

1

2

Facing climate injustices:

3

community trust-building for climate services

4

through Arts and Sciences narrative co-production

5

6 *Juan Baztan^{1*}, Jean-Paul Vanderlinden¹, Lionel Jaffrès², Bethany Jorgensen³, and Zhiwei Zhu¹*

7

8 ¹ CEARC, Université Paris-Saclay, UVSQ, 78280 Guyancourt, France

9 ² Le Grain, Le Maquis, 29200 Brest, France

10 ³ Civic Ecology Lab, Cornell University, Ithaca, NY, 14850, USA

11 * *Corresponding author: juan.baztan@uvsq.fr*

12

13

14

15

16

17

18

19

20

21

22

23

24

25 **Keywords:**

26 Climate services, Co-production, Narrative, Arts and Sciences, Transdisciplinary, Brittany

27 **Abstract**

28 The goal of this paper is to analyze how and with what results place-based climate service co-
29 production may be enacted within a community for whom climate change is not a locally salient
30 concern. Aiming to initiate a climate-centered dialogue, a hybrid team of scientists and artists
31 collected local narratives within the Kerourien neighbourhood, in the city of Brest in Brittany, France.
32 Kerourien is a place known for its stigmatizing crime, poverty, marginalization and state of disrepair.
33 Social work is higher on the agenda than climate action. The team thus acknowledged that local
34 narratives might not make much mention of climate change, and recognized part of the work might
35 be to shift awareness to the actual or potential, current or future, connections between everyday
36 non-climate concerns and climate issues. Such a shift called for a practical intervention, centered on
37 local culture.

38 The narrative collection process was dovetailed with preparing the neighbourhood's 50th
39 anniversary celebration and establishing a series of art performances to celebrate the
40 neighbourhood and its residents. Non-climate and quasi-climate stories were collected,
41 documented, and turned into art forms. The elements of climate service co-production in this
42 process are twofold. First, they point to the ways in which non-climate change related local concerns
43 may be mapped out in relation to climate change adaptation, showing how non-climate change
44 concerns call for climate information. Secondly, they show how the co-production of climate services
45 may go beyond the provision of climate information by generating procedural benefits such as local
46 empowerment – thus generating capacities that may be mobilized to face climate change. We
47 conclude by stressing that “place-based climate service co-production for action” may require
48 questioning the nature of the “services” rendered, questioning the nature of “place,” and questioning
49 what “action” entails. We offer leads for addressing these questions in ways that help realise
50 empowerment and greater social justice.

51

52

Today, there is some irony for us to work on a paper tackling issues of priorities, justice, and the interconnectedness of climate issues with most issues of social justice. As we are writing these words, we are locked-down, contributing, through isolation, to a fight against a very disruptive world scale pandemic. We have somehow imperfectly shifted our priorities. Many of us observe that COVID-19 has shifted all sorts of priorities. Some of us long for a world a world where priorities will be, at long last, straightened-out – thanks to the lockdown and the realization that some things can grind to a halt if really needed (Latour 2020). Some see current events not so much as a crisis, but as a necessary, and painful, wake-up call leading to an evolution in our ways of inhabiting the world. If there is lesson to be learned from COVID-19, it is that priorities are contextual and short-term crises, mutations, may blind us from more pressing challenges (the intertwining of climate change and pandemics takes many twists and turns, see for instance Ord 2020). We have known for a long time that pandemics and climate change may be connected, and climate justice may very well be one of these connections.

54

55 **Box 1: On the irony of writing about priorities and interconnectedness during COVID-19 lockdown.**

56 This paper contributes to the growing body of the literature on climate service co-production; co-
 57 production understood here as a normative practice that consists in “the deliberate collaboration of
 58 different people to achieve a common goal” (Bremer and Meisch 2017, pg. 2). We chose to analyze
 59 a climate service co-production situation where potential climate information users were not
 60 necessarily aware of the importance of climate change in their daily lives. We developed an
 61 intervention allowing for the analysis of how and with what results place-based climate service co-
 62 production may be enacted within a community whose locally salient concerns do not include
 63 climate change.

64 While envisioning local climate change adaptation action, one may have to face the fact that for
 65 some communities climate change might not be high on the local agenda. The issue is not
 66 necessarily that such communities negate the salience of climate change and its impacts. Some
 67 communities may have other challenges that are more pressing and not obviously climate related:
 68 marginalization, poverty, resource depletion, crime, sense of powerlessness, health, housing,
 69 education, cultural erosion. Some communities are facing short-term challenges for which all their
 70 energy is mustered – other stressors do matter (e.g., Ahmed et al. 2016, McCubbin et al. 2015). Yet
 71 these communities are and will be facing climate change and its impacts. It is quite likely they are
 72 already in a position where climate change adaptation may be necessary. They may thus need
 73 climate science attuned to their specific challenges, however they are not yet part of the visible
 74 “demand side” for climate services such as climate information.

75 Climate science will have to deploy itself in accordance with their priorities, which are not climate-
 76 centered. These situations raise questions about the legitimacy of climate action in the face of social
 77 and economic hardship not directly connected to climate challenges. Who has a say in priority
 78 setting? Can an issue seen as salient from outside a community be somehow made salient for
 79 those within the community? By whom, and under what conditions, is exogenous priority-setting
 80 acceptable?

81 Concern about exogenous priority setting and its associated marginalization led our team of
 82 scientists and artists to engage in fieldwork in the Kerourien neighborhood, the results of which we
 83 present in this paper. We share a story of seemingly competing priorities, external and internal.
 84 Through climate service co-production, which we see as an avatar of transdisciplinary research, we
 85 conducted a real-life experiment where scientists and artists focused on developing approaches for
 86 place-based climate service co-production by reaching out to a community that has other, more

87 pressing concerns than climate change. The Kerourien neighborhood, in the city of Brest located on
88 the coast of the Brittany region of France, is better known for its stigmas (e.g., high unemployment
89 rate, state of disrepair, drug-related violence) than for its awareness of climate issues. Yet climate
90 change is the symptom of broader issues, and is intimately connected to social issues (see Krauss
91 2020) and it seemed to the research team that Kerourien's challenges deserved to be explored
92 through the lens of climate change.

93 We first present a summary of the literature we drew from to design our on-site intervention,
94 including: climate change adaptation and local contexts, art and science approaches to climate
95 intervention, and climate service co-production as an empowering transdisciplinary practice. We
96 then describe the CoCliServ project and the Kerourien community. The results section focuses on
97 the process in which we participated, its outputs in terms of approach, procedural and substantive
98 benefits, and entry point for place-based climate information design. We focus on locating climate
99 change within apparently non-climate related narratives and on the ubiquity, yet invisibility, of climate
100 change within Kerourien. We further discuss the procedural and substantive benefits of the work
101 conducted.

102 **2 Local context, climate services, and art and science co-production**

103 "Climate science usability is a function both of the context of potential use and of the process
104 of scientific knowledge production itself" (Dilling and Lemos 2011).

105 It is now widely documented that climate change adaptation is dependent upon local contexts and
106 there are no one-size-fits-all solutions (IPCC 2014). Culture (Adger et al. 2013), local knowledge
107 (Naess 2013), local institutions (Berman et al. 2019), the intertwining of local and global political
108 forces and history (Kennedy et al. 2018), are examples of dimensions that define the ability of a
109 community to face climate change. The provision of meaningful and usable climate information at
110 the local level, therefore, entails some sort of tailoring. There are now case studies illustrating the
111 mismatch between climate science and local interests (e.g., Baztan et al. 2018)

112 Providing information does not necessarily mean local users will be able to make use of it. Climate
113 science may need to be linked more directly to local communities, to their particular capacities and
114 contexts of vulnerability (IPCC 2014, Vaughan et al. 2016). As Bremer et al. (2019) put it, "scholars
115 and practitioners have been ill-equipped to describe the contexts where climate services are
116 introduced, or interpret how context can shape the way they develop" (pg. 47).

117 Co-production has been proposed as one approach for addressing the challenge of turning climate
118 science into a usable climate service. Not only does knowledge co-production allow for better
119 usability and implementation, it has many increasingly documented benefits such as social learning,
120 empowerment, and inter- and intra-community trust building.

121 2.1 Climate service co-production

122 For the purpose of this research we used, as starting point, Vaughan and Dessai's (2014) definition
123 of climate services: "The aim of climate services is to provide people and organizations with timely,
124 tailored climate-related knowledge and information that they can use to reduce climate-related
125 losses and enhance benefits, including the protection of lives, livelihoods, and property" (pg. 588).
126 When considering this definition, we focused on providing people with climate tailored knowledge,
127 "people" understood as members of local communities. The central challenge we wished to address
128 was that of "tailoring" climate knowledge and information for communities at the margins, who might
129 not be very aware of climate issues.

130 Such tailoring of climate knowledge is closely associated with the ability to establish iteration (Dilling
131 and Lemos 2011) and dialogue (Vaughan and Dessai 2014) between scientists and non-scientists in
132 the course of knowledge production and use. Climate knowledge co-production, the “deliberate
133 collaboration of different people to achieve a common goal” (Bremer and Meisch 2017, pg. 2) has
134 been proposed for quite some time (e.g., Lemos and Morehouse 2005) to address challenges of
135 initiating and maintaining such reiterations and dialogues. But what if this dialogue needs to be
136 established on grounds other than those of climate change?

137 Bremer and Meisch (2017) conducted an extensive mapping of the literature on climate change
138 research co-production. They identify a series of eight “conceptual lenses” and call for a “self-
139 reflexive transparency when using co-production concepts” (pg. 1) to address the concepts’
140 polysemy. Within their framework, the work we conducted lies at the juncture of several objectives
141 associated with these lenses: we want to integrate non-scientists as co-investigators (extended
142 lens); we wish to sustain interactions between climate science providers and users (iterative
143 interaction lens); we pursue a goal of empowering local experience, and thus of local knowledge
144 (empowerment lens); we recognize the need to facilitate social learning about climate issues (social
145 learning lens); and we are embedded in a culturally-rooted goal to improve public service through
146 the joint engagement of government agencies and citizens in the production of new knowledge
147 (public services lens).

148 All these objectives are associated with acknowledging the current uneven distribution of access to,
149 and benefits from, climate services development (Vaughan and Dessai 2014). For instance,
150 Harjanne (2017) surveyed institutions related to climate services to identify how they justify the need
151 for climate services (as a departure from climate science), and identified the following rationales: the
152 global and widespread nature of the climate challenge; specific industry needs; socio-economic
153 value; technological potential; and deficient supply and demand. There seems to be very little room
154 left for marginalized communities. In the work presented here, we envision the co-production of
155 climate services, not because we perceive co-production as a “value in itself” (Voorberg et al. 2015),
156 but because we see co-production as a means to create and nurture sustained interaction with
157 marginalized communities while contributing to their empowerment. We wish to explore means for
158 correcting the inequitable distribution of climate change knowledge for action.

159 This uneven distribution in part reflects the fact that not all communities are equal and some are
160 facing such immediate challenges that climate change may be invisible to them. Over the course of
161 the research presented here, this called for working to shift awareness to the actual or potential,
162 current or future, connections between everyday non-climate concerns and climate issues. Such a
163 shift required a practical intervention centered on local culture. We chose to work hand-in-hand with
164 artists to conduct such an intervention, as art is well-identified as an approach to make visible the
165 “invisible or almost-visible” phenomenon of climate change (Knebusch 2008). Art is also identified
166 as facilitating access to narratives in general, and climate narratives in particular (Roosen et al.
167 2018).

168 2.2 Art and science integration for climate intervention

169 Art-based intervention has been proposed in the context of climate change for quite some time
170 (Lippard 2007, Volpe 2018). This is not without pitfalls such as instrumentalising art, and
171 reproducing dominant categories and codes through art (Miles 2010). Experiments have shown that
172 through public participation and activism, art may be empowering, and may shift attention to issues
173 that question dominant paradigms (Sommer and Klockner 2019).

174 Several dimensions have been identified for collaborations between art and science: new
175 understandings and capacities within and across the arts and sciences involved (Gabrys and Yussof
176 2012); catalysing explorations of the scientific context and critical re-imaginings of research
177 practices (Rödder 2017); helping to engage multiple senses and emphasizing social interaction
178 within research practices; aiding participating researchers in thinking creatively (Jacobson et al.
179 2016); redesigning social relations to natural systems (Armstrong and Leimbach 2019);
180 rearticulating politics and knowledge (Latour 2011); offering more effective approaches to engaging
181 multiple publics in climate-compatible behaviour change; and engaging explicitly with the under-
182 researched issue of the role of place attachment and local, situated knowledge in mediating the
183 influence of climate change communication (Burke et al. 2018).

184 Capitalizing on these observations, we developed the working hypothesis that iterative art and
185 science approaches have the potential for instigating and sustaining community dialogue through
186 efforts to co-produce climate services. We saw art as essential for making the concept of climate
187 services more meaningful in a specific place, and focused on narratives as an entry point for co-
188 construction. Artists are ideally placed to challenge existing narratives and to provoke the
189 exploration of new narratives. The intermeshing of nature, culture, emotions and reason around
190 weatherscapes implies that approaching local climate through science could be put into perspective
191 by a more intuitive approach seeking to represent the world as perceived by the senses. Such an
192 approach has been achieved by including the arts in social dynamics together with scientific
193 research and innovation (Bilodeau, 2013). We envision the integration of art and science not in
194 terms of using the arts to communicate scientific findings, but rather in terms of gaining access to
195 elements that are generally excluded from scientific inquiry to convey a more complete picture of the
196 challenges at hand. Developing a strong connection between art and science enables the re-
197 articulation of the scientific description of the world (Latour, 2011).

198 We proposed to test if an art and science based ‘recomposing’ of the world (Latour, 2010) allows for
199 locally clarifying ambiguous concepts such as climate change and associated “services”. Our
200 investigation entailed examining the potential of art ‘gestures’ (Citton, 2012) and the ‘practices of
201 everyday life’ (de Certeau, 1990) to facilitate cultural translation between different fields of
202 knowledge and the associated diversity of priorities.

203 **3 Setting of the transdisciplinary work**

204 3.1 Narrative-based inquiry within the CoCliServ project

205 The results presented here are from a broader project entitled “Co-development of place-based
206 climate services for action” (CoCliServ, <http://cocliserv.cearc.fr>), implemented in parallel at five sites:
207 Jade Bay in Germany (Krauss 2020), Bergen in Norway (Bremer et al. currently under review),
208 Dordrecht in the Netherlands (Marschütz et al. 2020), the gulf of Morbihan (da Cunha et al. under
209 review), and the Kerourien neighborhood in Brest, France. These sites follow a shared
210 methodological design starting with narratives as an entry point (Krauss 2020) and extending to
211 incremental normative scenario design (Vanderlinden 2015). These steps are transversely
212 associated with: (a) identifying available climate information and potential gaps to be addressed now
213 or in the future, (b) developing a suite of representational tools and participatory approaches (e.g.,
214 outreach material, art and science procedures, participatory metadata scheme developments and
215 mapping, citizen science), and (c) creating a knowledge quality assessment protocol tailored to the
216 needs of the project.

217 The narrative dimension of the project is seen simultaneously as a “first step” and a step that yields
218 results in and of itself. More details on the CoCliServ narratives can be found in the “narratives of
219 change” work, led by Werner Krauss (Krauss 2020, Krauss and Bremer 2020).

220 One of the central challenges in designing the CoCliServ project related to generating a sufficiently
221 broad and diverse set of ground-truthing sites to assess how the approach would fare in different
222 settings as it was being developed and tested. Within the participating communities, the Kerourien
223 site -the focus of the experiment we present here- was unique. In Kerourien, climate change is not a
224 visible concern; residents of Kerourien face other daily struggles that take priority and the research
225 team had to adapt to their situation.

226 3.2 Kerourien

227 The peri-urban neighborhood of Kerourien is in the port city of Brest (Brittany, France). It is located
228 in a coastal area with low population density on the western edge of France. Kerourien is a 30-
229 minute walk from where the Bay of Brest connects to the *Mer d'Iroise*, part of the Atlantic ocean
230 system. It is technically coastal, however its residents are not seafarers or fishers, they live in a
231 suburban housing development similar to many found throughout France.

232 *3.2.1 Climate change in a quasi coastal context*

233 Climate change and its effects have been studied in the Brest area for decades. We know today, as
234 shown for example in L'Hévéder et al. (2017), that temperature plays a fundamental role in ocean
235 circulation; stratification; chemical and biogeochemical processes such as degradation, dissolution,
236 precipitation; and in controlling the spatial distribution, metabolic rates and life cycles of marine flora
237 and fauna (e.g., Bissinger et al. 2008, Chen 2015, Helmuth et al. 2006, Philippart et al 2011,
238 Thomas et al. 2016 in L'Hévéder et al. 2017). Kerourien's context is that of an oceanic region with
239 sea temperature sensitives to global change, this area is a biogeographic boundary zone and in
240 recent years warm water species have become much more common (Southward et al. 1995).
241 Ecological problems related to sea surface temperature change also include alterations in nutrient
242 delivery from land to sea; arrival of invasive species and changes in host–pathogen relationships
243 and biological interactions (Poloczanska et al. 2008). These observations are combined with coastal
244 erosion and extreme weather events such as droughts, exceptional storms, and heat waves, as
245 experienced in 2003.

246 *3.2.2 Climate change adaptation within a larger urban planning context*

247 The 2019-2025 city climate plan for Brest pays particularly close attention to mitigation, and thus to
248 energy production and consumption, concluding that: (i) housing (heating, hot water, and all uses of
249 electricity) is responsible for 36% of energy consumption in the Brest metropolitan area and 28% of
250 greenhouse gas emissions. The energy used in the Brest metropolitan area is mainly of fossil origin
251 (gas: 37% and oil: 35%), the net quantity stored annually in the Brest metropolitan area is estimated
252 to be 8,633 tonnes of CO₂, i.e., around 1% of its annual emissions. While adaptation planning is a
253 legal requirement, mitigation seems to remain higher on the city's list of priorities.

254 *3.2.3 Some of Kerourien's key characteristics*

255 Kerourien has 1200 residents (2013 census), and the neighbourhood is mostly organized around
256 post-war housing projects. It is a priority area for the city, which implies a well-identified social
257 vulnerability including demographics such as: 24.4% single-parent families, with 40% of its residents
258 under the age of 25, and more than 20 nationalities represented. Kerourien is one of the most
259 diverse areas in the city and faces the most challenges in terms of urbanization, migration, and
260 disempowerment (Fig 1). Thirty-two percent of its inhabitants are unemployed versus 12% in the

261 rest of the city, with an apex of 46% for youth between the ages of 15-24 versus 21% for the rest of
 262 the city. The schooling rate for youth ages 18-24 is 35% versus 65% for the rest of the city. This is
 263 Kerourien's current context. From the neighbourhood's beginning there have been efforts for
 264 improvement conditioned by its unbalanced social structure. Currently five formal social work
 265 organizations conduct on-going efforts here, but with high unemployment and growing imbalances,
 266 the question often arises: "who helps whom"?

267 *PLEASE INSERT FIGURE 1 AROUND HERE*

268 **4 Key observations**

269 4.1 On the process of linking a local event and our climate services centered inquiry

270 The initial step of our co-production work focused on collecting narratives. This was an *ad hoc*
 271 process, which evolved along the way. We present our approach and associated observations as
 272 the first part of our results, describing the organisational stages and observations of procedures and
 273 materials (Table 3).

274 As a starting point, we formed a working group with four partners who had participated in preparing
 275 the project, including: The *Maquis*, the *Centre social Couleurs quartier*, the *Theatre du Grain*, and
 276 the CEARC research center.

277 The five initial meetings focused on identifying the means to simultaneously mobilize the
 278 neighbourhood around locally salient issues while giving access to potential conversations about
 279 climate-related concerns. The upcoming 50th anniversary of the neighbourhood was chosen as an
 280 opportunity to achieve this goal.

281 A list of stakeholders was established by the four core partners with the provision that snowballing
 282 was possible if a category had been overlooked. Accordingly, over the course of events we
 283 incorporated additional partners, but to a limited extent and very progressively. The initial
 284 stakeholder list comprised eight groups and institutions. After limited snowballing, it expanded to 14
 285 members (Table 1).

Name	Structure	Role
Le théâtre du Grain	Theater company	Project partner
Le Maquis	Policy "factory" NGO	Project partner
Centre Social Couleur Quartier	Social center	Project partner
Mairie de Quartier de Saint-Pierre	City service	Local stakeholder
Association Don Bosco	Social inclusion NGO	Local stakeholder
Brest Métropole Habitat	City services	Local stakeholder
Confédération syndicale des familles (CSF)	Consumers NGO	Local stakeholder
Jardins partagés de la Fontaine Margot	Shared garden NGO	Local stakeholder
Les Lapinoux	Nursery assistants NGO	Local stakeholder
Groupe scolaire Jean de La Fontaine	School	Local stakeholder
Cinémathèque de Bretagne	Audio-visual NGO	Local stakeholder
Canal TiZef	Audio-visual NGO	Local stakeholder

City Hall	City service	Local stakeholder
Residents	Non-associated Residents	Local stakeholder

286 **Table 1: Stakeholders involved in the local coordination committee.**

287 These stakeholders were invited to a foundational meeting to identify shared objectives within the
 288 context of organizing Kerourien’s 50th anniversary celebration. The goal that generated the most
 289 widespread support was to dispell the myth that “in Kerouien only bad things happen”. The
 290 anniversary celebration was thus named *les Belles histoires de Kerourien (Kerourien’s beautiful*
 291 *stories)*. The group of 14 stakeholders formally became the local coordination committee for the 50th
 292 anniversary.

293 At that point, the aim of climate service co-production seemed remote. However the intention,
 294 climate-services wise, was to gather narratives in order to explore the linkages between explicit
 295 concerns and climate issues, which seemed mostly invisible in Kerourien. Working on *les Belles*
 296 *histoires* with and for Kerourien residents seemed to be a challenging and promising opportunity.

297 We held monthly meetings of the 14-member local coordinating committee. These occurred under
 298 the leadership of its rapidly established executive board, composed of four members of the initial
 299 core working group. In the course of these meetings, stories were progressively identified. Four
 300 important developments were observed:

- 301 1. Members of the group acknowledged the need to increase the involvement of community
 302 members;
- 303 2. Systematic archive research became necessary because, according to those around the
 304 table, the stories being told needed anchoring in dated, identifiable events that those present
 305 had not necessarily witnessed but that were still part of the memories of the neighbourhood;
- 306 3. An interview protocol was devised to simultaneously involve more members of the local
 307 community and gather stories in the words of those most affected;
- 308 4. Practical matters were delegated to implementation committees tasked with managing
 309 specific practical concerns for the 50th anniversary celebration, such as: welcoming/ticketing;
 310 hiking, cycling, scooters; canteen/kitchen organizing; reports, video editing, projections (17
 311 total). These were powerful recruitment tools, and many community members participated.

312 These developments were important on two levels. First, the local coordinating committee turned to
 313 the *a priori* climate-centred transdisciplinary team to mobilise their expertise in terms of public
 314 participation and research. Second, it allowed for a more systemised approach to recruitment and
 315 collecting local and non-local narratives.

316 A transdisciplinary research design was then adopted to prepare the 50th anniversary celebration
 317 and its associated art form. This included systematising the identification of archive materials, their
 318 sorting, key-wording, storage, and subsequent use. These archives contained materials such as:
 319 personal photographs, drawings, memorabilia, media excerpts, and recorded songs collected
 320 through on-site participant observation. Gathering the archive had two effects. First, it allowed us to
 321 put Kerourien’s stigma in perspective both as the product of historical and political processes, and
 322 as the product of the amplification of anecdotal events. Second, compiling the archive also lent a
 323 sense of materiality to the process.

324 A semi-structured interview protocol was designed and the associated interview framework was
325 developed. Both were developed with input from the local coordination committee and members of
326 the local community. The interview protocol contained the following questions:

- 327 • Where were you born?
- 328 • What was the path you took that brought you to Kerourien?
- 329 • Can you tell us about the first time you came to Kerourien? How did you feel?
- 330 • Tell us about three events in Kerourien that have been important to you (personally).
- 331 • How do you feel when you look at Kerourien today?
- 332 • Can you describe three dreams you have for Kerourien in 2050 (in 30 years)?
- 333 • What would it take to make them come true?
- 334 • Do you have anything you would like to add?

335 The interview process led to the collection of narratives that stressed the need for *les Belles*
336 *histoires*. Interviewees were proud to be part of the neighbourhood and expressed a deep wish to
337 shift the stigma and be seen by the city as the decent people they recognise themselves to be:

338 “What I like is the moments when you help people and they thank you. Help with a stroller, or
339 the shopping bags of an elderly lady, hold a door. Small moments like that and people thank
340 you. A thank you. Not much, but attention, a gesture, a coffee, a smile.”

341 “We have lots of things to do. And in Kerourien we think, we act, we do a lot of things for
342 people to gather. Faced with the disorder of the world, here Kerourien is bubbling with ideas.
343 How, in the face of global reality, we invent something here to rebuild, to find meaning, with
344 the people of the neighbourhood. Many people do not give up. Continue tirelessly to fight, to
345 resist. Day by day. Right here. Now.”

346 At that point, our experiment in climate service co-production had taken quite a turn. First,
347 narratives were being collected with a level of robustness that would make them usable in a
348 science-centred process. Second, the team of climate social-scientists and artists were putting their
349 skills to work to serve the local community in realms that may seem far removed from climate
350 issues, but that allowed for a fascinating exercise in trust building and, as a result, quite extensive
351 data collection.

352 Papers, objects, newspaper clippings, bits and pieces of local narratives, were made physically
353 available. This led to another important development: obtaining two rooms and bathrooms fully
354 dedicated to those preparing the 50th anniversary celebration. This locally anchored what had
355 otherwise been a “placeless” exercise. Stories, archives, drawings, timelines all could be pinned on
356 the walls. Interviews were conducted in the *les Belles histoires* room. Involvement continued
357 growing, with community members “just passing through” to “take a look,” and thereafter staying
358 around, becoming contributors to the anniversary celebration preparations and the archive and
359 narratives corpus we were compiling (Table 2).

360 For the climate service co-production work, it meant a wealth of stories were made available.
361 Ongoing dialogue with and participation from the artists meant that a central art form was taking
362 shape. This acted as a filter, prioritizing local issues as they appeared in the stories being told. A
363 script and a scenography emerged, encapsulating the stories being told in Kerourien.

Primary or Secondary Source	Type	Number of items	Reference Code
Primary	Audio interview	15	AI
Primary	Video interview	7	VI
Primary	Workshop	1	W
Primary	Art Form	3	AF
Primary	Meeting minutes	10	MN
Secondary	Unpublished papers, not peer-reviewed	3	UNPRP
Secondary	Published papers, not peer-reviewed	302	PNPRP
Secondary	Published peer-reviewed papers	2	PPRP
Secondary	Published reports and books	7	PR
Secondary	Selected press releases	25	SPR
Secondary	Films	2	F
Secondary	Songs	16	S
Secondary	Official photographs	5	OP
Secondary	Residents' selected photographs	25	ISP
Primary	Project selected photographs	25	PSP

365
366
367

Table 2: Summary description of the data collected through the joint process of preparing Kerourien's 50th anniversary and collecting narratives as part of the climate service co-production process.

368 This process (Table 3) led to material and procedural benefits. On the material front, robust data
369 were collected. These were used for creating an art form and for laying the foundations for the
370 climate service co-production process. On the procedural front, the neighbourhood was highly
371 involved and, more importantly, trust had been built and mobilised for collective action.

372

Event / Activity	Date	Key observation
Start of the project's implementation in Kerourien / Setting up the working group	09/17	These four partners have a well-established working relationship: trust between them is well established. Issues of symbolic hierarchies, associated with status (artists are not as regularly employed as social workers or scientists)
Initial meetings and identification of a <i>modus operandi</i> / Decision taken to contribute proactively the neighbourhood's 50 th anniversary celebration.	6/10/17	The anniversary was to take place in June 2018, then delayed to October 2018. Content and program are still a total blank slate.
Identification and invitation of all potential stakeholders / Foundational meeting of the local coordination group. The initial working group is turned into the local coordination group executive board / Proactively implementing the local	26/10/17	Meeting facilitation was organized around the following aim: identifying a common goal for all present, around which everyone could be mobilized. Of the 14 members, 10 are residents of the neighbourhood and act as initial proxies for the

coordination groups' decisions.		resident population.
Monthly meetings of the local coordination group / Discussing the planning and programming of the 50 th anniversary.	From 11/17 to 11/ 18	All decisions taken collectively. When the group deemed it necessary, votes were organized.
Leaflet for volunteers.	12/17	This was the first step to spread the word and be publicly explicit with the intentions and partnerships.
Tasking a specific group with conducting interviews.	10/2017-06/18	
Obtaining fully dedicated facilities (2 rooms and bathrooms).	11/17	Agreement with the City as landlord.
Moving the date of the anniversary from June to October.	12/17	The decision was taken to document the process more systematically.
Establishing thematic working groups / 17 specialized working groups are created.	01/18	These working groups are open to anyone willing to contribute to organizing the 50 th anniversary.
The public presentation of the "beautiful stories" process.	15/01/18	At 10h, 15h and 20h to be sure all residents have the chance to come if they wish.
Formal closure of the social centre after arson.	22/02 to 8/03/18	The perpetrators are identified but the ongoing efforts of trust-building are damaged as well as the front door of the social centre itself.
Weekly meetings / Discussing the process and detailed programming of the 50 th anniversary.	From 03/18 for some of the working groups.	Some meetings are working-group focused, some are plenary with all partners.
Poster proposed by the graphic artist, discussed at the coordination level and the final version made available to spread the word.	06/18	A new iconic image for the neighbourhood.
Final programme available.	07/18	
Efforts increase progressively going from weekly to daily.	09-10/18	The number of people engaged grows day by day, the thematic working groups structure is key.
<i>Kerourien's beautiful stories.</i>	17-21/10/18	A popular success with a strong public and mass media impact.
"Beautiful stories" review meeting.	11/18	People express that Kerourien is whole again, community members have a renewed sense of sharing common narratives.

373
374
375

Table 3: Chronological summary of the process of jointly organizing Kerourien's 50th anniversary and collecting local narratives.

376 What did the climate service co-production component of the process learn from the exercise up to
377 now? First, we witnessed progressive involvement from community members. By embedding
378 ourselves in a process focused on highly salient non-climate related issues we gained access to
379 community members and to issues that would not have been accessible otherwise, including a
380 diversity of narratives.

381 More importantly, and this came a bit as a surprise, the transdisciplinary abilities of the research
382 team were called upon to help achieve non-science centered goals. An initially asymmetrical
383 situation became a situation of more balanced cross-fertilization. Somehow our respective
384 specialized lines of action became blurred and from this trust and capacity for action grew.

385 This situation created a central question: how do we manage the different natures of the various
386 processes at hand – celebrating Kerourien, preparing an art form, and identifying how local issues
387 relate to climate issues within the context of climate service co-production?

388 As stated above in section 2.2, our working hypothesis was that all issues are connected with
389 climate issues, and these connections deserve to be made explicit. This hypothesis led us to
390 commit to maintaining the blurring of the lines as artists working with and for social scientists when it
391 came to the climate dimension; and social scientists working with and for artists when it came to
392 preparing the art form, rooting it in local issues and giving the identified and collected stories back to
393 the community.

394

395 4.2 Central narratives identified and used for the art form and the climate-centered analysis

396 The process described here between artists, social scientists, and community members led to the
397 joint identification of a series of three narratives seen as fundamental for the local community. These
398 are available in detail, including interview quotes and the final script of the play, in the
399 supplementary materials. We summarize these materials here, highlighting the most important
400 characteristics. The narrative identification and explication process was conducted through a
401 systematic analysis (iterative thematic analysis), conducted by the social scientists. The creative
402 writing and scenography was conducted by the artists. These phases included on-going interaction
403 with community members, and thus evolved under their constant scrutiny, including during the first
404 (Figure 2) and following days of the play.

405

406 *PLEASE INSERT FIGURE 2 ABOUT HERE*

407

408 Here we present the narratives in the order of their “discovery”.

409 A first narrative that stood out was that of the Kerourien neighbourhood, its origin, and the trajectory
410 of its first residents. Schematically this narrative reads like this:

1. In 1944, the fight for the liberation of France led to the widespread destruction of Brest (many families lost their houses and could not afford to find new ones – how to relocate them became an urgent issue).
2. Barracks were built as emergency housing for those affected (twist: a new community emerged, that of “those from the barracks”).
3. Living in the barracks was associated with the stigmas of poverty (and led to the emergence of a sense of “us and them”).
4. In 1966 a subsidized housing development was constructed (and living conditions in the barracks degraded due to the clear malfeasance of authorities – yet solidarity was maintained within the barracks).
5. The construction work went fast, entailed huge effort from construction workers (the sacrifices of many, coming from many countries made the Kerourien neighborhood possible – solidarity is all over the place).
6. People moved in and an official inauguration ceremony was held 1972 (and yes the barracks were destroyed; those “from the barracks” became “those from Kerourien”).
7. Thing went downhill in the mid-1980s and those who could afford it, and did not feel attached, left the neighbourhood).
8. The newly vacated apartments became housing for the “newcomers” (and the current residents

represent 20 nationalities – those “from the barracks” are now a minority group in Kerourien).

411

412 **Box 2: "Girls don't dance with us when they know we're from [...]" - Kerourien's history in a nutshell.**

413

414 When this narrative was identified, the experiment in climate service co-production could have taken
415 a wrong turn. We could have had the illusion that access to the “place” had been gained. However
416 the place, as a stabilized geographical and administrative space, located in Brest, France, turned
417 out to be a misconception. Kerourien is made of many places, associated with the diversity of it
418 inhabitants. Does that mean this story should have been dispelled as useless? Certainly not, it gives
419 a wealth of information. For example, there once was agriculture, and the weather matters when
420 discussing construction work. Yet this is not Kerourien's only story. Other stories matter, and we did
421 gain access to those as well. The second important story of Kerourien reads as follows (see
422 supplementary materials for details and interview excerpts):

423

1. We, the newcomers, settled in Kerourien after leaving home (from abroad) in order to find a better life (and yes we did find it, at first).
2. Since the 1980s Kerourien's population has been in flux (and individuals carry their sometimes heavy personal histories, and their traditions, seen as source of positive diversity).
3. Integration within a diverse mix is proactively pursued (not always easily, xenophobia exists, as well as clear challenges associated with highly intercultural settings).
4. Progressively newcomers are disappointed and often regret leaving their home country (and feel that promises that were made, mostly of vertical social mobility, are unkept).
5. There is nostalgia for elsewhere and anger toward “here.” (Kerourien encapsulates the love-hate relationship that any migrant community may have with its new country).

424

425 **Box 3: “The first generation laid low. The second generation crashed. The third is restless.” -**

426 **Kerourien's recent-present narrated as a multicultural entity.**

427

428 Once this narrative was identified and clarified, we stumbled on something fundamental in terms of
429 climate services development. Kerourien is, for its population, just one of the places that matters.
430 When envisioning Brest's humid climate, it is compared with a place of birth, which is, for many, the
431 place where they long to return upon retirement. If we are about to co-produce place-based climate
432 services, we must prepare ourselves to expand our geographical horizons beyond Brittany.

433 Further conversations indicated that these narratives of Kerourien's history and the histories of its
434 “newcomers” were connected though other avenues beyond simply being from Kerourien. Both
435 “newcomers” and those “from the barracks” share life trajectories of adversity, proactive fights
436 against dominant forces, and the need to contribute to a sense of justice. These characteristics are
437 connected to the third dominant narrative we identified.

1. The harshness of the life in Brittany, the war, and post-war reconstruction, created in Brest strong unions, a strong civil society, ready to fight for its rights (even more so in low income neighbourhoods such as the barracks first, and Kerourien thereafter).
2. The fight for social justice led, in the 1960s and early-1970s, to genuine progress that reinforced Kerourien residents' conviction in favor of social justice and the need to fight.
3. These convictions were reinforced when the Amoco Cadiz oil spill affected a summer campground where Kerourien residents went for vacation (and they fought for justice following this major environmental crime).
4. This commitment to social justice was confirmed, even as newcomers were the majority in the

neighborhood now, during the 2002 presidential election when the far-right candidate made it to the second round (people registered en masse as voters in order to have their voices heard).

5. Today in Kerourien community members continue walking the same streets while their context becomes increasingly fragile, they still want to take charge, but feel increasingly unable to shape their world.

438

439 **Box 4: “I have a say” - Kerourien narrated as a place fighting for justice.**

440

441 At this stage, the experiment in climate service co-production had access to a unique and locally
442 validated dataset of narratives. These encapsulated local priorities, concerns, and, to a much
443 smaller extent, their interaction with weather and climate.

444

445 4.3 Local life and climate change, connecting the dots

446 The narratives we collected show that Kerourien residents are, indeed, stressed by their daily
447 economic constraints along with societal challenges related to gender, racism and well-being. They
448 do not seem to show much interest in Kerourien’s weather and climate.

449 Furthermore, when envisioning a relationship to the nexus of place, weather, and climate, the
450 narratives seem to indicate that for the so called “newcomers”, weather and climate has mostly
451 been experienced in places other than Kerourien. Newcomers may have experienced weather and
452 climate, but in diverse ways, associated with their diverse origins. Moving from the Comores, entails
453 seafaring, flying, and having lived in intense relationship with the Indian Ocean, its power and
454 associated weather patterns. This experience is not easy to relate to the experience of those
455 migrating from Mali who have experienced rainfall deficits at the margin of the Sahara desert. The
456 relatively mild and humid climate of Kerourien may be seen as a relief for some, and as nuisance for
457 others. The limited time some have spent in Kerourien may simply not allow for much of a
458 relationship with the local weather to exist.

459 In order to further our inquiry, we tried to identify traces, even faint ones, of weather or climate
460 information. This led us to reorganize the corpus (Table 3) in terms of weather and climate issues.
461 Three ways of grouping the associated narrations emerged from this reanalysis: climate/weather
462 information sources; manifestation of climate or weather in one of the dominant narratives; and
463 reference made to places where climate issues may be radically different than in Kerourien and that
464 are seen as central to the life experiences of the narrators.

465 *4.3.1 What are Kerourien’s current climate information sources?*

466 Residents of the Kerourien neighbourhood have access to mass media and their coverage of
467 weather (mostly through weather forecasts, or coverage of extreme events, mainly storms) and
468 climate issues. They also have access to information sources produced by authorities (such as
469 information booklets about Brest’s climate action plan) or by social action NGOs (such as
470 information booklets developed by an NGO centred on fighting for housing rights and covering the
471 Paris Conference of Parties in 2015). They thus have access to the dominant techno-scientific
472 discourse on climate change. Very little is available on their everyday concerns, on the places they
473 hold dear, be it Kerourien or their hometown in Syria, Mali, Morocco or Haiti. Very little is even said
474 about climate change impacts on water quality in the Bay of Brest.

475 One striking finding from our analysis of the collected narratives is the inability of dominant climate
476 change discourse to significantly influence local narratives. Not that weather and climate are absent,
477 they simply take another form.

478 *4.3.2 Traces of weather and climate in Kerourien's narratives.*

479 We identified several traces of weather and/or climate in the narratives we collected. First, living
480 conditions in Brest are very connected to the omnipresence of rain, drizzle, and water in a way that
481 resonates with the situation in Bergen (Bremer et al. Under review). There is “mud” in the barracks,
482 construction sites are dangerous because of “mudslides” and “slippery conditions.” Rain is
483 associated with gray skies. Coming from warmer climes:

484 “It's not the cold that bothers me the most. It's the gray. I don't like fall. It's too wet, too gray”.

485 Nowadays the weather in Kerourien, for its residents, is relative to elsewhere, places that, thanks to
486 the filters of nostalgia, are characterized by milder conditions, blue skies, easy living. The traces of
487 weather and climate we found are not often from “over here”. For many now, Kerourien is not
488 necessarily associated with their future. In the future, climate and weather encounters will occur
489 elsewhere.

490 The framing of the weather in Kerourien per se follows the enthusiasm-to-regret cycle of the “*The*
491 *first generation laid low. The second generation crashed. The third is restless*” narrative :

492 “When I arrived there was snow. I was coming out of the oven. From a hot climate up to
493 50°C in February. And I was going into the refrigerator. From hot there to cold here. I was
494 happy to see the kids playing with the snow.”

495 The climate of the emotions guides the judgement of the external climate, that of rain, cold and grey
496 skies, shaping a “sense of climate.”

497 When the future is envisioned in Kerourien, we interpret it through a climate lens as a future that will
498 be the product of the fight between forces of progress and reactionary forces, with Kerourien on the
499 side of progress:

500 “In 2050, I'm seeing [...] that we push further the respect for the environment. [...] So let's go
501 green. Let's be truly aware, let it be a part of our way of life. [...] I see capitalism swelling and
502 I don't know in 30 years where we'll be....”

503 We observed that, while rarely present in explicit terms, weather and climate are part of the
504 background of Kerourien's narratives. From here, we turned to connecting to climate change issues
505 through these stories. These stories, their material, ethical, and emotional dimensions have been
506 recognized as important by community members. For the climate service co-production team, they
507 constituted an escape route away from the dominant technocratic climate change discourse that is
508 currently a non-starter for Kerourien residents.

509 **5 Discussion**

510 5.1 Beyond substance: empowerment

511 By engaging in the process of jointly creating an art form and gathering data while preparing an
512 event with local significance, we managed develop trust and establish mutually beneficial
513 relationships between Kerourien community members and the transdisciplinary research team, even
514 leading to the co-production of climate services.

515 Vincent et al. (2018) stress that climate services are more than information alone. They are about
516 producing long-term relationships and trust. In Kerourien the situation was slightly different, as we
517 were not in a position to engage in a relationship by talking about climate change (see Krauss 2020
518 for another instance of such a situation). Our challenge stopped at simply engaging in a relationship,
519 let alone one built on climate concerns. We were in a situation where we wanted to “prime the
520 pump” of a co-production process. Trust-building in our case study was a condition for co-producing
521 climate services, and a product of our process. This intervention primed not only the co-production
522 of climate services, but also a desirable positive feedback loop.

523 Another important observation relates to mutual learning, in the sense of learning to do things
524 together (see Chouinard and Perron 2002, Vincent et al. 2018). One key element that stood out in
525 this experiment was the way in which the transdisciplinary and scientific skills of the research team
526 were put to work for non-scientific purposes, namely the preparation of a neighbourhood's
527 anniversary celebration. Learning and trust-building were deeply intertwined for this. As our case
528 shows, those on the science-side of co-producing climate services may render other services to the
529 communities with whom they engage. Through this observation we see that co-producing climate
530 services may actually be more about transdisciplinary science than about climate science. This
531 suggests climate service co-production is following the example of sustainability science (see
532 Mauser et al. 2013, Polk 2015) but with a narrower, and much more local focus.

533 Finally, we collectively identified a limited set of narratives encapsulating what Kerourien residents
534 had to say about themselves. In the words of some of the participants, this process, and the
535 associated *les Belles histoires*, did put the Kerourien community back on track to becoming whole
536 again. These stories constitute what the residents all share, at least for the time being. Having this
537 renewed common ground is making them stronger than before our co-production intervention. A
538 stronger community will be able fare better in the face of climate change. For our purpose of co-
539 producing climate services, a stronger community will be a stronger partner, more reliable, and more
540 aware of its actual needs. Not only did we develop trust with the Kerourien community, we all
541 became stronger in the process, stronger for engaging in substantive work, stronger for taking stock
542 of the substantive effects of our intervention.

543 Climate services are often assessed against their usability. Our research demonstrates this is not
544 sufficient; the procedural benefits of co-producing climate services should be assessed as well.
545 Context dependency will make such evaluation particularly challenging. This should not prevent
546 climate service funders from taking stock of the wider social benefits the actions they support bring
547 to co-producing partners.

548 5.2 Getting the priorities straight: adopting local values and contributing to justice.

549 The initial step of our co-production process allowed us to anchor our actions in local stories and
550 relate directly to our partner community and its values. This allowed us to free the co-production
551 team from dominant (and technocratic) climate change and adaptation discourses. Rather than
552 adopting the pervading culture represented in the climate literature available to the community, we
553 adopted narratives associated with everyday life, hardships, the joys and pain of migration, and
554 engagement for greater justice.

555 Through the lens of priority setting, climate service co-production has much to learn from
556 participatory research and participatory planning. For instance, one aspect we did not address
557 explicitly in this experiment in co-production was that of gender. In the realm of participatory
558 research there many analyses showing that one should be explicit about gender and other identity
559 dynamics at play – the “Whos voices? Whose choices?” questions that need to be answered

560 (Cornwall 2003). In the case of climate service co-production, the dominant discourse may totally
561 blind co-producers with its technocratic, mainstream scientific stance; it seems too often to consider
562 gender, race, class, and other social categories, as not necessarily part of what deserves attention.
563 Within the realm of climate change, our results point to “the importance of (re)politicizing co-
564 production by allowing for pluralism and for the contestation of knowledge” (Turnhout et al 2020, pg.
565 15). As Krauss (2020) writes, “a focus on narratives shifts the attention from the impact of climate
566 on society to the myriad of entanglements between human and non-human actors in a changing
567 climate” (pg. 3). This shift in focus will allow us to ground further steps of climate service co-
568 production in the priorities of those most vulnerable to the vagaries of the world.

569 5.3 Extending the geographical boundaries of empowerment and the fight for justice: 570 revisiting the concept of place

571 Finally, paying attention to local stories and the role of weather and climate within these stories led
572 us to the realization that locally place-based climate service co-production may actually entail
573 working with multiple locations and associated issues. Co-production challenged our routines
574 (Krauss 2020). It pushed us to reconceptualize “place” as extending beyond the circumscribed
575 location where our co-production partners were living at the time. This opened up a rich perspective
576 in terms of climate service co-production. In the course of our work, place became a relational
577 concept, the definition of which belonged to the members of the co-producing community – what
578 mattered what their sense of place (see Stedman 2003). Sense of place is an integrative concept
579 (Saarinen et al. 1982), and it carries both the characteristics of the environment and of the individual
580 or group perceiving it. Sense of place connects with place attachment, and others have shown, as
581 we observed, how memory is critical for migrant populations’ relationships to places (Rishbeth and
582 Powell 2013). By adopting this extended concept of place, the co-production team had to accept
583 that knowledge transcends national boundaries, and that time-scales may relate to individual
584 trajectories of past, present, and hoped-for futures. Huot and Liberté-Rudman (2010), analyzing the
585 interplay of occupation, place, and identity, propose that individuals perform their identity in relation
586 to place and occupation. This resonates with our results and the dynamic nature of the judgement
587 individuals expressed of the place where they live and of the (now imagined) place they once left,
588 and to which they long to return. The status of place shifts through time, as a manifestation of
589 changes in context, occupation and identity. Place-based co-produced climate services in such
590 situations need to be reinvented in order to offer information that is dynamic, reconfigurable, and
591 multi-layered. This is another central challenge for the climate service co-production research
592 agenda.

593 **6 Conclusion**

594 ***What did we learn by reaching out to a community for whom climate issues were not***
595 ***central?*** We learned that things are not what they seem; at least when one is “co-producing place-
596 based climate services for action.” “Places” have multiple meanings, are not bounded, and depend
597 very much on personal experience and mobility. The conceptualization of climate services, and the
598 potential for co-production, depends on the reference discourse one mobilizes. Climate services
599 may generate many things: from the reproduction of a dominant liberal narrative emphasizing
600 individual responsibility to a unique opportunity to contribute to justice and the redistribution of
601 power. And “action” in this case entailed being mobilized to co-produce an anniversary celebration
602 and the corresponding theater play, along with a stronger partner community as a result.

603 If we return to our original line of questioning, “how and with what results might place-based climate
604 service co-production be enacted within a community for whom climate change is not a locally
605 salient concern?”, we have some answers.

606 **How?** In order to engage with a community in a climate service co-production exercise despite the
607 community’s seeming lack of interest in climate issues, we took the long way around. We engaged
608 in relationship-building and making our skills available for many purposes while progressively
609 connecting with the community, its concerns, interests, and finding intersections with climate issues.
610 We were transparent in terms of our interest in climate concerns, yet we kept that agenda on the
611 back burner while accepting to be mobilized ourselves around the community’s more pressing
612 issues.

613 **With what results?** From the development of a trust-based relationship with the community to the
614 building of a stronger community, this experiment allowed us to question the dominant paradigm
615 that may be crippling for climate service co-production: the assumption that climate and weather are
616 evident parts of the fabric of everyday life; that it is not always necessary to be explicitly focused on
617 climate to be able to co-produce climate services.

618 These three points lead us to question the definition of climate services we used at the onset of our
619 work and as a starting point for this paper. Paraphrasing Vaughan and Dessai we are inclined to
620 propose a working definition of climate services that will need further ground-truthing:

621 The aims of climate services are to provide people and organizations with timely, tailored
622 climate-related knowledge and information that they can use to reduce climate-related
623 losses and enhance benefits, including the protection of lives, livelihoods, and property, **as**
624 **well any process designed to reinforce the ability to:**

625 **(a) identify individual and collective knowledge needs,**

626 **(b) mobilize existing knowledge, formal and informal, and**

627 **(c) turn such knowledge into action, at the individual, and collective levels.**

628 These conclusions seem to indicate that it might be worth considering integrating climate service co-
629 production into all community development activities. Preparing for a changing climate and
630 preparing the requisite knowledge base should be part of the everyday routines of local
631 development, especially in neighbourhoods with a long list of seemingly more urgent concerns.
632 They might be the hardest hit by climate change.

633

634 **7. References cited**

635 Adger, W. N., Barnett, J., Brown, K., Marshall, N., & O'brien, K. (2013). Cultural dimensions of
636 climate change impacts and adaptation. *Nature Climate Change*, 3(2), 112-117.

637 Ahmed, A., Lawson, E. T., Mensah, A., Gordon, C., & Padgham, J. (2016). Adaptation to climate
638 change or non-climatic stressors in semi-arid regions? Evidence of gender differentiation in three
639 agrarian districts of Ghana. *Environmental Development*, 20, 45-58.

640 Armstrong, K., & Leimbach, T. (2019). Art-eco-science. Field collaborations. *Antennae: The Journal*
641 *of Nature in Visual Culture*, (48), 108-127.

642 Baztan, J., Cordier, M., Huctin, J. M., Zhu, Z., & Vanderlinden, J. P. (2017). Life on thin ice: insights
643 from Uummannaq, Greenland for connecting climate science with Arctic communities. *Polar*
644 *Science*, 13, 100-108. doi: 10.1016/j.polar.2017.05.002

645 Berman, M., Baztan, J., Kofinas, G., Vanderlinden, J. P., Chouinard, O., Huctin, J. M., ... & Thomson,
646 K. (2019). Adaptation to climate change in coastal communities: findings from seven sites on four
647 continents. *Climatic Change*, 1-16.

648 Bilodeau, C. (2013). A Climate of Collaboration: environmental scientists urge artists to humanize
649 the stories behind the research. *American Theatre*, 30.

650 Bissinger, J. E., Montagnes, D. J. S., harples, J., & Atkinson, D. (2008). Predicting marine
651 phytoplankton maximum growth rates from temperature: Improving on the Eppley curve using
652 quantile regression. *Limnology and Oceanography*, 53(2), 487–493.
653 <https://doi.org/10.4319/lo.2008.53.2.0487>

654 Bremer, S., Johnson, E., Fløttum, K., Kverndokk, K., Wardekker, A., Krauß, W. Portrait of a climate
655 city: How climate change is emerging as a risk in Bergen, Norway. *Climate Risk Management*. Vol.
656 29 (2020). 100236.

657 Bremer, S., & Meisch, S. (2017). Co-production in climate change research: reviewing different
658 perspectives. *Wiley Interdisciplinary Reviews: Climate Change*, 8(6), e482. doi: 10.1002/wcc.482

659 Bremer, S., Wardekker, A., Dessai, S., Sobolowski, S., Slaattelid, R., & van der Sluijs, J. (2019).
660 Toward a multi-faceted conception of co-production of climate services. *Clim. Serv.* 13, 42–50.

661 Burke, M., Ockwell, D., & Whitmarsh, L. (2018). Participatory arts and affective engagement with
662 climate change: The missing link in achieving climate compatible behaviour change? *Global*
663 *Environmental Change*, 49, 95-105.

664 Chen, B. (2015). Patterns of thermal limits of phytoplankton. *Journal of Plankton Research*, 37(2),
665 285–292. <https://doi.org/10.1093/plankt/fbv009>

666 Chouinard, O., & Perron, J. (2002). Learning about community capacity in the Fundy Model
667 Forest. *The Forestry Chronicle*, 78(5), 637-642.

668 Citton, Y. (2012). Gestes d'humanités: anthropologie sauvage de nos expériences esthétiques.
669 Armand Colin.

670 Cornwall, A. (2003). Whose voices? Whose choices? Reflections on gender and participatory
671 development. *World development*, 31(8), 1325-1342.

672 da Cunha, C., Rocha, A., Cardon, M., Breton, F., Labeyrie, L., & Vanderlinden, J.-P. Adaptation
673 planning in France: Inputs from narratives of change in support of a community-led foresight
674 process. *Climate Risk Management*. 30 (2020). 100243.
675

676 de Certeau, M. (1990). L'invention du quotidien. *Arts de faire*, 1, 57-63.

677 Dilling, L., & Lemos, M. C. (2011). Creating usable science: Opportunities and constraints for
678 climate knowledge use and their implications for science policy. *Global environmental*
679 *change*, 21(2), 680-689. doi: 10.1016/j.gloenvcha.2010.11.006

680 Gabrys, J., & Yusoff, K. (2012). Arts, sciences and climate change: practices and politics at the
681 threshold. *Science as culture*, 21(1), 1-24.

682 Harjanne, A. (2017). Servitizing climate science—Institutional analysis of climate services discourse
683 and its implications. *Global environmental change*, 46, 1-16.

684 Helmuth, B., Broitman, B. R., Blanchette, C. A., Gilman, S., Halpin, P., Harley, C. D. G., O'Donnell,
685 M. J., Hofmann, G. E., Menge, B., & Strickland, D. (2006). Mosaic patterns of thermal stress in the
686 rocky intertidal zone: implication for climate change. *Ecological Monographs*, 76(4), 461–479.
687 [https://doi.org/10.1890/0012-9615\(2006\)076\[0461:MPOTSI\]2.0.CO;2](https://doi.org/10.1890/0012-9615(2006)076[0461:MPOTSI]2.0.CO;2)

688 Huot, S., & Rudman, D. L. (2010). The performances and places of identity: Conceptualizing
689 intersections of occupation, identity and place in the process of migration. *Journal of Occupational*
690 *Science*, 17(2), 68-77.

691 IPCC (Intergovernmental Panel on Climate Change) (Ed.) (2014). *Climate Change 2014: Impacts,*
692 *Adaptation, and Vulnerability IPCC Working Group II Contribution to AR5.* Cambridge, UK and New-
693 York, NY, USA: Intergovernmental Panel on Climate Change.

694 Jacobson, S. K., Seavey, J. R., & Mueller, R. C. (2016). Integrated science and art education for
695 creative climate change communication. *Ecology and Society*, 21(3).

696 Kennedy, G., Raimonet, M., Berman, M., Gaye, N., Huctin, J. M., Kaleekal, T., & Vanderlinden, J. P.
697 (2018). *Environmental History and the Concept of Agency: Improving Understanding of Local*
698 *Conditions and Adaptations to Climate Change in Seven Coastal Communities.* *Global*
699 *Environment*, 11(2), 405-433.

700 Knebusch, J. (2008). Art and climate (change) perception: Outline of a phenomenology of climate,
701 S. Kagan & V. Kirchberd (eds), *Sustainability: a new frontier for the arts and cultures* (pp 242-261).
702 Frankfurt: Verlag fur Akademische Schriften.

703 Krauss, W. (2020). Narratives of change and the co-development of climate services for
704 action. *Climate Risk Management*. 28 (2020) 100217.

705 Krauss, W., & Bremer, S. (2020). The role of place-based narratives of change in climate risk
706 governance. *Climate Risk Management*. 28 (2020) 100221.

707 Latour, B., (2010). An attempt at a “Compositionist Manifesto”. *New Literary History*, 41, 471-490.

708 Latour, B., (2011). *Waiting for Gaia. Composing the common world through art and politics.* Paper
709 presented at the Lecture given for the launching of SPEAP, French Institute, London.

710 Lemos, Maria Carmen, and Barbara J. Morehouse. "The co-production of science and policy in
711 integrated climate assessments." *Global environmental change* 15.1 (2005): 57-68.
712 doi:10.1016/j.gloenvcha.2004.09.004

713 L'Hévéder, B., Speich, S., Ragueneau, O., Gohin, F., & Bryère, P. (2017). Observed and projected
714 sea surface temperature seasonal changes in the Western English Channel from satellite data and
715 CMIP5 multi-model ensemble. *International Journal of Climatology*, 37(6), 2831-2849.

716 Lippard, L. (Ed) (2007). *Weather Report: Art and Climate Change.* Boulder, CO: Boulder Museum of
717 Contemporary Art.

718 Marschütz, B., Bremer, S., Runhaar, H., Hegger, D., Mees, H., Vervoort, J., & Wardekker, A. (2020).
719 Local narratives of change as an entry point for building urban climate resilience. *Climate Risk*
720 *Management*, 100223.

721 Mauser, W., Klepper, G., Rice, M., Schmalzbauer, B. S., Hackmann, H., Leemans, R., & Moore, H.
722 (2013). Transdisciplinary global change research: the co-creation of knowledge for
723 sustainability. *Current Opinion in Environmental Sustainability*, 5(3-4), 420-431.

724 McCubbin, S., Smit, B., & Pearce, T. (2015). Where does climate fit? Vulnerability to climate change
725 in the context of multiple stressors in Funafuti, Tuvalu. *Global Environmental Change*, 30, 43-55.

726 Miles, M. (2010). Representing nature: art and climate change. *Cultural Geographies*, 17(1), 19-35.

727 Naess, L. O. (2013). The role of local knowledge in adaptation to climate change. *Wiley*
728 *Interdisciplinary Reviews: Climate Change*, 4(2), 99-106.

729 Ord, T. (2020). *The precipice: existential risk and the future of humanity*. London: Bloombury
730 Publishing.

731 Polk, M. (2015). Transdisciplinary co-production: Designing and testing a transdisciplinary research
732 framework for societal problem solving. *Futures*, 65, 110-122.

733 Philippart, C. J. M., Anadón, R., Danovaro, R., Dippner, J. W., Drinkwater, K. F., Hawkins, S. J.,
734 Oguz, T., O'Sullivan, G., & Reid, P. C. (2011). Impacts of climate change on European marine
735 ecosystems: Observations, expectations and indicators. *Journal of Experimental Marine Biology and*
736 *Ecology*, 400(1–2), 52–69. <https://doi.org/10.1016/j.jembe.2011.02.023>

737 Poloczanska, E. S., Hawkins, S. J., Southward, A. J., & Burrows, M. T. (2008). Modeling the
738 response of populations of competing species to climate change. *Ecology*, 89(11), 3138–3149.
739 <https://doi.org/10.1890/07-1169.1>

740 Rishbeth, C., & Powell, M. (2013). Place Attachment and Memory: Landscapes of Belonging as
741 Experienced Post-migration. *Landscape Research*, 38(2), 160–178. doi:
742 10.1080/01426397.2011.642344

743 Rödder, S. (2017). The climate of science-art and the art-science of the climate: Meeting points,
744 boundary objects and boundary work. *Minerva*, 55(1), 93-116.

745 Roosen, L. J., Klöckner, C. A., & Swim, J. K. (2018). Visual art as a way to communicate climate
746 change: a psychological perspective on climate change–related art. *World Art*, 8(1), 85-110.

747 Saarinen, T. F., Sell, J. L., & Husband, E. (1982). Environmental perception: international
748 efforts. *Progress in Geography*, 6(4), 515-546.

749 Sommer, L. K., & Klöckner, C. A. (2019). Does activist art have the capacity to raise awareness in
750 audiences?—A study on climate change art at the ArtCOP21 event in Paris. *Psychology of*
751 *Aesthetics, Creativity, and the Arts*.

752 Southward, A. J., Hawkins, S. J., & Burrows, M. T. (1995). Seventy years' observations of changes
753 in distribution and abundance of zooplankton and intertidal organisms in the western English
754 Channel in relation to rising sea temperature. *Journal of Thermal Biology*, 20(1–2), 127–155. doi:
755 10.1016/0306-4565(94)00043-1

756 Stedman, R. C. (2003). Is it really just a social construction?: The contribution of the physical
757 environment to sense of place. *Society & Natural Resources*, 16(8), 671-685.

758 Thomas, Y., Pouvreau, S., Alunno-Bruscia, M., Barillé, L., Gohin, F., Bryère, P., & Gernez, P. (2016).
759 Global change and climate-driven invasion of the Pacific oyster (*Crassostrea gigas*) along
760 European coasts: A bioenergetics modelling approach. *Journal of Biogeography*, 43(3), 568–579.
761 doi: 10.1111/jbi.12665

- 762 Turnhout, E., Metze, T., Wyborn, C., Klenk, N., & Louder, E. (2020). The politics of co-production:
763 participation, power, and transformation. *Current Opinion in Environmental Sustainability*, 42, 15-21.
- 764 Vanderlinden, J.-P. (2015). Prévoir l'imprévu. In F. Gemenne (Ed.), *L'enjeu mondial.*
765 *L'environnement* (pp. 241-250). Paris: Presses de Science Po.
- 766 Vaughan, C., & Dessai, S. (2014). Climate services for society: origins, institutional arrangements,
767 and design elements for an evaluation framework. *Wiley Interdisciplinary Reviews: Climate*
768 *Change*, 5(5), 587-603. doi: 10.1002/wcc.290
- 769 Vaughan, C., Buja, L., Kruczkiewicz, A., & Goddard, L. (2016). Identifying research priorities to
770 advance climate services. *Climate Services*, 4, 65-74.
- 771 Vincent, K., Daly, M., Scannell, C., & Leathes, B. (2018). What can climate services learn from
772 theory and practice of co-production?. *Climate Services*, 12, 48-58. doi: 10.1016/j.cliser.2018.11.001
- 773 Volpe, Christopher (2018). Art and climate change: contemporary artists respond to global crisis.
774 *Zygo* 53 (2), 613-623.
- 775 Voorberg, W. H., Bekkers, V. J., & Tummers, L. G. (2015). A systematic review of co-creation and
776 co-production: Embarking on the social innovation journey. *Public Management Review*, 17(9),
777 1333-1357. doi: 10.1080/14719037.2014.930505.

778

779 **8. Acknowledgements**

780 Thanks to All the Kerourien inhabitants for their kindness. We thank the reviewers and the guest
781 editor for the care taken in the process of reviewing our manuscript. This paper was made in the
782 course of the CoCliServ project. Project CoCliServ is part of ERA4CS, an ERA-NET initiated by JPI
783 Climate, and funded by FORMAS (SE), BELSPO (BE), BMBF (DE), BMWFW (AT), IFD (DK),
784 MINECO (ES), ANR (FR) with co-funding by the European Union (Grant 690462).

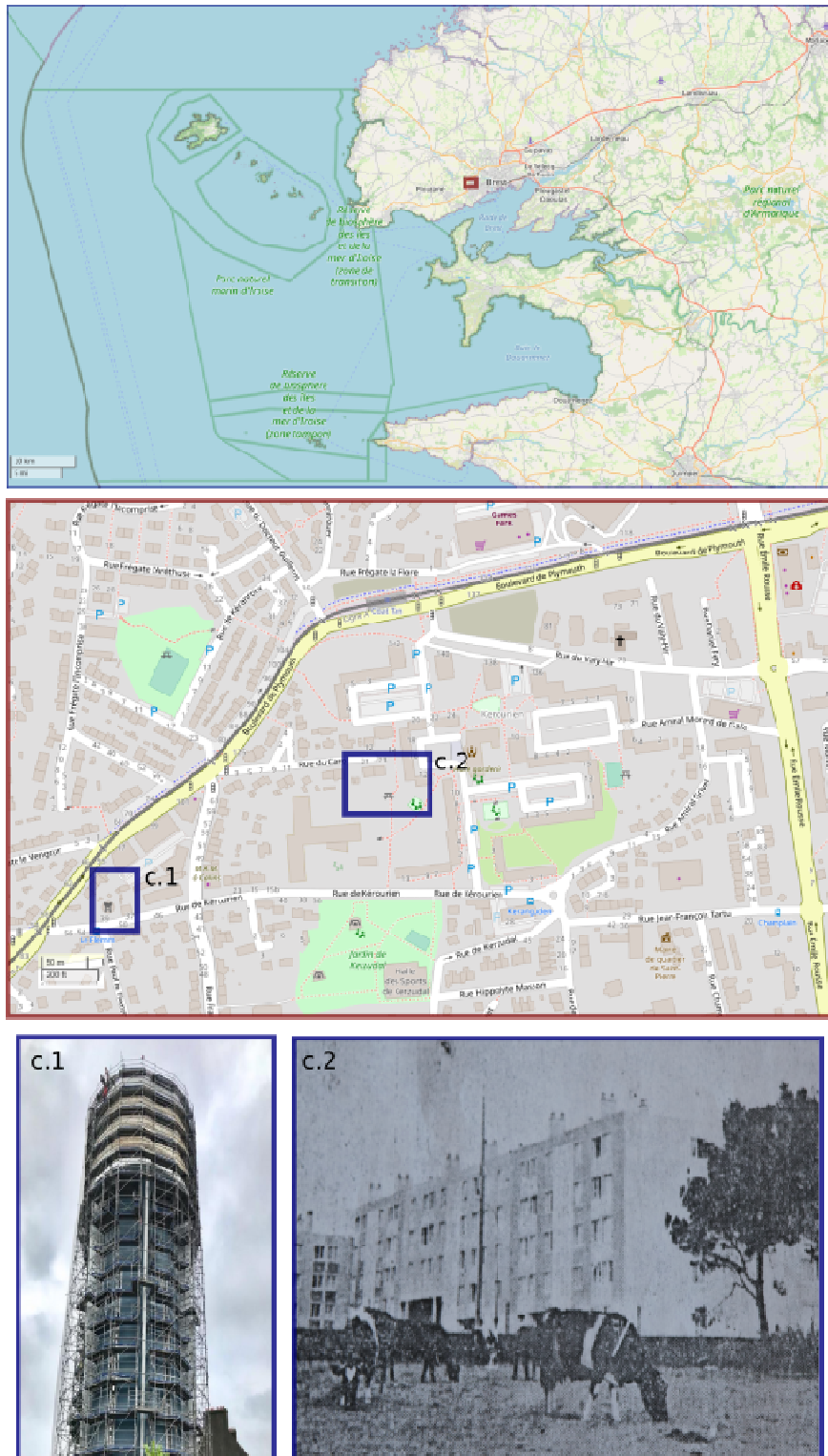


Figure 1: Kerourien's regional context (a); detailed map of the neighborhood (b) with the location of two representative sites: c.1: the water-tower, c.2: the builders' bar in 1972, with cows grazing.

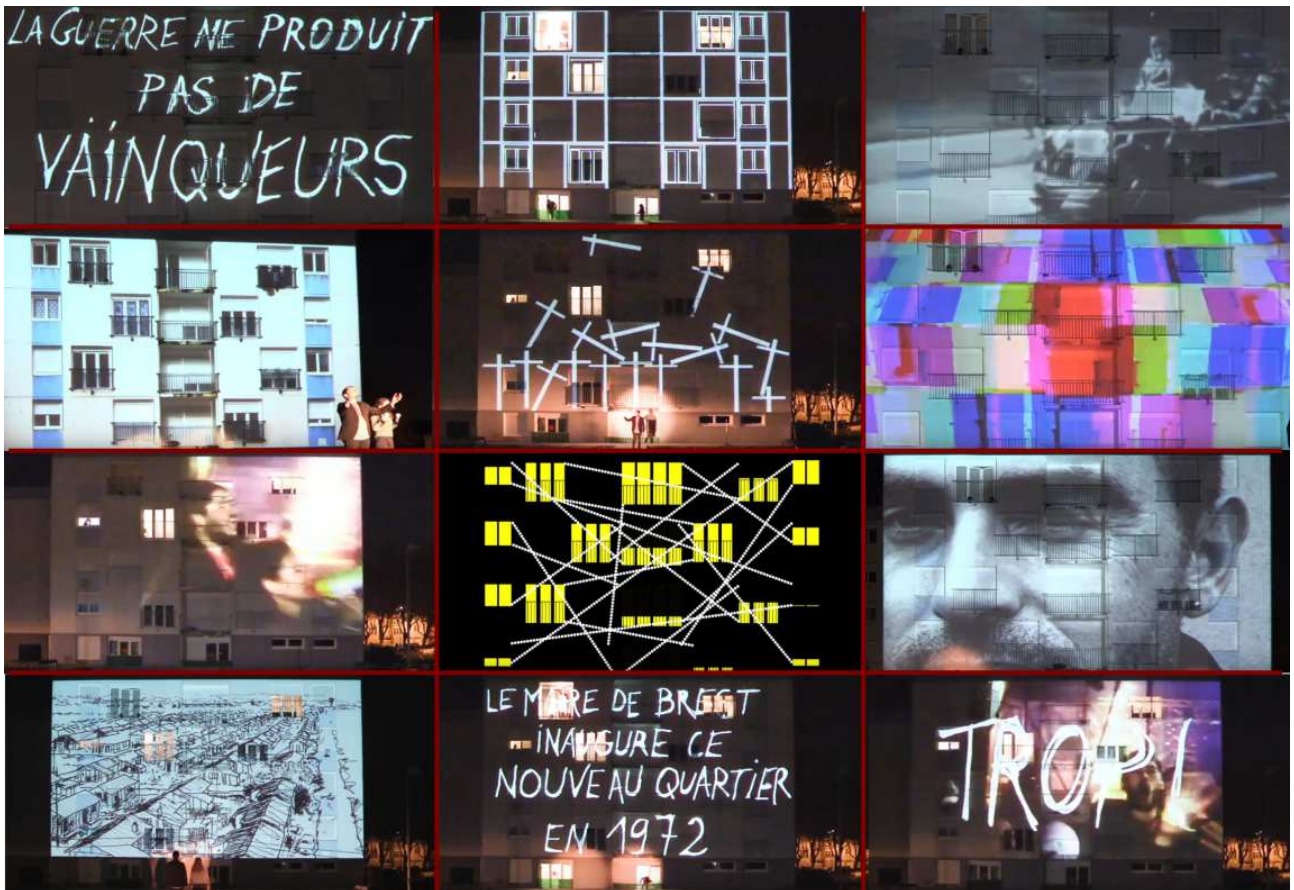


Figure 2: Photos taken during the first day of the play, showing the projection on one of Kerourien's central buildings and the two actors on the Kerourien theater set. The 58-minute video with captions is available through this link:

HYPERLINK

"<https://www.youtube.com/watch?v=QIUBACMW7pU>"<https://www.youtube.com/watch?v=QIUBACMW7pU>

A
C
M
W
7