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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

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

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

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

39

## 40 1. Coastal risks: marine erosion and flooding

### 41 1.1. A global issue

42 Climate change results in rising sea levels and an increase in the number of storms [3, 10],  
43 which makes coastal areas subject to a higher risk of marine erosion and flooding, or in other  
44 words, an increase of coastal risks [3]. Although these two hazards, which influence each  
45 other, are basically natural phenomena, human action also impacts their occurrence.  
46 Erosion, which is naturally wind- and/or wave-induced, can be exacerbated by human  
47 actions [11-12]. Similarly, coastal protection measures implemented locally to limit the  
48 effects of erosion, e.g. riprap, may have the opposite effect and accentuate it by  
49 destabilizing the hydro-sedimentary system [12-13]. This phenomenon is both global and  
50 local as these risks affect each coastal area differently depending on the coastal usage and  
51 the risk management, protection and prevention policies in place [5-6]. Numerous studies  
52 report the various consequences of coastal disasters in different countries around the world  
53 [e.g. [14], or see literature review on the global consequences of floods on human health  
54 [15]]. Another example is the company Maribus [16-17] created by Mareverlag publishers in  
55 Hamburg; this non-profit focuses on the state of the oceans and works in partnership with  
56 the International Ocean Institute (IOI) and the non-profit Ocean Science and Research  
57 Foundation (OSRF). Nevertheless, most studies describe local situations or individual cases  
58 [14], which make generalizations about the adaptation process [18] difficult because data  
59 are presented on a case-by-case basis. However, some researches have adopted  
60 international comparative approaches that take into account countries' local specificities.  
61 For example, in the ARTisticc project, researchers from various disciplines in the natural and  
62 human and social sciences have come together to examine adaptation to climate risks

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

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

80

### 81 1.2. Towards the study of systemic vulnerability

82 The conception of risk in the natural sciences has had a significant influence, both  
83 theoretically and practically. At the theoretical level, in the main risk research approach of  
84 the twentieth century, vulnerability was regarded as a component of risk [21-22, 24-25],  
85 referred to the ecosystem’s sensitivity to hazards, and was expressed in terms of the level of  
86 possible risk to infrastructure. However, vulnerability, as it is understood in this paradigm,  
87 has clearly since been relegated to the background, partly because it is a polysemous term  
88 [26] that is difficult to grasp and operationalize. At the practical level, this approach has had  
89 a major impact on the management policies implemented to combat risk. For the most part,  
90 this has led to avoidance policies or hazard-focused policies in which risk management is a  
91 response to risk, its intensity, and its frequency [27]. However, when similar hazards have  
92 different consequences according to context and society, it is difficult to see how a purely

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<sup>1</sup> 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.

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

106

### 107 1.3. Systemic vulnerability

108 The "systemic vulnerability" model deals with risk comprehensively by integrating natural  
109 and anthropogenic elements within a single system [29]. As such, hazards and vulnerability  
110 are no longer differentiated because hazards are considered to be a constituent element of  
111 the "vulnerability system". On this basis and inspired by the work of d'Ercole and et al.'s [21,  
112 25], this interdisciplinary theoretical model was developed at the beginning of the 2000s in  
113 the context of research on coastal erosion and marine flooding risks [29]. Practically, this  
114 model comprises the following four main components, all of which interact with each other:  
115 hazards, issues, management and representations/perceptions [22, 30]. The term *hazards*  
116 relates to natural phenomena, sometimes influenced by human action, such as cliff erosion,  
117 breaching of dune ridges, and flooding; *issues* refers to persons and property exposed to  
118 hazards; *management* means, inter alia, public prevention, protection and crisis  
119 management policies, and sea defence systems; and *representations/perceptions* refers to  
120 awareness and memory of risk, uses of and attachment to exposed places, and knowledge of  
121 geographical areas, etc.

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

125

126 2. Social psychology approach to the study of coastal risks

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

134 As for risks, research on representations has found that the socio-cognitive elaboration of  
135 the risk serves the specific function of providing psychological protection against danger [37-  
136 38]. This social representational process enables individuals to symbolically integrate risk  
137 [39], which on a practical level, means that they can live with a risk in their living  
138 environment by constructing an acceptable risk representation [35-36] which they share  
139 with their local community they live in. Consequently, the links (meaning, attachment, etc.)  
140 that an individual builds with their community are very important in the process of the social  
141 construction of their living environment [40-42]. In this respect, place attachment [43-47] is  
142 an important variable in research on the construction of risk.

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

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<sup>2</sup> 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),



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

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

202 Going into further detail, in France, the coastline is a highly urbanized area: the French  
203 National Institute of Statistics and Economic Studies (INSEE) census figures for 2017 showed  
204 that the average population density on the coast was 285 inhabitants per km<sup>2</sup>, which is 2.5  
205 times higher than the national average [58]. There is therefore a lot of pressure to build in  
206 these areas – it is three times greater than in the rest of metropolitan France. The  
207 attractiveness of coastal areas in today’s world has created a coastal economy that is  
208 increasingly turned towards residential environments (shops, personal services, construction  
209 and public works) [59] and a rise in land prices that has consequences for socio-demographic  
210 distribution. According to France’s national sea and coastline monitoring centre (ONLM),  
211 pensioners and people from the higher socio-professional classes are over-represented in  
212 these geographical areas compared with the national average. In terms of coastal risk,  
213 management is essentially the responsibility of local authorities (*collectivités*). This involves  
214 coastal land use planning and risk prevention plans (PPR). For coastal land use planning,  
215 current legislation includes the Coastal Law of 3 January 1986 that regulates and restricts  
216 coastal construction; the coastal zone management operational tools (PPRs) implemented in  
217 1995 for the early prevention of the impacts of hazards on citizens and infrastructures and

218 for the establishment of action/prevention methods in at-risk *communes*. The Bachelot Law  
219 (2003) extends this Coastal Law by creating an obligation to inform future owners or tenants  
220 that a property is located in a PPR-designated risk zone. Furthermore, a European Directive  
221 requires the French government to assess and manage flood risks and maintain coastal  
222 protection work. All of this legislation formed the regulatory basis for risk management in  
223 France until the 2010 storm Xynthia [7, 60] that caused the deaths of several dozen people.  
224 As a consequence, different Circulars have since been issued to strengthen the perimeter of  
225 at-risk zones and to ramp up the implementation of PPR in the concerned *communes*. In the  
226 2003 Circular, the national integrated coastal management strategy [61] advocated a  
227 paradigm shift by relocating the most exposed properties inland [62].  
228 Currently, Canada's 243,000-km coastline is the longest in the world [63]. It is a highly  
229 urbanized area. The impact of climate change on these densely populated areas is a major  
230 concern [56]. In 2006, 23% of the population lived on the coast, mainly in the large cities.  
231 This coastline has gradually adapted to world trade [63] – a colonial inheritance, and is an  
232 essential part of the country's economy that has developed accordingly (urbanization and  
233 urban reconversion, port developments, etc.). This dynamism has enhanced these  
234 geographical areas, but they have also experienced negative consequences, especially at the  
235 environmental level (disappearance of beaches, more intense and frequent storms,  
236 destruction of coastal roads, etc.). Canada has set up national conservation programmes  
237 (e.g. the 2002 Canada National Marine Conservation Areas Act) as part of a general approach  
238 towards environmental protection, covering climate change in particular. Furthermore, in  
239 Canada, coastal territories and activities are managed by federal and provincial  
240 governments, each with their own specific areas of action. Coastal construction and  
241 urbanization are managed at the provincial level, thus considerably reducing the federal  
242 government's involvement in coastal risk management [56]. In New Brunswick, the  
243 provincial government actively became involved in a coastal space protection policy in the  
244 late 1990s (initiated in 1996 and finalized in 2002) with the particular objective of regulating  
245 construction activities. However, this policy is ineffective insofar as its application is at the  
246 discretion of local governments [64]. In addition, the policy is only applicable in  
247 municipalized *communes*. In reality, there are very few municipalized *communes*, so coastal  
248 territories in New Brunswick are managed by Local Service Districts (LSDs) which are  
249 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

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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

	<b>Grande-Digue</b>	<b>Tracadie-Sheila</b>	<b>Île-Tudy</b>	<b>Dieppe</b>
<i>Geographical location</i>	Southeastern New Brunswick	Northeastern New Brunswick	Brittany (South Finistère)	Normandy (North Seine-Maritime)
<i>Surface area, density, inhabitants</i>	46 km <sup>2</sup> , 47 inhab/km <sup>2</sup> , 2182 inhabitants, 53% permanent homes	6 km <sup>2</sup> , 527 inhab/km <sup>2</sup> , 3184 inhabitants, 62% permanent homes	1 km <sup>2</sup> , 591 inhab/km <sup>2</sup> , 745 inhabitants, 29% permanent residences	11.7 km <sup>2</sup> , 2568 inhab/km <sup>2</sup> , 29965 inhabitants, 90% permanent residences
<i>Main economic activities</i>	Tourism, exploitation of natural resources (agriculture, fishing, forestry, etc.)	Services (health, education, construction, etc.), fishing, agriculture, tourism	Tourism	Trade, transport and miscellaneous services
<i>Coastal risks</i>	Coastal flooding (surrounded by the sea and the Cogue 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)
<i>Preventive measures</i>	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 <i>Plan Communal de Sauvegarde</i> (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

## The social construction of coastal risks in two different cultural contexts

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

297

298 Table 2. Sample characteristics

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

299

### 300 4.3. Constructing and administering the questionnaire

301 The questionnaire was constructed on the basis of semi-structured interviews conducted  
 302 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

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

342

## 343 5. Results

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

350

### 351 5.1. Relationship to living place

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

356

#### 357 5.1.1. Reasons for choice of residence

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

364

365 Table 3. Reasons for choice of residence (frequency)

## The social construction of coastal risks in two different cultural contexts

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

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

368

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

376

377 5.1.2. Residence characteristics



## The social construction of coastal risks in two different cultural contexts

378 There were several differences between the Canadian and French respondents in this  
 379 respect. The Canadians were more likely to report having a sea view ( $\chi^2(1, N = 186) = 6.31, p$   
 380  $= .01$ ). However, this does not mean that they felt closer to the sea, because French  
 381 respondents reported that they lived closer to the sea ( $M_{\text{Canada}} = 1187$  metres,  $M_{\text{France}} = 921$   
 382 metres;  $U = 3916.5, p = .46$ ).

383 On the other hand, the Canadian homeowners outnumbered the French homeowners in the  
 384 sample ( $\chi^2(1, N = 184) = 12.19, p = .0005$ ). In addition, the Canadians were more likely to  
 385 own their main residence ( $\chi^2(1, N = 138) = 9.88, p = .002$ ). This result was consistent with the  
 386 reasons for choice of residence because more Canadian respondents had chosen to live  
 387 where they did during their retirement years and had therefore fully integrated into the  
 388 place. More French respondents reported that they had always lived by the sea ( $\chi^2(1, N =$   
 389  $186) = 5.43, p = .02$ ). We can therefore assume that their knowledge of the seaside had been  
 390 built up over the long term. However, there was no difference in length of residence at  
 391 current dwelling between the two countries ( $M_{\text{Canada}}=27$  years,  $M_{\text{France}} = 32$  years) ( $t(184) =$   
 392  $1.69, p = .09$ ).

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

396

397 Table 4. Residence characteristics

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

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

400

401 5.1.3. Relationship to living place: sense of place

## The social construction of coastal risks in two different cultural contexts

402 Sense of place was measured through three dimensions: attachment, identity, dependence.  
 403 The most significant result here was that all respondents reported a strong link; they are all  
 404 very much attached to their living place ( $M_{\text{Canada}} = 5.52$ ,  $M_{\text{France}} = 5.32$ ;  $t(188) = 1.25$ ,  $p = .21$ ).  
 405 This result can be found in other coastline studies [e.g. [32]].  
 406 However, there were a number of differences on some very specific dimensions. For  
 407 example, Canadian respondents reported being more attached to their residence than  
 408 French respondents ( $M_{\text{Canada}} = 5.84$ ,  $M_{\text{France}} = 5.40$ ;  $U = 3616.5$ ,  $p = .02$ ), and the results  
 409 showed they would feel sadder if they had to leave ( $M_{\text{Canada}} = 5.89$ ,  $M_{\text{France}} = 5.33$ ;  $U = 3483.5$ ,  
 410  $p = .009$ ). However, the French respondents attached more importance to the prestige of  
 411 the place than the Canadians ( $M_{\text{Canada}} = 4.91$ ,  $M_{\text{France}} = 5.53$ ;  $U=3625$ ,  $p = .02$ ) (see Table 5).

412

413 Table 5. Sense of place

	Mean Canada	Standard deviation	Mean France	Standard deviation
<i>Sense of place (global scale)</i>	5.52	1.09	5.32	1.13
I'm very attached to my home	<b>5.84</b>	<b>1.48</b>	<b>5.40</b>	<b>1.50</b>
I'd feel very sad if I had to leave this coastal community	<b>5.89</b>	<b>1.59</b>	<b>5.33</b>	<b>1.70</b>
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	<b>4.91</b>	<b>1.81</b>	<b>5.53</b>	<b>1.60</b>
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

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

416

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

421

### 422 5.2. Relationship to coastal risks

#### 423 5.2.1. Assessment of risks in the *commune*

## The social construction of coastal risks in two different cultural contexts

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

432

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

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

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

436

437 The results highlighted differences between the two countries in assessing these  
 438 problematics. Thus, in France, coastal risks stood out significantly compared to other  
 439 problematics (e.g.  $M_{\text{Coastal risks}} = 5.00$ ,  $M_{\text{Economic risks}} = 4.23$ ; Wilcoxon Signed Rank test,  $Z = 6.13$ ,  
 440  $p < .0001$ ). In Canada, economic risks ( $M = 4.06$ ) and coastal risks ( $M = 3.90$ ) were assessed  
 441 almost identically (Wilcoxon Signed Rank Test,  $Z = 0.24$ ,  $p = .81$ ) and were both distinguished  
 442 from other risks (e.g.  $M_{\text{Coastal Risks}} = 3.9$ ,  $M_{\text{Natural Risks}} = 2.61$ ; Wilcoxon Signed Rank test,  $Z =$   
 443  $4.42$ ,  $p < .0001$ ). In the comparison between the two countries, there was no difference in  
 444 economic risk assessment ( $U = 4408$ ,  $p = .78$ ), but there was a difference in coastal risk  
 445 assessment, with the French respondents' risk assessment being significantly higher ( $M_{\text{Canada}}$   
 446  $= 3.90$ ,  $M_{\text{France}} = 5.00$ ;  $U = 3201.5$ ;  $p = .0005$ ). There were other differences between the two

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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 ( $M_{\text{Canada}} = 2.61$ ,  $M_{\text{France}} = 1.51$ ;  $t(188) = 4.27$ ,  $p = .00003$ ), 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 ( $M_{\text{Canada}} = 4.59$ ,  $M_{\text{France}} = 4.31$ ;  $U = 334.5$ ,  $p = .47$ ) and  
 464 not very worried by them ( $M_{\text{Canada}} = 2.89$ ,  $M_{\text{France}} = 2.86$ ;  $U = 3547$ ,  $p = .86$ ). 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
		zone			zone	

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

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

474

475 The results differed according to the risk zone regardless of country. In both France and  
 476 Canada, inhabitants who reported living “in a risk zone” ( $M_{\text{Canada}} = 5.53$ ,  $M_{\text{France}} = 5.48$ ) felt  
 477 significantly more concerned than those who reported living “outside a risk zone” ( $M_{\text{Canada}} =$   
 478  $4.48$ ,  $M_{\text{France}} = 3.53$ ) and those who did not express an opinion ( $M_{\text{Canada}} = 2.40$ ,  $M_{\text{France}} = 4.18$ ).  
 479 While this latter result for France was quite high, it did not significantly differ from the result  
 480 for Canada ( $M_{\text{Canada}} = 2.40$ ,  $M_{\text{France}} = 4.18$ ;  $U = 21.5$ ,  $p = .14$ ). There was also no significant  
 481 difference between the two countries according to risk zone.

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

491

492 Despite the fact that almost a third of the study population lived in at-risk areas, their direct  
 493 experience of an erosion or flooding episode was low. Only 9 out of the 190 respondents  
 494 reported having been concerned by this type of hazard. Indirect experience (measured by  
 495 people who reported having heard/seen something in their *commune* or read in the press  
 496 about coastal hazard-related events) was higher (see Table 9). However, this indirect  
 497 experience did not differ between the Canadian and French respondents ( $\chi^2(2, N = 190) =$   
 498  $1.36$ ,  $p = .51$ ).

499

500 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

501

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

515

516 Table 10. Implementation (or not) of individual protection measures against coastal hazards  
 517 (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

518

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

522

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

527

528 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	<b>5.14</b>	1.75	<b>4.20</b>	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

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

531

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

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

540

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

542

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

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

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

545  
 546 Overall, in Canada, respondents placed their trust in local non-profit associations, scientists  
 547 and themselves, in short, the people or institutions involved in day-to-day risk management  
 548 in Canada. This result was significant and was clearly/significantly differentiated for scientists  
 549 (e.g. Associations/Scientists; Wilcoxon Signed Rank Test,  $Z = 2.78$ ,  $p = .005$ ). In France,  
 550 scientists were also trusted sources of information and were differentiated from all other  
 551 institutions (e.g. Associations/Scientists; Wilcoxon Signed Rank Test,  $Z = 3.54$ ,  $p = .0004$ ).  
 552 Overall, the level of trust was greater in Canada than in France ( $M_{\text{Canada}} = 4.75$ ,  $M_{\text{France}} = 4.16$ ;  
 553 ANOVA Wilks,  $F(10, 93) = 5.51$ ,  $p < .0001$ ).

554  
 555 In summary, as regards coastal risks, the results showed that in Canada, respondents  
 556 reported being just as concerned as their French counterparts as regards risk management,  
 557 especially if they lived in a risk zone. However, there were differences in the levels of  
 558 concern about the possibility of sea damage to residences, with respondents from Canada  
 559 living in risk zones expressing the greater concern. Although almost a third of the surveyed  
 560 population stated that they lived in a risk zone, any direct experience of erosion or flooding  
 561 was rare. This did not, however, prevent the respondents in both France and Canada from  
 562 putting in place individual protection measures. The effectiveness of collective measures was  
 563 judged to be fairly good overall, but the demolition and retreat of dwellings was not  
 564 considered a popular measure in France. Finally, while the respondents in France were  
 565 generally more cautious about placing their trust in any institutions, those in Canada fully



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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	<b>0.61</b>	1.00						-0.10	<b>0.37</b>	1.00					
Memory	-0.15	<b>0.34</b>	<b>0.49</b>	1.00					0.02	<b>0.27</b>	<b>0.58</b>	1.00				
Prestige	0.05	<b>0.43</b>	<b>0.44</b>	<b>0.41</b>	1.00				0.04	<b>0.27</b>	<b>0.44</b>	<b>0.38</b>	1.00			
Life	-0.13	0.20	<b>0.32</b>	<b>0.31</b>	<b>0.28</b>	1.00			0.04	0.05	<b>0.41</b>	<b>0.31</b>	<b>0.36</b>	1.00		
Projects	-0.05	<b>0.22</b>	<b>0.44</b>	<b>0.26</b>	<b>0.24</b>	<b>0.51</b>	1.00		0.04	0.16	<b>0.59</b>	<b>0.34</b>	<b>0.31</b>	<b>0.58</b>	1.00	
Tourist	0.00	<b>0.24</b>	<b>0.30</b>	<b>0.23</b>	<b>0.41</b>	0.15	<b>0.21</b>	1.00	0.13	0.13	<b>0.46</b>	<b>0.44</b>	<b>0.51</b>	<b>0.38</b>	<b>0.40</b>	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

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

592

593 Table 14. Analysis of variance of the coastal risks problematic assessment according to  
594 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		

595

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

608

### 609 6. Discussion and interpretation of results

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

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

618 Although the human factor is a key element, it is often neglected in risk studies [e.g. [21-  
619 22]]. However, from an integrated management perspective, a person-centred approach is  
620 recommended as it places the populations impacted the most by these risks (the inhabitants  
621 themselves) at the very heart of the system. Because they know their living environment,  
622 they have valuable local knowledge and experience to combat these risks, and ultimately  
623 leading to a better management of the risk itself [19]. It is in this context that we focus on  
624 the social construction of the living environment, paying particular attention to the psycho-  
625 social and cultural aspects that could influence this construction [33, 35-37]. Drawing on a  
626 psycho-social approach, the objective of this study was therefore to understand  
627 respondents' (including those concerned by these risks) representations of their living  
628 environment, the sense of place (including coastal risks) in different cultural contexts. In  
629 order to do this, surveys were conducted in two Western countries (France and Canada) that  
630 are both impacted by coastal risks. Results highlighted both theoretical and practical  
631 implications.

632

### 633 6.1. Theoretical implications: Studying the social construction of risks

634 The main focus was on the inhabitants' representations of their living environment (see  
635 5.1.3. Relationship to living place: sense of place). The results showed that this living  
636 environment was described in a highly positive way by the respondents, who considered it  
637 to be a very pleasant living environment. These results are commonly found in coastline  
638 studies [31, 53, 67]. It became apparent that in both countries, the sea was the main reason  
639 for their choice of living place and therefore a central element in the respondents'  
640 residential environment, and that the environmental amenities contributed to the  
641 attractiveness and uniqueness of these coastal areas. The respondents' attitudes towards  
642 their coastal living environment was consistent with the widespread view of this type of  
643 environment as an "object of attractiveness" [55] or a prestigious object, a value that  
644 seemed to be particularly important in France. This place enhancement can contribute to  
645 the construction of an individual's identity because individuals are influenced by their spatial  
646 belonging [66, 68-69]. The results also revealed the affirmation of a positive sense of place,

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

649 We assumed that it was highly probable that representations of coastal risks were related to  
650 this particular relationship to living environment, because place of residence is an important  
651 anchorage point for individuals and because it plays a protective function psychologically  
652 speaking as a protection against outside threats [47]. Representing a risk, whatever it may  
653 be, allows the individual to symbolically “control” it and protect themselves from it [38-39].

654 The results of this study highlight an ambivalence in the representation of these risks. While  
655 respondents from both Canada and France reported being equally concerned by risks and  
656 their management, those from Canada appeared to be much more worried about these  
657 risks, more so if they lived in a risk zone. However, for the assessment of local issues (5.2.1.  
658 Assessment of risks in the *commune*), coastal risk, in relation to other issues, was considered  
659 more important in France than in Canada. It is highly likely that the difference in risk  
660 management and the media coverage of this issue influenced the construction of these  
661 representations because no direct association was identified between place relationship and  
662 coastal risk assessment. In France, extensive media coverage of flooding phenomena  
663 (particularly since storm Xynthia in 2010 [7]) may explain why respondents assess the coastal  
664 risk problematic to be a high-risk issue for their *commune*. The representation of a risk is  
665 constructed in interpersonal relations, but also in media communication [39]. In France,  
666 coastal risks are a socially situated object in public discussions, and their representation  
667 depends on their inclusion in a set of sometimes highly conflictual social relations.  
668 Therefore, risk management in all of these aspects (choice of defence strategies, funding  
669 measures, etc.) has become a central point in coastal risk communications [69].

670 As a result, the assessment of the issue was not influenced by whether or not respondents  
671 lived inside or outside a risk zone, but by whether or not they felt concerned by coastal risks.

672 As this construction is collective and not individual, it is a reflection of the current climate of  
673 opinion and the majority views on coastal risks in a particular place [37]. Consequently, the  
674 social context helps to shape the image of coastal risks and individual outlooks. Our results  
675 have shown that coastal risks are assessed as a more important issue in France than in  
676 Canada because in France, the issue is widely discussed and debated in the social arena,  
677 while in Canada the social debate is more focused on climate change and coastal risk is  
678 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].

## The social construction of coastal risks in two different cultural contexts

710 This study also shows the relevance of adopting a social construction-based approach to risk.  
711 In France and Canada the physical risk (hazard) remains the same, however, it is constructed  
712 differently in terms of representation and emotion (worry). These differences stem from the  
713 cultural context (particularly in terms of an individual's responsibility towards risk) and the  
714 local context (interpersonal relationships and media communications). Previous studies [72-  
715 73] have shown these differences in representations between "individualist" (e.g. the United  
716 States) and "collectivist" countries (e.g. Japan). France's values are not based on collective  
717 values, but its insurance system remains embedded in a "protectionist" system in which post  
718 disaster responsibility is societal and not individual. As representations are linked to  
719 practices, studying representations enhances our understanding of the choice of prevention  
720 and/or protection strategies and offers ways to optimize risk management by taking into  
721 account inhabitants' opinions (e.g. an awareness campaign).

722

### 723 6.3. Limits and perspectives

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

737 One of the limitations of this study relates to respondent recruitment. Examining coastal  
738 risks means that geographic limits must be imposed on the respondents affected by the  
739 risks. The parent population is therefore necessarily small because not every coastal  
740 municipality is affected by a coastal risk. In these municipalities, it is necessary to find people  
741 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.

750

751

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