socially situated object in public discussions, and their representation depends on their inclusion in a set of sometimes highly conflictual social relations. Therefore, risk management in all of these aspects (choice of defence strategies, funding measures, etc.) has become a central point in coastal risk communications [69].

As a result, the assessment of the issue was not influenced by whether or not respondents lived inside or outside a risk zone, but by whether or not they felt concerned by coastal risks. As this construction is collective and not individual, it is a reflection of the current climate of opinion and the majority views on coastal risks in a particular place [37]. Consequently, the social context helps to shape the image of coastal risks and individual outlooks. Our results have shown that coastal risks are assessed as a more important issue in France than in Canada because in France, the issue is widely discussed and debated in the social arena, while in Canada the social debate is more focused on climate change and coastal risk is included in the broader issue of climate change [e.g. [57, 70-71].

679 Taking into account the cultural context means that individual outlooks can be put into
680 perspective. The results of the present study show that there is no direct link between place
681 attachment and concern about coastal risks. However, by studying the living environment
682 representation, the importance of local issues becomes apparent. As this approach takes
683 into account the local context, it can give meaning to individual local discourses and
684 behaviours by relativizing the issues compared to others issues.
685
686 6.2. Practical implications: local specificities and local implications in risk management
687 In both Canada and France, the risk management systems in place seem to be indicative of
688 the cultural model in place. For example, in France, coastal risks are managed by the
689 *commune* because under the current regulations, it is the government's responsibility to
690 implement risk management and prevention measures; prevention plans and urbanisation
691 controls on coastal territories are the concrete expression of the collective management of
692 these risks. In Canada, the cultural model of risk management appears to be influenced by
693 the Liberal North American model which emphasizes individual responsibility. As mentioned
694 in the introduction, as coastal risk management is relegated to the provincial government in
695 municipalized communes, there is minimal involvement from the Canadian government.
696 However, in the absence of *commune* municipalization, the coastal territories in New
697 Brunswick are managed by Local Service Districts which have no administrative power [8,
698 13]. As a result, inhabitants manage the risks themselves with the support of local non-profit
699 associations and scientists [70-71], and this is reflected in the results regarding confidence in
700 these institutions. In practice, this is manifested by an individual who manages their own
701 land and risks as they see fit.
702 These distinct modes of risk management help to put risks in perspective. It could explain
703 why Canadian respondents are more worried (because they are individually responsible for
704 risks) than French respondents about coastal risks, along with the results concerning the
705 implementation of individual measures (e.g., the effectiveness of the measure of "housing
706 demolition and retreats", a measure deemed to be more effective by the respondents in
707 Canada than in France). In France, the government's interventionist policies symbolically
708 "protect" French people from risk, whereas in Canada, individualistic policies mean that
709 owners must take responsibility for risk management [8, 13, 70].

This study also shows the relevance of adopting a social construction-based approach to risk. In France and Canada the physical risk (hazard) remains the same, however, it is constructed differently in terms of representation and emotion (worry). These differences stem from the cultural context (particularly in terms of an individual's responsibility towards risk) and the local context (interpersonal relationships and media communications). Previous studies [72-73] have shown these differences in representations between "individualist" (e.g. the United States) and "collectivist" countries (e.g. Japan). France's values are not based on collective values, but its insurance system remains embedded in a "protectionist" system in which post disaster responsibility is societal and not individual. As representations are linked to practices, studying representations enhances our understanding of the choice of prevention and/or protection strategies and offers ways to optimize risk management by taking into account inhabitants' opinions (e.g. an awareness campaign).

6.3. Limits and perspectives

In conclusion, these results do not mean that an individual's relationship with their living place (in its emotional and identity dimensions) is not an important factor in the construction of coastal risks, but our results do not show a direct link between the two. We have primarily taken into account the evaluation of this problematic in comparison with others local issues in this study, but we have not directly examined prevention behaviours or intentions to act. Castro et al.'s (2010) study revealed that a high degree of place attachment can be accompanied by "better" individual consideration of risk through the acceptance of individual responsibility and the adoption of preventive and/or protective behaviour [54]. Our results tend to show that it is the interaction between these different factors that further explains the construction of this representation of coastal risks. Many determinants influence relationships to risks [19-20], so one factor alone cannot explain how the former can be modulated. This observation shows the importance of adopting a systemic approach to vulnerability [22].

One of the limitations of this study relates to respondent recruitment. Examining coastal risks means that geographic limits must be imposed on the respondents affected by the risks. The parent population is therefore necessarily small because not every coastal municipality is affected by a coastal risk. In these municipalities, it is necessary to find people exposed to coastal risks whose parent population is even smaller. This explains the small size

742 of our sample. Currently, a new interdisciplinary approach towards the concept of
743 vulnerability is developing a series of monitoring indicators for the four components of
744 systemic vulnerability [22]: hazards, stakes, management and representations. These
745 indicators are precursors of an integrated observatory that will act, inter alia, as a source of
746 data for research. For the component “representations”, the observatory sets out to
747 measure the evolution of representations over the long term. This may overcome the
748 problem of recruiting respondents by allowing the continuous dissemination of an online
749 questionnaire.
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