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Meaning in the face of changing climate risks: Connecting agency, sensemaking and narratives of change through transdisciplinary research

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1 **Title:**

2 Meaning in the face of changing climate risks: connecting agency, sensemaking and
3 narratives of change through transdisciplinary research.

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31

32 **Keywords:**

33 Transdisciplinary science, narratives, sensemaking, agency, coastal adaptation.

34 **Abstract:**

35 This paper contributes to the body of knowledge associated with the analysis of
36 transdisciplinary research. We use a narrative centered approach, focusing on hybridity,
37 sensemaking and the potential for transdisciplinary research to foster agency.

38 When confronted with changes, people – as individuals – and local communities – as groups
39 – make sense of them in the light of their own knowledge, beliefs and experiences. The
40 process by which communities make sense of changing institutional and natural
41 environments can be defined as the interaction between their own frame of reference and
42 the perception of the situational demands inherent to changes, together with their
43 interpretation of these changes. Such a dynamic process of sensemaking constantly
44 redefines the boundaries of the narratives that community members can call on to give
45 meaning to their past, present and future. In this paper we use five case studies to analyze
46 how this sensemaking plays out in situations of changing climate risk and changing frames of
47 reference associated with the presence of trans-disciplinary scientists. We identify the
48 central challenge of ambiguity. We define ambiguity as situations where narratives of
49 change assign different meanings to the changes observed. In such situations, we observe
50 three potential outcomes in our case studies: (1) communities appear to be forced into
51 inaction – as a consequence of agency-depriving senselessness; (2) communities appear to
52 be cornered into maladaptation – as a consequence of a misguided sense of agency; and (3)
53 communities try to resolve ambiguity and effectively move forward – as knowledge-based
54 agency-fostering exercise. In light of these results, we argue that by contributing to the
55 clarification of such ambiguities, climate science may contribute to increases in local agency,
56 thus enhancing adaptive capacities. We conclude by proposing that climate science be place-
57 based and community-centered. The purpose of such a shift would be aimed at building the
58 agency-enhancing sensemaking of local communities.

59

60 Text

61 1. Introduction

62 Between 2013 and 2017 we, as an international team of scientists, were engaged in
63 transdisciplinary research in a series of study sites scattered around the globe including
64 Uummannaq in Greenland; Tiksi in the Sakha Republic, Russian Federation; Cocagne and
65 Grande-Digue in New Brunswick, Canada; the *Petite Côte* in Senegal; and the Kanyakumari
66 district, in Tamil Nadu, India, among others. This project was entitled “Adaptation research,
67 a transnational transdisciplinary community and policy centered approach (ARTisticc). It
68 brought together scientists from France, the USA, the Russian Federation, Senegal, Canada
69 and India.

70 We decided that in order to embrace the challenge of such an enquiry into adaptation, we
71 would not adopt an expertise-centered approach. We argued that trying to force-feed
72 scientific knowledge and the associated prejudices to local communities might act as
73 blinkers, preventing us from accessing experiences from which lessons might be learned. As
74 an alternative, we decided to partner with local interest groups, policy makers, community
75 leaders and ordinary community members and explore together instances of what seemed
76 to be local “adaptation.” As could be expected, such a journey was full of wonders.

77 The purpose of this paper is to relate, while adopting a reflexive stance, one of these
78 wonders: the fact that transdisciplinary science – and its corollary, science co-construction –
79 reconfigures local and scientific narratives in unexpected ways – fact that we observed in 5
80 of the 8 sites. We further argue that this reconfiguration, “sensemaking,” has the potential
81 to influence individual and collective agencies within local communities.

82 Community-centered transdisciplinary science may be about giving a voice to local
83 communities along with a degree of influence over the making of science. Yet, it is also a
84 way for those involved to make sense of the rapidly changing and challenging reality of their
85 natural environments. This is a space not only of science but of all knowledges and
86 interpretation; sensemaking appears to be a significant part of responding to climate change
87 and seems central to the ability of local inhabitants to act to shape their future. Sensemaking
88 at the local level emerges as a key component of individual agency and collective adaptive
89 capacity.

90 In this paper, in order to share our observations, we start by associating meaning with four
91 concepts that are central to this paper: adaptation to climate change, sensemaking,
92 transdisciplinary science and agency (section 2). We continue by presenting the participant
93 observation method and the associated sources that we prioritized (section 3). This
94 methodology section is directly followed by a brief description of the communities that
95 generated the narratives under consideration. Section 5 contains the core of the paper: we
96 present the type of sensemaking that we observed while in the discussion presented in
97 section 6, we ascertain how this may be associated with agency. The conclusion focuses on
98 envisaging climate sciences that would be rooted in place-based agency enhancing
99 mechanisms and go beyond the mere provision of climate information.

100 2. Transdisciplinary research, adaptation to climate change, agency and
101 sensemaking

102 2.1 Adaptation to climate change: uncertainty as a narrative-generating device

103 Within a context of climate change, adaptation has for quite some time been “a concept of
104 uncertain form” (Godard 2010, Tubiana et al. 2010). Definitions abound, yet their actual
105 content, in terms of policy-making and action, is renegotiated on a context-by-context basis.
106 When implementing adaptation in general, and adaptation research in our specific case, the
107 following key challenges must be addressed: (A) the temporal dimension of adaptation that
108 needs to be anticipated on a short- to long-term proactive approach; (B) the uncertainties
109 surrounding the impact of climate change, particularly at local level (Hallegatte 2009); and
110 (C) the evolutionary nature of the adaptation concept, which assumes a permanent
111 readjustment of knowledge and choices. Deploying adaptation to climate change locally may
112 quickly lead to challenges in planning and a quagmire of implementation procedures
113 (Simonet 2011, Adger et al. 2007). Adaptation research is thus a formidable narrative-
114 generating machine. Each situation, each temporal scale, each and every place, may
115 generate its own interpretations of the concept, the risks they face, suitable solutions, and
116 how such solutions might be implemented. In our work adaptation was embraced as a fuzzy
117 concept dealing with uncertainty. As such it gave us the necessary freedom to explore a
118 cultural and geographical variety of field settings. It generated a mass of stories, meeting
119 places, hybridizations.

120 2.2 Sensemaking: narrative intertwining, hybridization, substitution, marginalization

121 When confronted with changes, community members – as individuals – and local
122 communities – as groups – make sense of them in light of their own knowledge, beliefs and
123 experiences (Ketelaar et al. 2012). The process by which communities make sense of
124 changing institutional and natural environments, sensemaking, can be defined as the
125 interaction between their own frame of reference and the perception of the situational
126 demands inherent to changes, together with their interpretation of these changes
127 (Luttenberg et al. 2013). Climate change is no exception. Yet within a context of
128 transdisciplinary research into climate change, several frames of reference from various
129 origins coexist. Community members and scientists individually and collectively interpret
130 climate change and its impacts differently. The research process thus becomes a meeting
131 place. The very concept of adaptation becomes a boundary object. A boundary object is “an
132 entity shared by several different communities but viewed or used differently by each of
133 them” (see Baggio et al. 2015). Through the research process, the existing interpretations of
134 change may compete, complement or even ignore each other. Sensemaking may thus lead
135 to different situations whereby narratives may become hybridized, intertwined, substituted
136 and/or marginalized. In this paper, we explore the fate of narratives of change meeting in a
137 transdisciplinary context. We explore how, through iteration and reiteration, the meaning
138 that is associated to a specific situation may change, or exist in different forms, within local
139 communities, or within the transdisciplinary consortium. Furthermore, we analyze the
140 variety of sensemaking situations that we encountered.

141 2.3 Agency and adaptation together

142 In course of the ARTistic project, environmental history was called on to analyze past
143 instances of adaptation. This analysis demonstrated the need to mobilize the concept of
144 agency within action-oriented adaptation research (Kennedy et al. 2018). Agency is defined

145 as “the ability of people to act intentionally to shape their worlds” (Nash 2005). Agency
146 allows the multiple and diverse dimensions of the ability to face adversity to be unpacked
147 (Brown and Westaway 2011). In our project, the concept of agency was applied to individual
148 and collective manifestations of adaptation, as well as to past, present and imagined future
149 adaptations. Transdisciplinary efforts to co-construct knowledge must take into
150 consideration the different capabilities, and resources of all participants so that the
151 contributions are equal and the resulting synthesis meaningful. There may be convergent or
152 divergent sensemaking rooted in these differences.

153 2.4 Transdisciplinary research

154 Transdisciplinary science is

155 “a reflexive, integrative, method driven scientific principle aiming at the solution
156 or transition of societal problems and concurrently of related scientific problems
157 by differentiating and integrating knowledge from various scientific and societal
158 bodies of knowledge.” (Lang et al. 2012)

159 Transdisciplinary research is called upon when knowledge is uncertain, when the nature of
160 problems is, or may be, disputed, and when the stakes are high for those concerned (Pohl
161 and Hirsch Hadorn 2008). Climate change adaptation research has been recognized as
162 having these characteristics, and transdisciplinary approaches are increasingly adopted in
163 order to address the associated challenges (Gosselin et al. 2011, Cundill et al. 2019).

164 Transdisciplinary practice require carefully led negotiations and interactions. The different
165 resources, goals and values at stake and their social representations need to be considered.
166 Mutual learning is thus a central feature of transdisciplinary research. (Wiesmann et al 2008)
167 Adaptation to climate change transdisciplinary research has shown that such an approach to
168 science may turn into a societal battleground for holders of conflicting interest and
169 knowledge claims (Siebenhüner 2018). Analyzing adaptation dynamics in Germany,
170 Siebenhüner (2018) demonstrates there may be situations where consensus formation and
171 mutual agreement is not attainable.

172 Paradoxically, the narrative dimension of these negotiations, mutual learning, and situations
173 of competing, and sometimes irreconcilable, claims, does not appear to be documented;
174 neither are the inevitable sensemaking dynamics at work. This has encouraged us to share
175 our observations.

176 Furthermore, transdisciplinary research, with its action and engagement oriented stance, is
177 associated with a very precise normative stance: change is desired, should be oriented by
178 those affected, and occurs through the redistribution of power (Alonso-Yanez 2019);
179 empowerment is central to transdisciplinary research (Whiteside et al. 2011). This generates
180 a second paradox when considering the lack narrative centered analysis of transdisciplinary
181 research; narratives have been long known to be an important part of empowerment
182 processes (e.g., Alter 1993, Rapaport 1995).

183 Our analysis of the dynamic evolution of narratives, through a sensemaking lens, thus
184 addresses a gap in the analysis of transdisciplinary research. It contributes to a better
185 understanding of the conditions for interactions and empowerment within transdisciplinary
186 consortia.

187

188 **3. Materials and methods**

189 For this paper, we adopt a phenomenological, participant observation, position. “Participant
 190 observation is a means of collecting data in natural settings used by ethnographers who
 191 observe and take part in the common and uncommon activities of the people being studied.
 192 Central to this method is a particular approach to recording observations in field notes”
 193 (Musante 2015). For a review of participant observation, its history, methods, benefits and
 194 shortcomings, see, for instance, Jorgensen (2015). We founded our analysis on the
 195 “appearances of things, or things as they appear in our experience, or the ways we
 196 experience things, thus the meanings things have in our experience” (Smith, defining
 197 phenomenology, 2018). The general gist of phenomenology is to try apprehending the
 198 object of our enquiry through a careful and reflexive documentation of the evolving
 199 relationship that we have with that object.

200 We thus observed the shaping of worlds, in which we were deeply embedded and in which
 201 we played an active role. Along the way, we reflected, and are still reflecting, on a world that
 202 changes, and on the ways we and our partners changed along the way. We center our
 203 analysis on the period during which we were actively conducting the ARTisticc research
 204 project. We, our project, its outputs and our partner communities are all part of the same
 205 material.

206 For this paper, we relied on field notes that were taken throughout the project by the
 207 project coordinator, who is also this paper’s lead author. While these notes, pertaining to
 208 the project, its evolution, and the meandering narratives that were associated to it, are the
 209 reference corpus for this paper, many other items complemented these project-centered
 210 field notes. Table 1 presents the sources that we used.

Item	Primary author(s)	Primary purpose
Field notes	Project coordinator	Keep track of the project progresses, documents observations made along the way.
Papers stemming from the project’s work	Authors: Baztan et al. (2017) Berman et al. (2019) Kennedy et al. (2018) L’Hévéder et al. (2017) Vanderlinden et al. (2015)	Share our results with the scientific community. Submit our results to the scrutiny of our peers. Respect the commitment made to the funding bodies.
Conference presentation and posters	All consortium members.	Share our results with the scientific community. Submit our results to the scrutiny of our peers.
Documented artistic outputs of the project	Forgues et Surette (2017) Thomson (2018) Satheesan et al. (2016) Jensen (2016) Stender (2016)	Conduct a robust and culturally sensitive enquiry into local experiences. Produce long-lasting art forms as a tribute to the local communities’ commitment process.
Report made by the partners during meetings	National team leader and members for each site on a yearly basis.	Touch base with all the site teams on an annual basis. Prepared before the consortium meeting and circulated before being discussed
Meeting minutes and reports	Project coordinator and coordinating team.	Perform official and practical project housekeeping.
Project proposal and reports to the funding bodies	Project coordinator and coordinating team.	Original project proposal Ensure regular, contractual reporting to funding agencies

Policy briefs	Chouinard et Fauré (2018)	Share our results with policymakers.
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Table 1: reference corpus used in the course of the participant observation and subsequent analysis

211 Within these materials, narratives were identified and selected. This selection was based on
 212 the centrality, within the narrative that were present, to the initial and/or final stories that
 213 could be heard or read. These narratives were produced by our local partners, by the team
 214 of the scientists themselves or by a hybrid group originating from the project.

215 In order to establish chronological markers to follow the narratives' evolutions over time, we
 216 used both the field notes and time-stamped presentation made by consortium members
 217 during the course of the project. We then proceeded by identifying changes in the stories
 218 being told. Insofar as possible, we then interpreted the nature and origin of these changes.
 219 This analysis was rooted in the day-to-day practical management and scientific coordination
 220 of the project. In a second phase, we consciously removed ourselves from the corpus. This
 221 allowed us to assess our initial interpretation with the benefit of hindsight. Before moving
 222 on to our results, it is necessary to briefly describe the places associated with the
 223 communities that were part of this narrative-generating device.

224 Analytically, we used an approach akin to thematic analysis. Throughout the corpuses we
 225 identified narratives - i.e. discourses expressing causal claims that are linking an initial and a
 226 final situation. For each of these narratives, we identified the main theme that they were
 227 pertaining to. We grouped narratives pertaining to the same theme within a single field site.
 228 We then identified whether, and if yes how, narratives interacted with each other. Finally
 229 each narrative was reduced to a series of simple causal statements, the local interpretation
 230 of which was submitted for final approval to local (and culturally sensitive and
 231 knowledgeable) scientists.

232 4. Short presentation of the locations

233 The stories we will be analyzing come from our work within five of the eight local
 234 communities in which the ARTisticc project was deployed. The three communities we do not
 235 present here generated few identifiable narratives and are the subject of results of another
 236 nature (Kennedy et al. 2018, Berman et al. 2019). We voluntarily kept the description of
 237 these communities short, mostly retaining the description found in the original proposal.
 238 The choice of these communities had been guided by the following necessities: being able
 239 and willing to engage in a multi-year partnership with scientists, having faced, and currently
 240 facing, identifiable changes leading to adaptation. The first criterion, i.e. the capacity to work
 241 collaboratively with scientists, proved to be most salient determining factor for choosing the
 242 various communities as evidenced in other instances of transdisciplinary adaptation research
 243 (e.g., Simon et al. 2018).

244 4.1. Uummannaq, Greenland

245 Uummannaq is an island covering an area of 12 km² and a fjord with a polar climate located
 246 in the middle of the west coast of Greenland. Uummannaq was selected for the project as it
 247 underwent a process of adaptation to changes introduced by Danish colonialism. At the time
 248 of the project design, its biggest challenge was to find a way to remain a sustainable and
 249 attractive community in spite of the demographic concentration in urban areas, economic
 250 globalization and the need for rationalization to build the country's future independence.
 251 Climate changes cause dramatic impacts on landscapes and people. The key feature that led
 252 us to select Uummannaq lies in its vulnerable nature, explained by history, combined with

253 current challenges associated with climate. The key local partner was a local institution with
254 is a foster home, Uummanaq’s Children Home, which is closely associated with its resource
255 umbrella: the Uummanaq Polar Institute (UPI). The UPI is dedicated to bringing cultural
256 resources to the youth from the Children’s home and promoting Inuit culture abroad. The
257 working relationship with some of the consortium members had already existed for more
258 than 10 years for the purpose of scientific research and more than 20 years for other type of
259 joint projects.

260 4.2. Tiksi, Sakha Republic, Russian Federation

261 Tiksi is one of Russia’s settlements on the coast of the Laptev Sea. As such, it is experiencing
262 the transformations associated with climate change in the arctic. Since the end of the Soviet
263 Union, Tiksi has also been confronted by a dramatic reduction in its economic activity and
264 population. It has lost a very large part of its employment base, and many see its future as
265 quite unpromising. As a study site, Tiksi offered lessons to be learned from a fragile
266 community that will nevertheless have to adapt to climate change in ways associated to its
267 arctic nature. Local stakeholders envisaged for the research partnership consisted of the
268 local authorities, the managers of the Lena Delta National Park and indigenous associations
269 representing the interests of local reindeer herders. Such a partnership is established in line
270 with the very formal established institutional set up, as is customary in the Russian
271 Federation.

272 4.3. Senegal’s *petite côte*;

273 The town of Mbour and its surrounding rural and urban communities are located along
274 Senegal’s *Petite côte* coastal area. The *Petite côte* economy relies heavily on the agricultural,
275 fishery and tourism sectors. Agriculturalists are facing increasingly erratic rainfall (Sane et al.
276 2018) combined with a seemingly never-ending series of land reforms (Ndiaye 2019).
277 Fisherfolks are increasingly confronted with changes in resource availability that are
278 sometimes framed as manifestations of climate change. Tourist operators are faced with
279 beach erosion and concerns regarding rainfall and are currently engaged in “adaptive
280 actions” such as protecting their beaches with boulders and redefining the “good “ season
281 and their target clientele (Ly 2018, Ndour et al. 2018, Ngom et al. 2018). It is interesting to
282 note that the pressures faced by all these sectors place them on a collision course regarding
283 the use of available space. This final element led us to select Mbour as a study site. Local
284 partners include fisherfolks unions, women’s groups engaged in fish processing and
285 mangrove rehabilitation, as well as traditional and modern authorities, village leaders and
286 business operators within the tourism sector. It must be noted that all the members of the
287 Senegalese research team had conducted research on *Petite côte* for more than 10 years.
288 Furthermore, they conducted yearly field courses with their graduate students during which
289 they established a long term relationship with local stakeholders.

290 4.4 Kanyakumari district, Tamil Nadu, India

291 The Kanyakumari district includes typical tropical coastal villages with a high population
292 density exceeding the general average in India. It has a historical legacy of dealing with
293 community-based adaptations – such as those relating to regime shifts during the monsoon.
294 Kanyakumari has undergone dramatic instances of historical adaptation (Subramanian 2003,
295 Kaliraj et al. 2017). Known adaptation processes include mobility, emerging new fisheries,
296 the development of new transboundary social networks between coastal communities and
297 inland communities etc. In Kanyakumari the central partners are a local NGO, the South

298 Asian Fishermens' Federation, and other fisher folks unions. This federation has a long track
299 record in defending the rights of Tamil Nadu's fishermen. It has developed working
300 relationships with academic institutions. One of these relationships was firmly established
301 with the Indian team of scientists participating in the ARTisticc project.

302 4.5. Cocagne and Grande-Digue, New Brunswick, Canada

303 Over the last decade, the Cocagne and Grande-Digue area coastal zone in South-East New
304 Brunswick (Canada) has been particularly affected by storms that have been attributed, at
305 least locally, to climate change (Chouinard et al. 2015). Yet the Cocagne and Grande-Digue
306 area is accustomed to adaptation to externally-driven changes, such as (1) the shift from an
307 economy based on natural resources to one based on services, and (2) population
308 emigration due to the globalization of the labor market, to name but two. Local initiatives
309 have developed plans to foster adaptation to changing climatic conditions: observations on
310 environmental changes and places at risk, identifying consensual adaptation options,
311 including a system of dikes, the elevation or displacement of buildings and roads, putting
312 houses on stilts, and the design of a "buy-out" program (Chouinard et al. 2011). These
313 community-led initiatives led us to select this case study site. The *Université de Moncton* has
314 a working relationship with Cocagne and Grande-Digue partners dating back to the late
315 1990s. Several research action projects have already been successfully conducted and
316 transdisciplinary practices are well established. A broad multi-scale partnership was set up
317 for the ARTisticc project. The project partners were: Pays de Cocagne Sustainable
318 Development Group, a local NGO with more than 15 years of partnership with the *Université*
319 *de Moncton*, the *Association francophone des municipalités du Nouveau-Brunswick*
320 (association of francophone municipalities), the *Commission des services régionaux de Kent*
321 (which is the administration delivering public services to unincorporated communities), the
322 *Association acadienne des artistes professionnel.le.s du Nouveau-Brunswick* (which brings
323 together Acadian professional artists) and the New Brunswick - Department of the
324 environment and local government.

325 5. Results: stories of change, changing stories

326 5.1. Stories from Uummannaq, Greenland.

327 In the initial months (months 1 to 11) of the project, the main story line was one of extreme
328 multidimensional changes in Uummannaq, a highly-developed historical adaptive capacity
329 and unique potential to inform the world while being informed by the scientific community
330 and other arctic communities. This storyline emanated from the more than 20 years of
331 experience enjoyed by one of the scientists, serving as a proxy for the community, and the
332 local partners who were well known. This information source was combined iteratively with
333 a formal literature review. This literature review pertained to the nature of the Greenlandic
334 environment under a changing climate and the impacts on Greenlandic populations (e.g.,
335 Box and Decker 2011, Derry, 2011, Kielsen Holm 2010, Nielsen 2009, Nuttal 2010). It
336 confirmed the "factual" nature of the narrative.

337 This narrative narration may be described as follows, as the "Uummannaq narrative #1"
338 (UN#1):

- 339 1. Uummannaq is the product of years of adaptation to an extreme environment and to
340 very peculiar conditions associated to Danish colonialism. These are given.

- 341 2. Climate change is particularly threatening, and adaptation may currently be under
342 way. Climate change is not, however, only threat. Cultural erosion and political and
343 economic upheavals associated with Greenland's accession to independence are also
344 to be feared.
- 345 3. The ARTisticc team will identify the community's main current concerns and
346 document what is done.

347 Following an initial fieldwork session, the following story was reported from the field by the
348 research team. This "story from Uummannaq" is best summarized in Baztan et al. (2017) as
349 the "Uummannaq narrative #2" (UN#2):

350 The Uummannaq community is strongly influenced by memories of previous
351 adaptation to extreme climatic conditions in an isolated place. This gives community
352 members the feeling they will be able to adapt in the future: "How brave our ancestors
353 were, even without money, surviving thanks to their physical strength. They still help
354 us survive today." And as another puts it in a nutshell: "We all adapt to changes, it's in
355 our nature."

356 The clear convergence of UN#1 and UN#2 is, in principle, reassuring. This is a story of trust in
357 one's ability to "shape one's world," come hell or high water. Such a story of trust in one's
358 agency does not leave much room for other stories such as stories of changing risk, unknown
359 before climatic changes, and major ecological shifts.

360 Yet within this story, regular references to sea ice changes were identified by the research
361 team. The research team felt that this theme may be an opportunity to engage in a more
362 meaningful conversation with the community, and more importantly about its future. A
363 second fieldwork session was organized. It was organized around scenarios for the future of
364 Uummannaq. From this fieldwork a new story emerged. It may be summarized as follows,
365 "Uummannaq narrative #3" (UN#3):

- 366 1. Sea ice is of critical importance to the local community.
367 2. Sea ice is the subject of a high level of interest among the international scientific
368 community.
369 3. This convergence sets the stage for a translation exercise, transferring the state of
370 the art of sea ice and climate change knowledge to the local community.
371 4. Such a translation exercise will allow for a locally-centered assessment of the current
372 scientific agenda.

373 UN#3 departs from UN#1 and UN#2. There is a new story under way. This new story focused
374 on a specific local community concern: sea ice. This local concern allowed for the assessment
375 of current knowledge by local communities, becoming of interest to the research team. The
376 local narrative somehow displaced the reference story of the research team, the hybrid
377 narrative being thus carried by the non-locals.

378 The result of the second field session indicated that community members believe that
379 western science, as proxied by the IPCC reports, is imperfectly salient – although sea ice is of
380 interest, the scale at which scientists work is not the scale that is of interest to them; the
381 qualitative information they need is not present in a way that is useful to them. These
382 results also indicate that IPCC science, is, according to community members, imperfectly
383 credible – some of these results seem, in their understanding, to contradict observations
384 made by hunters and some community members believe that the knowledge of the hunters

385 is more credible. These disconnects were further confirmed by the scientific team by using a
386 bibliometric analysis. From these results a new story emerged from the research team in the
387 form of the “Uummanaq narrative #4” (UN#4), best captured by quoting Baztan et al. 2017:

388 “Our study demonstrates that climate change science created by natural scientists
389 does not match the needs of small Inuit coastal communities such as Uummanaq. [...]
390 [our results as well as those of others] indicate how to use knowledge co-production
391 approaches to study research topics relevant to Inuit communities, leading to better
392 research work, enhanced collective awareness both for researchers and community
393 members and efficient application of findings for planning and policy making.”

394 UN#4 is a new story, narrated by the research team. It is the product of the researchers’
395 sensemaking. Confronted with the strong feeling of agency within the community, the
396 research team changed tack, reworked its discourse and reshaped its world. While this is
397 quite ordinary within the context of inductive research, it is important to report here in the
398 light of what occurred at the community level.

399 At the community level things are different. Two Greenlandic artists (a documentary film
400 director and a graphic designer) were hired to propose artworks capturing the stories they
401 heard while they observed the various field work sessions. The stories that the artists
402 proposed, in the form of a 20-minute video (Jensen 2017) and a series of 24 posters (Stender
403 2017) were very close to UN#1! The voice of the community carries an almost unaltered
404 discourse. Interactions with scientists did not lead to a reconfiguration of their narrative.

405 5.2. Stories from Siberia: when the existence of intertwined causal linkages generates 406 potentially incapacitating ambiguity

407 In Siberia extensive fieldwork by the local team in Tiksi generated a corpus of recorded video
408 interviews and focus groups. Supplementary fieldwork was conducted by interviewing the
409 authorities in Yakutsk, in the company of the project’s scientific coordinator. When
410 questioned about current changes that the community is facing and the associated
411 challenges, many stories emerged. These touched the issue of changing environmental
412 conditions disrupting ecosystem services: changes in fisheries timing and productivity
413 without adaptation of the associated logistics and logistical timing; increases in the sable
414 population without the necessary adjustment of trapping quotas; reindeer herding being
415 increasingly labor-intensive due to the falling health status of the herds without the
416 associated changes in payment transfers from the government; late onset and early
417 degradation of winter roads; acceleration of river bank erosion; respiratory ailments
418 associated with more intense summer fires; increases in wolf predation on reindeer herds.
419 For each of these issues, several stories existed, expressing various causal statements. Some
420 referred to local animistic beliefs, others to the political upheaval associated with the demise
421 of the Soviet Union. Some talked about direct impacts of climate change, others about
422 indirect impacts: regardless of the human origin of climate change, many respondents
423 believed climate change to be a natural phenomenon. These multiple stories followed an
424 archetypical pattern that is best exemplified by the wolf predation stories.

425 Tiksi wolf narrative #1 (TWN#1):

- 426 1. Nowadays, across Russia, the young generation is less and less respectful of the
427 standards and rules of the former generations. Young people do not listen to older
428 people anymore and this is a source of many social problems.

- 429 2. The same situation prevails with wolves.
430 3. In the past, wolves would only catch reindeer on the fringes of the herd that were
431 too sick or too old to follow along. This was a matter of respecting the work of
432 herders and the balance of things. In the past wolves would hunt with restraint as
433 they were better educated.
434 4. Nowadays, young wolves reject these rules. They hunt without restraint.
435 5. This is why predation by wolves is on the rise.

436 This story expresses causal statements associated with a nostalgia for old times linked to the
437 belief that animals are connected to humans in ways that goes beyond the western science's
438 understanding. Facing changes, imagined analogues are used creatively as frames of
439 reference.

440 Tiksi wolf narrative #2 (TWN#2):

- 441 1. With climate change, the Tundra is undergoing a process named shrubification: low
442 grasses and sedges are being taken over by sometimes thick, woody shrubs.
443 2. The supplementary biomass is available in the summer to feed the wildfires, with a
444 clear north-south gradient.
445 3. These wildfires push the wolf populations northward. This creates higher
446 concentrations of wolves in reindeer herding territories.
447 4. This is why predation by wolves is on the rise.

448 This story connects climate change, its impact on the ecosystem and associated impacts on
449 population dynamics. Such a story is intimately connected to the widespread observation
450 shrubification, often interpreted as a manifestation of climate change. An everyday
451 experience of a changing Taiga is used as an interpretative frame.

452 Tiksi wolf narrative #3 (TWN#3):

- 453 1. Since the onset of climate change, reindeer herds have become weaker because of a
454 higher prevalence of parasites and diminishing productivity of the rangeland. It
455 therefore takes more time and energy to tend to the herds.
456 2. Herders' wages are nevertheless still computed taking the previous conditions into
457 account. The total manpower cannot be increased, therefore there is less time to
458 watch out for, and manage, wolves.
459 3. Wolves might therefore come and when they come, they find weaker reindeers that
460 are easier to capture.
461 4. This is why predation by wolves is on the rise.

462 In this third narrative about wolf predation in the Siberian north, climate change and
463 political constraints are used as joint causes of increases in predation. Humans and nature
464 are engaged in a *pas de deux*, where opportunistic behavior by wolves is rewarded.

465 In Tiksi, sensemaking is at work. Confronted with changes, community members "make
466 sense of it in light of their own knowledge, beliefs and experiences" (Ketelaar et al. 2012).
467 They clearly use their frames of reference to interpret what they observe. Yet the numerous
468 potential frames of reference lead to a situation where no robust explanation stands out.
469 We have a situation characterized by ambiguity. We define ambiguity as situations where
470 narratives of changes assign different meanings to the changes observed, and where no
471 obvious choice seems to be made.

472 In Tiksi, the stories being told seem to ignore agency entirely. All causes are external to the
473 community's possibilities for action. Either the climate or the forces of history or the central
474 power may be identified as root causes. In the narratives collected in Tiksi, the shaping of
475 the community members' world does not belong to them. The only way in which they seem
476 to be able to shape their world is by trying to influence these external forces. Yet ambiguity
477 may be quite disempowering when confronting potential causes. Who would one turn to?
478 To the climate? To history? The only possibility is the central state, regardless of the
479 meaning associated with the changes observed. We would suggest calling such a situation of
480 ambiguity a situation of "agency-depriving senselessness."

481 5.3. Stories from Senegal: when ambiguity may generate causality-shopping and maladaptation.

482 In Senegal three major themes co-existed at the beginning of the project. These were closely
483 associated with three economic sectors: agriculture, fisheries and tourism. The associated
484 challenges were explicitly connected to climate change - or at least increasingly erratic
485 rainfall, environmental degradation - including dwindling fish landings, institutional changes
486 - such as land reform, and issues associated with power imbalance - people from Senegal's
487 capital city exercising their influence on all economic sectors. As in Tiksi, these multiple
488 causal expressions led to ambiguous situations.

489 What is the main cause of dwindling fish catches? Is it overfishing, mostly foreign, or
490 associated with foreign interests? If yes, action is needed: the government can be
491 pressurized; protests can be organized; captains of foreign boats can be brought to justice. It
492 is possible to imagine how the associated narrative might play-out. Let us name this
493 narrative "*Petite côte* fisheries narrative #1" (PCFN#1). Is it environmental degradation,
494 especially of mangroves, and the associated disappearance of spawning grounds? If so, we
495 need to mobilize local environmental protection agencies, and local NGOs to protect and
496 rehabilitate the mangrove. We will name the associated narrative "*Petite côte* fisheries
497 narrative #2" (PCFN#2). Is it climate change that generates a displacement of commercially
498 valuable species? If so, adaptation funding must be raised, research must be conducted,
499 donor countries need to pay attention, compensate the community and fund local and
500 international scientists. Similarly we name the associated narrative "*Petite côte* fisheries
501 narrative #3" (PCFN#3).

502 When considering the beach tourism sector, the narrative that we observed stresses that
503 the sector is threatened by accelerated beach erosion. In this narrative, such an accelerated
504 erosion may find its source in poor sediment planning when installing poorly designed anti-
505 erosive structures – in this case, research and engineering are the solution; it may find its
506 source in the overexploitation and theft of sand, associated with the real estate boom
507 experienced by Dakar and the *Petite côte* – those responsible, while very powerful, should
508 be brought to justice; finally it is also attributed, in stories of changes, to modified oceanic
509 currents and storm intensity associated with climate change – in this case, adaptation funds
510 should be raised as donor countries are partly responsible for climate change and benefit
511 from huge resources inherited from their past colonial and environmental sins.

512 Finally, looking at the plight of farmers, the narratives that are collected link their difficulties
513 to soil degradation and/or institutional instability (leading to incomplete land reforms and
514 associated land grabs) and/or climate change and associated changes in rainfall patterns.
515 Along the way solutions are considered.

516 On the *Petite côte* ambiguity is “everywhere”. Nevertheless, the context is not the same as
517 in Tiksi. Every causal chain identified has solutions on which the local community can act –
518 agency is an important part of the stories being told. Yet no real criterion for choosing the
519 “right” story appears in the narratives. This “choice” of a dominant narrative is nevertheless
520 a critical issue. Locally, nationally and internationally, the “climate change-centered
521 narratives” somehow displace responsibility to external, wealthy actors. The temptation may
522 be strong to ignore institutional frailty, abuses of power, environmental negligence,
523 ignorance and anything that can’t be attributed to external forces.

524 While the local scientific team kept working with the local community on the analysis of the
525 complex causal chains under scrutiny, the emergence of climate change as an explanation
526 for everything became increasingly present in public spheres within local communities. The
527 mere existence of the ARTistic project, an “adaptation to climate change project”, seemed
528 to imply that there was no need to even consider alternative explanations. In this situation
529 we, as transdisciplinary climate scientists, may unwittingly contribute to a misguided choice.
530 A story is retained not for its ability to represent reality. A narrative is selected regardless of
531 its potentially inaccurate causal statements. This may lead to the random selection of
532 inefficient solutions. We suggest naming such a situation as a “misguided sense of agency
533 leading to narrative selection fostering maladaptation.” Such a situation raises explicitly the
534 issue of the responsibility of transdisciplinary scientists. A potential mistake here may have
535 been that we appeared only interested in the single issue of adaptation to climate change.
536 Problem selection and framing may not have been sufficiently carefully conducted.

537 5.4. Stories from Kanyakumari and Cocagne and Grande-Digue: hybrid stories as empowerment 538 mechanisms

539 Sections 5.1. to 5.3. seem to indicate that transdisciplinary research may be locally
540 ineffectual at best (Uumannaq and Tiksi), and toxic at worst. These sections also seem to
541 indicate that transdisciplinary scientists may be the main beneficiary of the sensemaking
542 dynamics at play. This is incompatible with the normative load of transdisciplinary research,
543 and may be severely exploitative of local communities.

544 Fortunately, things played out differently in two of the communities. In Kanyakumari
545 sensemaking allowed the conditions to be set for increased agency. In Cocagne and Grande-
546 Digue it is part of a long-standing partnership jointly empowering the local community and
547 the scientists.

548 The initial story line for Kanyakumari may be described as follows (KFN#1) (Thomson 2016):

- 549 1. The population in general, and the fishermen in particular, have developed an
550 intimate knowledge and associated vocabulary regarding weather patterns and their
551 effects on the fishery resources.
- 552 2. This intimate knowledge has had far-reaching implications in terms of a fine-tuned
553 social and economic organization of local life in order to face normal and exceptional
554 years.
- 555 3. This includes individual and household-level risk management strategies such as
556 wage labour and temporary migrations. At the operational fishing level, such
557 strategies include resource pooling, proactive technological adoption and
558 displacement of the fishing grounds.
- 559 4. This applies, *caeteris paribus*, to coastal, inshore, mid-shore and high sea fishermen.

- 560 5. Nowadays, changes are observed. These seem more important than before. Changes
561 in rainfall patterns, wind and water temperature have induced changes in the
562 resource and call for even more adaptation.
563 6. Consequently, fisherfolk are moving further afield.

564 Such a story line, reminiscent of those from Uummanaq (see UN#2 in section 5.1), is
565 reassuring. Science may be called on in conditions that will need to be negotiated. Yet
566 midway through the project, the central story line changed and the new story line (KFN#2) is
567 described here:

- 568 1. The fisheries sector is going through an unprecedented social crisis.
569 2. This crisis takes several shapes, all of which are extremely threatening to the well-
570 being of fisherfolks and their families.
571 a. Inshore fisherfolks are facing unprecedented levels of violence when away.
572 They are victims of organized crime and very little is done by the authorities
573 to protect them.
574 b. Mid-shore fisherfolks are disappearing at sea more often than before; some
575 are jailed in Sri Lanka, in Deo Garcia and in the Gulf countries. The
576 government does not offer help.
577 c. High seas fisherfolks are being jailed abroad, as far away as Iran and the
578 Russian Federation. Very little is being done to secure fair treatment or a
579 speedy release.
580 3. All these issues are associated with travelling further afield in order to catch fish.
581 4. Protests are being organized in front of government offices in order to get help,
582 without success – the purpose of governmental agencies in general, and the police,
583 the coastguard, and the department of foreign affairs in particular is not to protect
584 fisherfolks from their own risk-taking behavior.

585 While this storyline became established, the project held a training workshop in Kerala. The
586 leader of the Southeast Asian Fishermen's Federation (the local partner in Kanyakumari)
587 made a presentation along the lines of KFN#2. In the audience were members of the project
588 team in India, including climate scientists from India's National Institute of Oceanography.
589 Their analysis of changing SSTs, sea currents and salinity levels in the Gulf of Bengal, the
590 Indian Ocean and the Arabian Sea provided insights into the probable weather causes
591 underpinning fisherfolks strategies to move further and further away from their home ports.
592 The conversation that ensued led to a third Kanyakumari narrative (KFN#3).

- 593 1. India's climate scientists have observed that the sea surface temperatures, local
594 currents and general weather patterns have been changing in the Bay of Bengal, the
595 Indian Ocean and the Arabian Sea.
596 2. Such changes in ocean conditions have important impacts on the fishery resource
597 and thus on fishermen.
598 a. Regarding the inshore fleet: modified sea currents impact on the productivity
599 of nearshore water. Fish are moving northward along the Bay of Bengal coast.
600 Inshore fishermen have to fish further from their traditional fishing grounds.
601 They are not welcome in these new fishing grounds as they are already the
602 subject of fierce competition between local fishermen. Violence ensues.
603 b. Regarding the mid-shore fleet: pelagic fish, their principal target, are
604 following higher SSTs, taking them further from home. At the same time,

605 storms have been more severe. They are thus facing higher risks at sea due to
606 both the distance and more severe storms.

607 c. Regarding the high-seas fisherfolks: the boats they use are generally less and
608 less able to meet their needs due, among other cause, to changes in the
609 environment including the climate.

610 3. This phenomenon, which might very well be attributable, at least discursively, to
611 climate change, takes several shapes, all of which are extremely threatening to the
612 well-being of fisherfolks and their families ...

613 - the story is then spliced into KFN#2 with a substantial change to the last item.

614 4. Fisherfolks are victims of elements beyond their control. As they are forced into the
615 trouble they are in, it seems legitimate for their representatives to request
616 government intervention – isn't it the role of the government in general, and of the
617 police, the coastguard, and the department of foreign affairs in particular, to protect
618 the Indian population from harm?

619 This splicing of weather science stories, combined with the overarching “climate change
620 impacts on everything” narratives, leads to a substantially changed situation. The framing of
621 fisherfolks as voluntary risk-takers may now be contested on scientific grounds.

622 Hybridization favors the community. The situation might not be fundamentally different
623 from the situation in Senegal. Yet in Kanyakumari, the community was stuck, deadlocked, in
624 a situation where it was simply impossible to shape the world, seemingly rightfully so – at
625 least in the dominant narrative. Adding scientific information to reframe the situation has
626 the potential to give agency back to the community. The meaning associated with the
627 ongoing crisis had changed. Sensemaking did not so much relate to a change of situation;
628 the meaning associated with the situation eluded those impacted. The sensemaking related
629 to very specific activities: exercises of joint analysis, discussing, and sharing, around scientific
630 findings. This sharing did not take the form of scientific publications or outreach documents.
631 It took the form of knowledge mobilization events with community representatives or even
632 in communities.

633 Knowing what is going on may empower local communities and this leads us to our final
634 example: Cocagne and Grande-Digue. In Cocagne and Grande-Digue an initial narrative was
635 presented by the Canadian research team (CGDN#1):

636 1. The Cocagne and Grande-Digue area has long-standing experience of adapting to
637 environmental, social and political changes dating as far back as the 18th century and
638 beyond.

639 2. It has been involved in a uniquely successful partnership with scientists from the
640 *Université de Moncton* for several years now and some of the partners have known
641 each other since the 1970s.

642 3. During the course of the ARTisticc project, this partnership was mobilized to address
643 ARTisticc's research questions.

644 4. Beyond the broad objectives of ARTisticc, the Canadian team considered that the
645 slate is now clean, as community consultations would soon begin and would
646 determine what this project would be about in concrete terms.

647 Later in the course of the project, and in coherence with this initial statement (CGDN#1), the
648 local implementation involved careful consultations with the community. This led to a series
649 of research plans, divided into the following fields: natural science, social sciences and the
650 humanities. The story that emerged was as follows (CGDN#2):

- 651 1. In Cocagne Grande-Digue, science with and for the people would be conducted along
652 the more traditional division of science – according to the work-task organization of
653 the ARTisticc project.
- 654 2. In this process, which would include various levels of local participation from
655 interviews and focus groups to citizen science, we would increase the knowledge
656 base relating to the Cocagne and Grande-Digue area. The research questions were
657 directly identified, “chosen,” by the local partners.
- 658 3. As a first step, a comprehensive inventory was taken of the knowledge currently
659 available and shared.

660 Finally research was conducted leading quite naturally to the following narrative (CGD#3)

- 661 1. In Cocagne and Grande-Digue, citizen-centered science was conducted.
- 662 2. The participation of the citizen in the science-making process was very high.
663 Community members provided a wealth of data in all scientific disciplines.
- 664 3. Observations in the field, from townhall meetings and from governmental agencies,
665 as well as papers presented in national and international conferences and papers
666 being prepared for publication show that this process was beneficial to all involved.
- 667 4. One example of uptake is the co-construction of a policy brief with key partners, that
668 has the potential to impact local, regional and national policy making and is widely
669 distributed.

670 In the Cocagne and Grande-Digue area, the narratives that were most visible related not so
671 much to environmental and social changes, but more to the process of transdisciplinary
672 science. The invisibility of the narratives of change may be explained by the fact that the
673 narratives of changes presented by the community and scientists were aligned. The central
674 issue for the case study was to see how the joint partnership could increase the accuracy of
675 knowledge on local change – past, present and future – and increase the community’s grasp
676 of these changes. Cocagne and Grande-Digue appear to be archetypical of the
677 transdisciplinary enquiry envisaged by those who wrote the ARTisticc project proposal.

678 This may be exemplified by a key central, and quite unique, characteristic of the Cocagne
679 and Grande-Digue site. In Cocagne and Grande-Digue historians were part of the
680 transdisciplinary team. Their enquiries, and associated results, helped people to connect
681 their current circumstances with larger questions about demography, migration, the rural
682 economy and resource exploitation – and science making. Seeing a longer view helped with
683 understanding of causes of change. It also provided a reinforcement of the feeling of
684 interconnectedness of sources of changes, and reasons for optimism.

685 6. Discussion and conclusion

686 In this research we analyzed a situation of sensemaking associated with the implementation
687 of a transdisciplinary research project exploring coastal adaptation to climate change. Our
688 results show that transdisciplinary adaptation research may generate hybrid narratives in
689 many ways. We also see that sensemaking in such situations interacts dynamically with
690 agency in various ways.

691 6.1 Sensemaking

692 In his seminal book, Weick (1995) states that:

693 “If accuracy is nice but not necessary in sensemaking, then what is necessary? The
694 answer is something that preserves plausibility and coherence, something that is
695 reasonable and memorable, something that embodies past experience and
696 expectations, something which resonates with other people, something that can be
697 constructed retrospectively but also can be used prospectively, something that
698 captures both feeling and thought, something that allows for embellishment to fit
699 current oddities, something that is fun to contrast. In short, what is necessary in
700 sensemaking is a good story.” (pp. 60-61)

701 Our results indicate that transdisciplinary science, and the associated sensemaking, may lead
702 to “good stories,” stories that make sense for those involved in their production, stories that
703 are adopted. In a worrying parallel to Weick’s “If accuracy is not needed”, our results also
704 indicate that robust science is not necessarily needed in order to create narratives that are
705 adopted by community members.

706 Within a transdisciplinary framework, what then is a “good story?” Who is in a position to
707 judge the validity of an hybrid narrative stemming from dialogues between scientists and a
708 local community. If we work under the hypothesis that a good story is one that is adopted,
709 we can observe the following.

710 The stories that took place in Greenland diverged; stories co-existed and were compatible.
711 Both “families” of stories, UN#1 and UN#2 on the one hand, and UN#3 and UN#4 on the
712 other, carry or mirror the identity of the community (UN#1 and UN#2) or of the team of
713 scientists involved (UN#3 and UN#4). One single common story did not, however, seem to
714 emerge from the transdisciplinary consortium. The judging of the story somehow remained
715 within each community. These different stories did co-exist. They were even occasionally
716 adopted by members if both communities - on an ad hoc basis.

717 In the case of Tiksi and the *Petite côte*, stories were adopted by these communities and were
718 thus deemed locally to be good stories. Yet for the scientific members within the research
719 consortium, these stories were not really satisfactory. “Climate change” as the only
720 explanation was seen as “inaccurate” by the scientists. Such a story could not be adopted
721 “as is” by the research team. In Tiksi, the story that conveyed the local community’s
722 disempowerment and heteronomy may have been accurate, yet they came into conflict with
723 the values and beliefs of the research team as whole. The scientists involved saw autonomy,
724 agency and adaptive capacity as central to human experience. Negating the possibility for
725 these, and considering that such a negation may be performative, was simply unacceptable
726 to the team. Transdisciplinary climate change research in our case is associated with a very
727 precise normative stand: a transdisciplinary research project should lead to empowerment;
728 it must not stabilize situations of disempowerment. While the power to choose a story
729 ultimately lies in the hand of the narrator, in these two cases, the stories chosen by one
730 group (the local community) could not be relayed by the other (the scientists).

731 Finally, in the Kanyakumari and Cocagne and Grande-Digue cases, a shared narrative
732 emerged, uniting the community and the scientists. In Kaniakumary the accuracy of the
733 causal chain that is spelled out (climate change-> changes in current, SSTs, and storm
734 climate-> changes ecosystem services->push fisherfolks further out or further north) remains
735 to be robustly demonstrated. Accuracy is not (yet?) an important part of the discussion.
736 Plausibility is what seems to be used as a validation criteria. In Cocagne and Grande-Digue,
737 the partnership was involved in a transition from plausibility to accuracy. Such an

738 enhancement of accuracy maybe sourced to the presence of the scientific team. Yet, and
739 this needs to be emphasized, it may also be sourced to the contributions of data and
740 interpretations from local actors and organizations. Local historical stories and emotions
741 were confronted with scientific protocols and a robustness assessment in order to develop a
742 robust, multiple perspectives and widely shared history of the area.

743 In this section we considered that a good story is one that is adopted. A good story may
744 nevertheless also be judged on its performative potential, regardless of whether this is
745 realized. This would seem coherent with transdisciplinary research as a source of well guided
746 action and with the need to take agency into account.

747 6.2 Agency

748 "If the first question of sensemaking is "what's going on here?", the second, equally
749 important question is "what do I do next?" (Weick et al. 2005).

750 In our case, agency – as an ability to shape one's world – came into play in various ways: a
751 strong feeling of agency within the local participants in Uummannaq, a strong manifestation
752 of agency (scientists working in Uummannaq, local community and scientists in Senegal), a
753 strong lack of agency (Tiksi community) and an agency reinforcement mechanism in
754 situations of low (Kanyakumari) or high (Cocagne and Grande-Digue) initial agency.

755 Our cases show several dimensions of the ways agency might interact with sensemaking in
756 situations where different narratives meet as interpretation frames. In Uummannaq, we
757 witnessed mutual reinforcement. In Tiksi, we observed the risk of reinforcing the feeling of
758 disempowerment. In Senegal there was a risk that the scientific narrative increased the
759 plausibility of a narrative that was inaccurate in its narrowness, potentially generating the
760 wrong actions. In Kanyakumari and in Cocagne and Grande-Digue, we saw that agency was
761 reinforced through joint sensemaking.

762 Ketelaar et al. (2012) explored the connection between agency and sensemaking in a very
763 different setting (teacher position in front of a teaching innovation). Their results indicate
764 that one central feature is that of group-building. In their case, the sensemaking agency
765 nexus seemed to be closely linked, developing a feeling of cohesion among those affected or
766 involved. In our cases, agency-enhancing through sensemaking is connected to the collective
767 construction of a shared story, a hybrid narrative (Kanyakumari and Cocagne and Grande-
768 Digue); alternatively the sharing of stories, without hybridization may also create a sense of
769 cohesion (Uummannaq). A central dimension that will need further analysis is that of
770 narrative sharing as a trust building and a trust nurturing mechanism.

771 6.3 Knowledge and power as central categories

772 "Sensemaking strikes some people as naive with regard to the red meat of power,
773 politics, and critical theory. [...] Sensemaking discussions do tend to assume that
774 meanings survive as a result of voting, with the proviso that sometimes the votes are
775 weighted equally and sometimes they are not." (Weick et al. 2005).

776 The results associated with Senegal's Petite Côte are reminiscent of the complex interplay
777 between power, knowledge and rationality as illustrated by Richardson (2005). Richardson
778 shows that imposing a knowledge base as reference knowledge amounts to imposing ones
779 rationality. He further demonstrate that such an imposition is the product of power play.
780 One of transdisciplinary science basic tenets is that power over knowledge production needs
781 to be better distributed (Alonso-Yanez 2019). Finally, within the realm of adaptation

782 research, Vink et al. (2013) propose a conceptual matrix based on the dimensions knowledge
783 and power. They apply this matrix to the existing literature on adaptation. This analysis leads
784 them to argue that more research on the knowledge and power interplay is needed.

785 The result that we obtained by using the sensemaking is a step in that direction. Within the
786 Senegalese case study, the narrative-centered sensemaking approach allowed us to keep
787 alive dissonant voices while documenting the interpretative frames that led to these
788 dissonance in spite of the progressive dominance of the “climate change” narrative. The
789 Uumannaq case study illustrate that, by using our approach, we kept a close watch of the
790 progressively diverging interpretative frames that were used by the community on the one
791 hand, and by the research team on the other hand. The Tiksi case study shows how
792 dissonant voices and frames may be mobilized and organized in order to, in later steps,
793 engage into various conversation between different communities, nonscientific and
794 scientific. Finally, in the Indian and Canadian case study the sensemaking lens allowed the
795 identification of a pathway where knowledge and power interact in order to foster
796 empowerment, not conflictual rationality imposition.

797 As already identified by Dervin (1998) in another setting, we observe that “Sense making, as
798 an approach, is [...] a methodology disciplining the cacophony of diversity and complexity
799 without homogenizing it.” Within the field of transdisciplinary adaptation to climate change
800 research a sensemaking approach may thus contribute to keep the diversity of knowledges
801 and interpretations alive yet somehow disciplined - in a way that may prevent the use of
802 knowledge to impose power or vice versa.

803 6.4. Furthering sensemaking centered enquiries into adaptation to climate change

804 In the work we present above, we are somehow one step short of addressing adaptation as
805 a deeply transformative process. Yet ultimately agency, world shaping, is about transforming
806 the world in a way that is desired. In their analysis of transformative science, Schneidewind
807 and Augenstein (2016) propose a classification of transformation thinking into three schools:
808 idealist school, the institutional school, and the technological innovation school. They
809 associate the following conception of humankind to the idealist school: “Humans are
810 sensemaking, social and communicative beings.” Sensemaking may thus be central to
811 transformative thinking. This being said, it is important to stress that transdisciplinary
812 enquiries are often consubstantial to transformative science (Schneidewind et al. 2016a, b).

813 For example, Schneidewind et al. (2016a) identify that transdisciplinary and transformative
814 research is in conflict with the established disciplinary organization of science. Within
815 adaptation research, such conflictual situations may generate a diversity of narrative.
816 Sensemaking, may in such cases be mobilized in order to document how such a diversity
817 evolve, and contribute to the final desired outcome of better adapted human communities.

818 6.5 Conclusion

819 In the ARTistic project we set out to analyze adaptation using a transdisciplinary approach.
820 Along the way we discovered some of the ways the setting up of hybrid narratives around
821 issues of adaptation and climate change may deploy itself. We observed, and shared in this
822 paper, how sensemaking may have various effects on the agency of those that are involved
823 in the hybridization process. We particularly observed how plausibility, as opposed to
824 accuracy, in many instances, was more important when selecting stories that “makes sense”

825 for local communities. Ambiguity was an outcome of the research process that we had
826 launched. We are now in a position to propose some conclusions:

827 First, stories do matter, and significantly so. Adaptation centered transdisciplinary research
828 entails the setting up of a battleground for holders of conflicting interest and knowledge
829 claims (Siebenhüner 2018). In such a context, grounding the associated processes in local
830 stories, and accepting that ambiguity may emerge along the way, may foster outcome
831 respectful of the diversity. This entails the risk of seeing inaccurate, yet plausible, stories
832 taking precedence over accurate, science-based stories - yet a close watch of the narratives
833 and their respectful questioning can be organized. Transdisciplinary scientists must thus
834 keep a very careful watch on the ways hybridization occurs, ambiguity emerges, and on the
835 interplay between accuracy and plausibility. Transdisciplinary scientists may also want to
836 keep a close watch on the coexistence of different stories. In such situation, the lack of
837 hybridization may reflect high level of trust and mutual respect. Alternatively it may indicate
838 that the communities in presence are not listening to each other.

839 Second, stories are connected to the history, needs and political economy of the local
840 communities in which they are observed. Plausibility may not be the only factor influencing
841 the adoption of a narrative. Consciously or not, the adoption of narrative may be
842 opportunistic, geared towards influencing local balance of power. Transdisciplinary scientists
843 must thus remain aware of local political forces. Local playing fields are not necessarily
844 entirely level, and a close watch on both narratives, and sensemaking processes, as well as
845 their evolution, may help in getting a grasp of what is actually happening in terms of power
846 play.

847 Third, stories and their deployment play a role in the ability of local communities to cope
848 with changes. Agency and narratives are dynamically connected through sensemaking. In a
849 transdisciplinary context, this means that science may benefit local communities through
850 increased knowledge AND an increased sense of agency.

851 Following these conclusions, transdisciplinary scientists may experiment with research
852 processes that use local narratives as an entry point. In doing so, science, and action, will
853 jointly benefit. A focus on narratives and sensemaking may help in respecting the interplay
854 between plausibility, accuracy and ambiguity in situation of multiple interpretations. It may
855 facilitate dealing with issues of knowledge and power which are central to transdisciplinary
856 climate change adaptation research.

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