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1 **Is social license to operate relevant for seaweed cultivation in Europe?**

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6 **Key words:** social license, seaweed cultivation, trust, legitimacy, consent

7 **Abstract**

8 The need for more sustainable sources of food, chemicals, and energy, combined with the European
9 Union's Blue Growth Agenda and national policies of European Economic Area member states, has
10 facilitated increasing interest in the cultivation of seaweed in European waters. There have been
11 several research projects looking at the economic and environmental feasibility of seaweed cultivation
12 as a low carbon commercial endeavour, however there is very little in the way of contextual social
13 research. Given mounting evidence of a decline in social acceptability of aquaculture activities (both
14 shellfish and finfish) at a site level, it is imperative to improve understanding of where seaweed
15 cultivation might fit within this picture. The aim of this study is to explore site-scale social interactions
16 of seaweed cultivation using social license to operate as the analysis framework. Two in-depth case
17 studies in were chosen to cover a developing commercial seaweed cultivation industry (France) and
18 an embryonic one (Scotland) in addition to a survey of seaweed cultivation organisations across five
19 European countries. The findings show that interpersonal relationships, perceptions of environmental
20 risk, scale of decision-making and of operations, and communication were key to local perceptions of
21 seaweed cultivation operations in both case studies. The views of seaweed cultivation organisations
22 on social interactions and the usefulness of the social license to operate concept for this emergent
23 industry is discussed.

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34 1. Introduction

35 The bulk of seaweed (macro-algae) production is in China, Indonesia and the Philippines [1]. However,
36 the need for more sustainable sources of food, chemicals, and energy, combined with the European
37 Union's Blue Growth Agenda and national policies of European Economic Area member states,
38 interest in the cultivation of seaweed in European waters is increasing [2]. Over the last decade there
39 have been several European research projects that have focussed on different aspects of macro-algae
40 cultivation. These include, among others; cultivation techniques and materials (see for example AT-
41 SEA <http://www.atsea-project.eu/>); bio-refinery, genetics and diseases (see for example GENIALG
42 <https://genialgproject.eu/>) and; development of products (see for example Macro Cascade
43 <https://www.bbi-europe.eu/projects/macrocascade> and MacroFuels <https://www.macrofuels.eu/>).
44 Pilot cultivation projects have helped to validate some approaches at smaller scales as well as develop
45 a basic understanding of the environmental changes associated with this activity. However, seaweed
46 cultivation in Europe is not yet widely commercially feasible [3], and the development of 'large-scale'
47 cultivation projects will require a more complete understanding of the environmental interactions to
48 fully assess and manage risk [4], [5]. To achieve this, a systematic approach to quantifying the
49 ecological carrying capacity of water bodies with respect to seaweed cultivation will be needed.

50 In addition there is a need to assess social carrying capacity. Given mounting evidence that one of the
51 most complex barriers to aquaculture growth in developed nations is related to social acceptability
52 and site level social interactions [6]–[10], it is imperative to improve understanding of where seaweed
53 cultivation might fit within this picture. However, there is a severe deficiency of peer-reviewed studies
54 in Europe exploring the potential social interactions of this emergent sector [11]. This study aims to
55 contribute to filling this gap by providing empirical evidence of site scale social interactions of seaweed
56 cultivation, using the social license to operate theory as a framework.

57 Social license to operate (SLO) was a term coined by the extractive resources industry in the 1990's in
58 an effort to try describe and better understand community-industry relationships [12]. The motivation
59 for acknowledging these relationships was market-driven, where the profitability of the industry was
60 being eroded by campaigns and litigation, started by local communities [13]. Boutilier and Thomson
61 [14] define SLO as a term used to describe the informal processes by which communities approve of,
62 accept or reject industrial developments. SLO specifically focusses on the measures that make an
63 activity legitimate in the eyes of communities of place [15], [16] and in some cases, communities of
64 interest [17]. The concept has been identified as one which could be developed into a useful
65 framework for understanding and improving the way that industries [18] and scientific researchers
66 [19] interact with local communities.

67 Since its origin, the idea of social license has been extended from extractive industries to forestry [20],
68 renewable energy ([21], conservation [19], [22], and aquaculture [9], [10], [23], [24]. Although SLO is
69 a growing area of research [9], [16], the concept is however, not without criticism. One of the key
70 arguments for using the term with caution is that there is no single definition which has been agreed
71 on by those using or researching it [17]. However, the flexible nature of the term [25] and its adoption
72 and understanding by industry and governmental agencies can also be considered its strength [26].
73 Literature reveals that there are several characteristics that are associated with having or not having
74 SLO. [12], [15] and [10] advise that understanding of the local context and the consent of local
75 communities is crucial to gaining and maintaining SLO, whereas [16], [20], [9], [27] focus on

76 relationships and trust between communities, the activity operator, NGOs and regulators. Legitimacy
 77 features across much of this work [6], although it is often used interchangeably with SLO [17].

78 The study reported here was conducted between 2017 and 2019 as part of the H2020 GENIALG
 79 research project, the aim of which is to understand how to sustainably cultivate and use two species
 80 of European seaweeds: *Saccharina latissima* (sugar kelp) and the green alga *Ulva rigida* (sea lettuce).
 81 The purpose of the study was to explore the relationships between seaweed cultivation organisations
 82 and communities across Europe at a site-scale. In addition, we assessed how cultivating organisations
 83 view the concept of social license to operate, and whether they perceive it as useful for their activities.
 84 During the course of this research it became clear that there is confusion between the two different
 85 activities of wild harvesting of seaweed and seaweed cultivation. Table 1 provides the definitions of
 86 these terms.

Table 1. Definition of terms used in this paper.

Term	Definition
<i>Seaweed</i>	Aquatic multi-cellular photosynthesising organisms without roots.
<i>Seaweed cultivation</i>	The deliberate introduction of seaweed to the environment on/in human-made infrastructure either by seeding or transplanting young seaweed onto/ into human-made infrastructure or installing man-made infrastructure to allow seaweed spores to naturally establish and grow. Once the seaweed biomass has reached the desired size or is in need of removal it is harvested through manual or mechanical processes (built on the definition in [28]).
<i>Wild harvesting</i>	The removal of part or all of a wild living seaweed from its natural position of growth. Wild harvesting can include hand picking, hand cutting (with hand-held scissors or rake), and mechanical removal (built on the definition in [28]).
<i>Gathering</i>	The collection of any wild or cultivated seaweed no longer in the position of growth. This typically refers to beach/shore-cast seaweed (built on the definition in [28]).
<i>Social license</i>	<i>'The ongoing acceptance or approval of an operation by those local communities stakeholders that are affected by it and who can affect its profitability'</i> [29], seen here as consent based on trust and perceived legitimacy.
<i>Community of place/ local community</i>	A group of intercommunicating people who live in a particular geographical area. Used in this paper for communities that live within close proximity to a proposed seaweed cultivation site or the infrastructure required to run such an operation such as slipways, ports and harbours.
<i>Community of interest</i>	A group of people who share an interest in a specific subject area or activity, but who may be geographically dispersed.
<i>Stakeholder</i>	A person or organisation with a recognised interest in an operation or activity. E.g. regulators, businesses, environmental Non-Governmental Organisations, citizens.
<i>Legitimacy</i>	<i>"A generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs and definitions"</i> [30]. In the case of this paper we are describing it as the sense/ belief that an activity and its operator are deemed desirable, proper or appropriate by local communities and communities of interest [6], [26].
<i>Consent</i>	Permission for, or agreement to, action. Ideal consent is a free choice by a well-informed actor; community consent can be the simple aggregate of members' consents or the result of intercommunication. The grounds for consent depend on an examination, using the actor's or community's normative framework, of the potential outcomes of the action. For

	example, if the framework is utilitarian, the grounds might concern the balance of costs and benefits, perhaps calculated individually, perhaps with an eye to fair distribution over a community.
<i>Trust</i>	Broadly defined as belief in the truth, reliability or ability of someone or something. For example a shared state of mind that considers the operator and the regulatory regime to be trustworthy enough to carry out the activity in a way that is fair and consistent [9], [6].

87

88 2. Context

89 Scotland and France were chosen as the case studies to facilitate a comparison between two
90 development levels of seaweed cultivation in the EU. France is already cultivating for commercial
91 markets and is the largest producer in the EU [31]; Scotland has small and mostly research-related
92 seaweed cultivation activities, but aspires to develop the industry further [32]. Table 2 compares the
93 regulatory frameworks in the two countries and figure 1 shows their locations in Europe.

Table 2: Operational governance/regulation of seaweed farming in France and Scotland. Few laws explicitly mention seaweed cultivation, and it is therefore regulated in the same way as shellfish farming. However there is a brief Scottish policy reference in the Seaweed Cultivation Policy Statement [33]. See Appendix 2 for acronym definitions.

Topic	France	Scotland
Use of seabed for moorings	Included in marine concession	Lease required from CES
Consent to development	Included in marine concession	Not required for marine operations; LA must consent terrestrial operations
Public consultation and consent	Application for concession considered by CCM; may be public enquiry	Not required for marine operations
Zoning for activity	Not currently? But may become explicit within DSF	Not explicit within NMP or RMP, but commercial farms can only operate in SWPA and SHA; no designated DMA
Permission to occupy sea space	Marine concession (for use of public waters) required from departmental Prefect	Marine Licence required from MS - LOT
Regulation of environmental impact	EIA and discharge consents not required; AFB, Agence de l'Eau, IFREMER, consulted	EIA and discharge consents not currently required; HRA may be needed if SNH so determines
Water (ecological/ environmental) quality	Managed by Agence de l'Eau in WFD coastal water bodies, AFB offshore	Managed by SEPA in WFD coastal water bodies, including special monitoring of SWPA
Biosecurity and bio-sanitary arrangements	Conseil supérieur d'hygiène publique de France (CSHPF)	Local seed recommended; operation in SHA & SHPA only
Permission to operate as a business		Will need an APBL from MS-FHI if treated like shellfish farms
Staffing and vessels	Farm vessels need navigation permit and muster roll; staff need professional qualifications	Adherence with all relevant Marine and Coastguard Agency regulations and certification requirements (several).

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Figure 1. Map showing the location of the two case studies, within Europe.

97

2.1. Scotland

98 As with many coastal and island communities in Europe, Scotland has a long history of seaweed use,
99 dating back to at least the Iron Age, where it was used for fertiliser and fodder. From 1720 – 1840's
100 industrial use of *Laminaria* (kelp) in bleaching, soap, and glass-manufacture processes was a
101 significant source of income for Orkney and the Uists [34]. In the 1900's there were several revivals
102 of use of seaweed in industry along the West Coast of Scotland, including for iodine and alginate
103 production[28]. A detailed history can be found in [28]. This legacy of seaweed use continues today
104 with several companies still conducting wild harvesting operations of a variety of seaweeds for
105 several uses. All of these operations are relatively small-scale and high value. However, the Scottish
106 Government and Local Authorities are looking to increase the use of Scotland's seaweed resources
107 for economic and social development, particularly in Argyll and the Islands [35], [33]. In 2017 the
108 Scottish Government released a Seaweed Cultivation Policy Statement, in support of 'small to
109 medium scale' seaweed farms [33]. At the same time, the Scottish Seaweed Industry Association
110 welcomed an increase in membership numbers from 2016 – 2018, reflecting a return to interest in
111 using seaweed as an economic resource and the potential for its use to sustain populations in
112 remote and rural coastlines [36]. Seaweed cultivation in Scotland is still in its infancy with only a few
113 small commercial operations and small experimental farms.

114 In 2018, a company based in the south of Scotland submitted a scoping report for harvesting up to
115 33,000 tonnes of kelp (*Laminaria hyperborea*) per year from the West and North Coast including the
116 islands of Scotland for the purpose of alginate and nanocellulose production [37]. However,
117 opposition to the plans were far reaching, resulting in a Change.org petition started by a local
118 advocate in the West Highlands and signed by 14,000 people (October 2018) [38]. Voices of
119 objection included natural historian and broadcaster Sir David Attenborough [39], the Scottish Green
120 Party [40], and a spokesperson for the Natural History Museum [41]. In November 2018, the Scottish
121 Parliament voted unanimously to include an amendment (14ZA) to the Scottish Crown Estate Bill

122 (2018) prohibiting mechanical harvesting of five species of kelp, for the purposes of ‘commercial use’
123 [42].

124 2.2. France

125 Historically, seaweeds were used in France as a source of animal food, fertilizers or were burned for
126 heating. From the 17th century, seaweed was extensively used in the glass industry to produce
127 sodium bicarbonate extracted from ashes. Iodine production from seaweed started during the 19th
128 century as well as the alginates industry and continues on today [43]. Most seaweed cultivation in
129 France is located along the west coast in Brittany and Normandy. However, some developers are
130 currently looking into the possibility of farming seaweed in the Mediterranean Sea. In 2012, French
131 seaweed production was estimated around 70 000 tons/year from mechanical harvesting and hand
132 harvesting. The production of seaweed from farming has increased from 50 tons in 2012 to 350 tons
133 in 2015 [44] and significant sites of up to 150ha have since been authorised in Brittany [45]. Seven
134 companies are currently registered as seaweed farmers by the CEVA algae technology & innovation
135 center, and some of these companies have several farms [46].

136 In Brittany, where much of the seaweed cultivation industry is located, there are historical and
137 current issues around a proliferation of green algae due to excessive nutrient run-off from intensive
138 farming of maize, pigs, and chicken, and bay typography [47]. The decomposition of this algae results
139 in hydrogen sulphide, which can be deadly to human and animals and is responsible for the deaths
140 of two people and several wild boar [48]. Within the media, both local and international, and by
141 some of the interviewees this green algae is described as macro-algae or seaweed¹.

142 3. Methods

143 Case studies of community opinion were carried out through semi-structured interviews in Scotland
144 (September-February 2019) and France (April-June 2018), and were complemented by a survey of
145 five seaweed cultivation organisations operating in five different countries in the European
146 Economic Area. These countries are not listed to protect the anonymity of the producers, but were
147 all small-scale and locally-owned. The survey focused on the local scale variables, comprising those
148 that relate to site-scale seaweed cultivation operations and regulation, the local community, and
149 community-operator relationships, rather than larger scale interactions such as the global economic
150 or regulatory environment [15]. The survey (appendix 1) included information on social license, so
151 that participants could self-gauge their understanding of the concept and determine its relevance to
152 their activities.

153 The case study approach, drawing on methods in [49], was qualitative, and included primary
154 sources from the semi-structured interviews triangulated with secondary sources from documents
155 (i.e. planning applications, policies, and news articles) [50]. Through a purposive sampling strategy
156 [50], a range of stakeholders and community representatives (local and of interest) were
157 interviewed in both of the cases, detailed in Table 4. During the interviews, the terms ‘social license’
158 and/ or ‘social license to operate’ were not used by the interviewer. Rather the interviewer asked
159 the participants to explain or describe the nature of the relationships that they had with the local
160 community or the seaweed cultivation company. Interviews with French participants were

¹ See for example <http://en.rfi.fr/environnement/20190718-france-sued-not-doing-enough-fight-killer-seaweed-brittany> and <https://www.theguardian.com/environment/2019/sep/08/it-can-kill-you-in-seconds-the-deadly-algae-on-brittanys-beaches> and, <https://www.anses.fr/en/content/green-algae-risks-surrounding-populations-walkers-and-workers>

161 conducted by telephone and in French and were then translated into English for analysis by the
 162 second author. The interviews in Scotland were conducted in person and in English.

163 All of the data that were collected were thematically coded by the first author using the theoretical
 164 approach detailed by Braun and Clarke 2006 [51], and QSRNvivo 11 software. The interviews were
 165 analysed separately per case study, to reduce the likelihood “forcing” of the data and to ensure
 166 contextually relevant coding [52]. The producer survey was analysed separately from the interviews
 167 due to the different in method. Once the codes were generated (from the data sets of the producer
 168 survey and the interviews in France and Scotland) they were grouped into themes. The final themes
 169 are presented as subheadings in the Results section and in table 3. In the Discussion section, the
 170 findings of the thematic analysis are explored and compared to the key attributes for social license
 171 found in the literature [24]; *trust*, *consent*, and *legitimacy*, the definitions of which can be found in
 172 Table 1.

173 This study was granted approval by the University of the Highlands and Islands Research Ethics
 174 Committee (approval number: OLETHSHE214).

Table 3. Number of emergent themes according to the case studies and the mode of data collection.

Case study	Mode of data collection	Number of emergent themes
Scotland	Semi-structured interviews	4
France	Semi-structured interviews	5
Cultivation organisations	Qualitative survey	2

175

176 **4. Results**

177 This section presents the findings for each in-depth case study according to the emergent themes,
 178 before describing the results from the producer survey. The results of this study refer to the period
 179 2017-2019. Only one interviewee in the Scottish and no interviewees in the French case study used
 180 the term ‘social license’ to describe the relationship between cultivation organisations, communities
 181 and other stakeholders. ‘Acceptability’ was used more frequently in both case studies. As the
 182 researchers steered away from using ‘social license/ social license to operate’ during the interviews,
 183 this could be a reflection of use of terms that are more widely known and/ or less technical. We
 184 acknowledge that SLO may change over time [15], and have attempted to record perceptions of this
 185 through the narrative of development of seaweed cultivation by interviewees, particularly in France.
 186 Quotes from interviews are aggregated by case study rather than representation category, to ensure
 187 anonymity.

188

Table 4. Number of interviewees and stakeholder representation in the in-depth case studies.

Case study	Number of interviewees	Representation
Scotland (SC)	17	Certification organisation x1, Community organisation representative x2, Cultivation organisations x2 (owner x1 and manager x1), Harvester x2, Other interested parties x2, Politician x1, Regulator x1, Science and research x3, Supply-chain x3
France (FR)	14	Cultivation organisations x4 (owner x3 and communications manager x1), Potential cultivation organisations x2, Environmental NGO x1, Industry associations x1, Marine

		industries (not aquaculture) and local community associations x4, Regulator x1, Science and research x1
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191 **4.1. Scotland**

192 *Mechanical kelp dredging debate improved awareness of the necessity for community*
193 *engagement*

194 The mechanical kelp harvesting debate was prevalent throughout the Scottish interviews. Comments
195 ranged from support for the anti-kelp harvesting campaign to concern about the lack of scientific
196 discussion before mechanical harvesting was banned. However, there was consensus that the
197 absence of communication and engagement by the company with the local communities, fishers,
198 and other small-scale seaweed harvesters already in operation, increased negativity towards the
199 company and the idea of mechanical kelp harvesting as a whole. Fears from those in island locations
200 included the threat of increased coastal erosion due to the removal or alteration of wave
201 attenuating kelp beds and reduction in habitat for fish nurseries, on which the local inshore fishing
202 industry relies. These concerns also appeared in the Scottish Government’s Strategic Environmental
203 Assessment for Wild Seaweed Harvesting [53]. The last paragraph of the campaign against
204 mechanical harvesting [38] suggested an alternative to harvesting:

205
206 *“Kelp CAN BE FARMED. It is farmed in Norway, the Faeros and at Rathin Island between Ireland and*
207 *Scotland. If alginate companies want kelp they must invest time in researching how they can make*
208 *farming viable for them. Dredging the wild beds must never be an option.”*
209

210 Some participants also conflated the perceived environmental impacts of harvesting of wild kelp
211 with the harvesting of cultivated kelp from a seaweed farm. These concerns were generally
212 portrayed as questions and were non-specific, *“Cultivation isn’t really something that we have yet,*
213 *but it could cause similar issues [to harvesting], right?”* (SC10). However, according to all of the
214 interviewees and regardless of their category or wild harvesting preferences, the process of banning
215 mechanical kelp harvesting heightened awareness of public perception and the importance of
216 gaining local social license for any proposed seaweed farming activities. However, the reality of the
217 difficulty of balancing social acceptance with economic and ecological pressures was highlighted.
218 One provided a succinct summary of the issue; *“Social acceptance doesn’t necessarily equate to*
219 *commercial viability and environmental and commercial viability doesn’t necessarily mean social*
220 *acceptance”* (SC03). Despite clear recognition of the complexity of working towards sustainability,
221 interviewees identified measures through which social license can be gained such as; *“getting*
222 *communities on board”* (SC03) from the start and then *“carrying communities with you”* (SC15) as
223 the industry develops. These two points were seen as the key to maintaining good community-
224 industry relationships, and gaining the social approval most interviewees deemed necessary for
225 seaweed cultivation activities to develop on a commercial scale.

226 *Ownership, entrepreneurial confidence, and scale*

227 The idea of ‘commercial’ or ‘large-scale’ scale seaweed cultivation resulted in varying opinions on
228 the social challenges that these ‘commercial’ models would present. For example, when discussing
229 ownership of large-scale farms by international companies, most interviewees wanted local jobs and
230 benefits to be generated. This was of particular importance for interviewees talking about the

231 context of the West Coast of Scotland, where depopulation and an ageing population [54] pose
232 serious concerns for the economy, social services, and social cohesion [55]. However, most felt that
233 the standard commercial model was not the “right” model for Scotland and that job provision by
234 itself was not a strong enough argument for large-scale internationally owned seaweed farms. For
235 example, one interviewee from the islands noted that “*Island thinking is that the sea doesn’t belong*
236 *to anyone*” (SC10) and privatisation of it through large-scale seaweed cultivation by international
237 companies is considered undesirable. Others noted that international ownership would almost
238 certainly result in less benefits to local communities.

239 Many interviewees spoke about a need for social innovation, where the goal is no longer profit for a
240 few people, but decent pay for all those employed, and benefits for the rest of the community. The
241 majority of interviewees envisaged that the industry would start small and locally owned, before
242 being sold on to larger companies or being developed into cooperatives. Interviewees associated the
243 concept of cooperatives with terms such as “*social entrepreneurship*” and “*sustainability*”. Most felt
244 that a locally-based development of the industry should be accelerated. One participant argued
245 strongly that Scotland should make a move in this sector as soon as possible and that confidence is
246 required to take that step. They warned that “... *if we don’t [start seaweed cultivation] someone else*
247 *will come in and do it. Do we really want that?*” (SC14). Comparisons were drawn with the salmon
248 farming industry, where over the past 30 years individual farms operators were bought out,
249 eventually leading to mostly international ownership [56], perceived by many of the interviewees as
250 reducing community benefits and jobs. “*There are already companies, not naming names that are*
251 *going for the approach where they don’t involve anyone local. I’m afraid that this will become the*
252 *norm.*” (SC08). Loss of, or difficulty in gaining, social license for the activity was seen by all
253 interviewees as a barrier to seaweed cultivation, should ownership be international and the scale
254 large. “*It’s hard to change people’s views and it might be difficult to get them on board, but if it’s*
255 *incomers, it will be even more difficult to gain acceptance.*” (SC15)

256 *Communication, accountability, and regulation*

257 Communication was inextricably linked with accountability and regulation by all interviewees, with
258 communication between local communities, regulators, and cultivators seen as key to the
259 development of seaweed cultivation in a socially equitable manner. One interviewee surmised, “*The*
260 *industry... needs to have as much community engagement as possible.*” (SC16) Many interviewees
261 advised that if the farms were small scale and locally owned this communication would be “*organic*”
262 in nature. Where the informal structures of the local community through social gatherings, school,
263 clubs, personal friendships etc. would act as a sufficient conduit for information exchange about the
264 seaweed farming activities. However, they also noted that if the farms were larger scale and owned
265 outside of the local community, then a more formal communication strategy would be required.
266 Some interviewees preferred the former mechanism to the latter as they felt that “*engagement*
267 *strategies*” developed by professionals in communication rather than those working on the farm,
268 would be less trustworthy. Conversely, others felt that engagement and communication is best left
269 to those who have the skills to reach the best outcomes for everyone.

270 The current regulatory regime of the finfish aquaculture sector was seen by most interviewees as
271 inefficient and unacceptable which, reduced their confidence in how the seaweed cultivation
272 industry would be held accountable for their activities, should ownership become international and
273 the industry large scale. However, when considering the current scale of the industry, most of the
274 interviewees were calling for clarity of what the regulations are, and how they can feed into their
275 development. There was recognition that statutory consultees such as Scottish Natural Heritage are
276 engaging with the researchers and those in the sector to try and understand what is required.

277 Nevertheless, there was also general discontent with the current licensing process required by
278 Marine Scotland. Interviewees who were actual or potential cultivators reported the procedures as
279 difficult to navigate, because definitions of scale, size, and operational techniques are based on
280 shellfish aquaculture, rather than seaweed cultivation. *“Seaweed cultivation as a term is not specific
281 enough. What does it actually mean? It’s as diverse as saying ‘I want to grow plants’”* (SC08). Most
282 interviewees who were involved in seaweed cultivation would like to have the option to integrate it
283 with other aquaculture, such as mussel or oyster farming, but felt the current licensing process did
284 not accommodate such combinations.

285 One interviewee advised that for seaweed cultivation in Scotland to reach its full potential as well as
286 develop in a socially sustainable manner, an adaptive management regime [57] based on reviewable
287 management plans could improve transparency and accountability of cultivation activities. This type
288 of procedure might allow the industry to innovate with systems that are not limited monoculture,
289 such as those that are multi-trophic, whilst also gaining social legitimacy for the activity(ies) [58].
290 *“Seaweed cultivators should learn what not to do from the salmon farming industry. It won’t be
291 helped by the regulatory regime so it has to secure its own sustainability rather than just function
292 under compliance.”* (SC04)

293 **4.2. France**

294 *Scale of farm and fear for the environment*

295 Across both industry and community groups/ NGOs interviewed in France, social acceptability was
296 inversely related to the scale of the industry and the area occupied by the farms, and also depended
297 on the balance of local benefits and costs of seaweed cultivation operations. This was particularly
298 true of interviewees representing community groups and environmental associations; *“It is
299 important to stay at the local level, i.e. micro-economic. We do not take into account the national or
300 European issues that today wish to develop what is called ‘blue gold’.”* (F03). These interviewees
301 advised the strategies at a high level do not account for the impacts on normal social function at a
302 local level. Examples included site abandonment (leaving semi-permanent structures such as
303 moorings in the sea), introduction of invasive species, and seaweed washed ashore during storm
304 events to decay on beaches. This last aspect was closely linked by the interviewees, to their
305 experience of the issues with large amounts of seaweed biomass decomposing on local beaches.

306 Linked to this, the expansion of the seaweed cultivation industry reduced its acceptability to
307 community groups and other local associations interviewed. This was also recognised by industry.
308 *“Until recently there were not too many problems with social acceptability because we cultivated on
309 smaller spaces... 3-4 hectares is fine but 100-150 is impossible.”* (F02). One interviewee noted that
310 although they organised demonstrations against large-scale seaweed cultivation, they were
311 supportive of smaller scale endeavours. *“We had three demonstrations and 500 people were
312 gathered at each one... we offered 5 hectares for 5 years... their answer was no because it doesn’t
313 correspond with their economic model... so you can see that we don’t always tell them ‘no’.”* (F09)

314 There were six interviewees who used the term ‘peur’ and ‘crainte’ to describe perceptions of large-
315 scale seaweed cultivation. Within the context of loss of human life due to seaweed decomposition
316 processes, it does not seem unreasonable that emotive terms were used. However, as exemplified
317 by the next quote, the main focus for the interviewees was environment impacts. *“Les craintes sont
318 essentiellement environnementales. L’aquaculture n’a pas bonne réputation, notamment pour le
319 gavage des élevages et la pollution de l’environnement. L’algoculture n’y échappe pas, la crainte*

320 *provient de la forte densité de monoculture et des espèces invasives, qui viendront très probablement*
321 *coloniser et appauvrir la flore locale.” (F03)*

322 English translation: *“The fears are essentially environmental. Aquaculture has a bad reputation,*
323 *particularly for force-feeding livestock and environmental pollution. The seaweed farming is not an*
324 *exception, the fear comes from the high density of monoculture and invasive species, which close to*
325 *the odds, will necessarily colonize and impoverish the local marine flora.” (F03).*

326 *Information, misinformation, and differing perceptions of ‘evidence’*

327 From the interviews it was evident that the technocratic and centralist approach to governance in
328 France [59] is set against an emergence of grassroots arguments and local evidence gathering. The
329 context of the localities where seaweed is cultivated in France has a strong influence on how the
330 industry is perceived. Where there are already agricultural and aquaculture issues, these were
331 projected onto the seaweed cultivation industry. For example, interviewees expressed concerns
332 around monoculture, use of nutrients, and invasive species, associated with the proliferation of
333 green algae around the coast of Brittany.

334 From the perspective of community associations and eNGOs, there was a lack of trust in the
335 evidence that was produced by government commissioned scientists about seaweed cultivation.
336 *“Generally we find scientific reports are written in support of those who request them rather than to*
337 *help with the decisions. It’s like that in the applied sciences.” (F09).* Equally, those who were in the
338 cultivation business did not trust the process of engagement, either with communities or with
339 regulatory agencies. One of the interviewees summed it up as; *“I think there are 3 types of people:*
340 *Those who do not want to hear anything, so there it is not worth it [talking to them], those who want*
341 *to listen well but scientific arguments do not work because there is a lack of scientific culture, and the*
342 *third category is open and ready to listen to our arguments.” (F10)*

343 This interviewee noted that where problems arise is with the second category of people, who make
344 ad hominem decisions. Another interviewee felt similarly, where they advised that in order to
345 expand a seaweed farm, one has to be in the right situation from a political perspective. In a study
346 exploring the effects of ad hominem attacks on scientific claims, Barnes et al, found that assertions
347 of conflict of interest were as influential as accusations of fraud on [60]. Nevertheless, both of these
348 interviewees and another 11 stated that participation and communication with stakeholders and
349 local communities was essential to the process of gaining a concession for seaweed cultivation. This
350 suggests that the process is as much about relationships as it is about science. More specifically, it
351 implies that it is about the relationships between select groups and individuals (e.g. members of
352 environmental associations and project officers/ managers from companies), rather than members
353 of the general public and operators. Following this narrative was the finding that dialogue is
354 essential to trust in the evidence that is being presented to communities, associations and to NGOs.
355 *“I don’t say that we are “all good” and that they are “all wrong”. We must link and gather points of*
356 *view that are far apart. We are in a logic of co-construction, sharing of decisions and uses, but for*
357 *this to work, it is necessary that people admit that we can share and therefore [have] discussions.”*
358 *(F01)*

359 However, this is evidently difficult to achieve when there are fundamental differences in
360 understanding about how various aquaculture systems work and their associated environmental
361 interactions. *“... I see what happens on shellfish farming when there are meetings in the presence of*
362 *the public when the locals condemn the activity in advance because of pollution when actually we*

363 *have no inputs and we just make a product in its environment. We do not add food, we do not add*
364 *antibiotics or anything.” (F05)*

365 *Communication, and the regulatory framework*

366 Communication was presented as a problematic topic for all interviewees. A conundrum was evident
367 between producers and local NGO’s/ associations. Some producers stated that they were less willing
368 to communicate with local communities and other interest groups about their activities because
369 they are concerned that they will “*destroy*” their proposals. On the other hand, local NGO’s/
370 associations that object to some cultivation activities object on the very basis of lack of information.
371 Intertwined with communication issues, is the regulatory framework, where many of the cultivators
372 found it difficult to navigate and therefore difficult to know when the appropriate time for
373 communication with stakeholders was.

374 When delving deeper into this issue, most of the interviewees advised that this is an area that
375 requires improvement and compromise, mostly by industry, regulators, and the competent science
376 authority. Transparency was seen as key to establishing better relationships. However, it was
377 recognised by industry and acknowledged by NGOs/ associations that transparency will not always
378 result in social acceptance for a seaweed cultivation activity. Further, interviewees within industry
379 found it difficult to engage individuals who are not direct stakeholders. “*But finally, if we do not do*
380 *voluntary communication that is more targeted, there is little engagement from the public who are*
381 *not directly concerned.” (F10)*

382 However, interviewees also related communication issues to economic status, culture change, in-
383 migration and opinions on what are acceptable activities for the area. “*In coastal populations there*
384 *are fewer and fewer people initially from the coast. Today, it’s more urban people who come with*
385 *money, they have paid a lot for the view they have from their garden.” (F01)*

386 **4.3. Producer opinions**

387 All of the producer organisations surveyed operate in close proximity to the coastline of their
388 respective countries. In two cases, there are population centres of more than 40,000 people within
389 sight of the operations. Four out five of the organisations surveyed cultivate for both experimental
390 and commercial purposes, one cultivates solely for experimental purposes and only one cultivates
391 on-shore. All of the organisations reported interactions with other stakeholders and marine users,
392 and they all provide information about their activities in varying formats. Only one of the
393 organisations had social license concepts built into their business plan, but all expressed that it is a
394 useful concept for their activities, with most recognising its importance in reducing conflict with
395 other marine users and increasing likelihood of more concessions.

396 *Interactions with other stakeholders and marine users*

397 All of the organisations perceived that the majority of stakeholders that they have had interactions
398 with have a positive view of seaweed cultivation. Three organisations, two in the North East Atlantic
399 and one in the North Sea, experienced negative interactions with other users of the marine
400 environment, namely other aquaculture operators and the fishing industry. In two of the cases, the
401 issue was the designation of the space for an activity other than fishing. This is not a new
402 phenomenon, as one of the organisations experienced this problem in the 1980’s. The same
403 company also reported a reduction in conflict as the years went by and a move towards acceptance
404 as people became used to their operations – a well-documented process within social acceptability
405 literature (see for example [61], [62]).

406 Survey respondents expressed that communicating with, negotiating and understanding the position
407 of the fishing industry during the licensing process does not necessarily end once the space has been
408 allocated to seaweed cultivation by the governing authority. Two organisations experienced cases
409 where fishers were fishing within the boundaries of the space allocated to seaweed cultivation, and
410 in one case they had several instances where fishing was going on underneath the farm itself. Both
411 companies are in communication with the people that were conducting these activities and are
412 working together with them to mitigate the danger that this type of fishing poses. Equally, they
413 recognised that the space granted to seaweed cultivation through formal licensing processes, is not
414 culturally accepted by the fishing community; *‘Although we legally have the space, the fishers have
415 historical and cultural ownership of the area – which is why we have to work them, rather than just
416 rely on regulation’* (O3).

417 *Communication, collaboration and engagement*

418 All organisations surveyed were going beyond compliance with regulation in terms of
419 communication and collaboration with local communities and other interested parties and
420 stakeholders. This included having partnerships with local schools, NGOs, chefs, and community
421 groups. Interestingly, all of the organisations differentiated between audiences, communication
422 tools and content required for SLO as opposed to marketing. Figure 1 shows the links between SLO
423 and the communication and engagement activities that the organisations identified during the
424 survey. Four out of five of the organisations do not have any official communication or engagement
425 strategy for their seaweed cultivation activities. However, all of them communicate with
426 stakeholders through activities including; open days, seafood expos, websites, leaflets, and generally
427 answering inquiries about the seaweed cultivation operations. When asked how they felt about the
428 concept of SLO for seaweed cultivation, responses were varied. Some organisations agreed with SLO
429 aspects relating to opportunities for expansion and cost of producing the commodity, and others
430 suggested that SLO provides the space to reflect on possible conflicts and come up with strategies
431 for mitigation before they occur.

432 All organisations felt that they have SLO. However, only one recognised this as part of their business
433 plan. Interestingly, this is the same organisation and the only organisation to suggest that social
434 license is only relevant where engagement, transparency, and communication are not written into
435 the business plan for the organisation. *‘The concept of SLO should not be necessary, for it must be
436 dealt with in your business plan already!’* (O2). Another organisation suggested that because they
437 are part of a larger institution that conducts environmental research, their farming activities by
438 association, are granted SLO. *‘I think locals trust the brand of [O5] and so tolerate our farming
439 activities, knowing that we believe in sustainability and will not carry out environmentally
440 detrimental activities... If the farm was owned by an independent company, I think the situation
441 could be more difficult since [the site] would need to be larger and more actively visited.’* (O5)

442
443

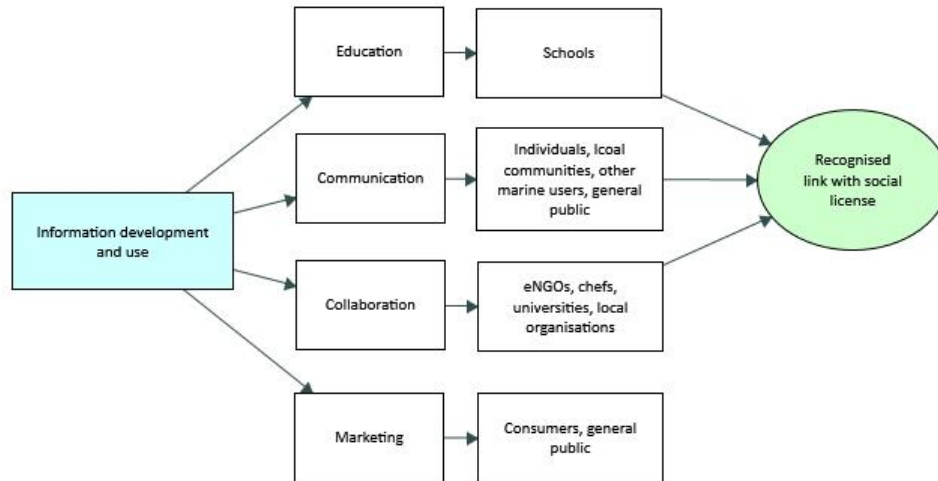


Figure 1. From left to right: the purpose of information that seaweed cultivation organisations have developed, the target audience, and recognition of links with social license as evidenced through the survey.

444 **5. Discussion: Social license is relevant for seaweed cultivation**

445 Below we consider the results of this study within our framework of three major social license
446 attributes: trust, consent, and legitimacy. We describe how our results contribute to furthering
447 detailed understanding of social license for the emergent European seaweed cultivation industry
448 within different contexts, cultures, and marine and coastal resource use histories.

449 **5.1. Legitimacy**

450 The legitimacy of seaweed cultivation in the case studies was related to economic viability and
451 potential local social and environmental opportunities and challenges. The economic viability of the
452 industry in both the French and the Scottish case studies was set against perceptions of what
453 constitutes a socially acceptable industry. In France, a socially acceptable industry was perceived as
454 one that is small scale, with clear and transparent environmental regulation and information
455 provision. In Scotland, the emphasis was on local jobs and social entrepreneurship. Neither of these
456 ideas of what constitutes a socially acceptable seaweed cultivation industry were considered as
457 economically viable in the short-term and under the current aquaculture industrial and policy
458 paradigm (large scale, single ownership) by interviewees who were regulators. However, options for
459 how to marry social legitimacy with economic efficiency were suggested and included small-scale
460 farms, possibly owned by the same company or by separate small businesses as part of a
461 cooperative, diffused along a coastline. To develop this type of a cultivation model, a joined-up
462 planning and management structure would be required, to reduce biosecurity risks [5] and
463 associated economic shocks. The current lack of European and global governance structures for
464 biosecurity for seaweed cultivation has been identified as a serious risk to the industry [2], [63].
465 Given the prominence of sustainability and perceptions of environmental issues in forming local
466 scale opinions on a resource use activity, evident within our case studies and broader aquaculture
467 literature (see for example [9], [15]), this is a matter in need of address.

468 **5.2. Trust**

469 Issues of environmental risk are associated with information and dissemination [64], and are of
470 particular relevance to social license, trust and consent. Information and more importantly, who
471 provides it, played a key role in interviewee’s opinions on whether they trusted assessments of

472 environmental risk. In France, the debate over evidence production and interpretation by different
473 stakeholders was at the forefront of arguments against opposing views (both for seaweed
474 cultivation and against). For example, local scale environmental and community organisations
475 perceived evidence and advice presented in reports produced by state level scientific agencies as
476 supportive of the industry, to the detriment of the local environment and local people. Likewise, the
477 arguments presented by those opposed to large-scale seaweed cultivation were perceived by those
478 in regulation and industry as illegitimate, and to the detriment of ‘facticity’ as experienced by
479 scientists. When thinking about the complex issue of ‘evidence’ and ‘facts’ within the current era of
480 misinformation [65], relationships, trust, and deliberative knowledge production is at the forefront
481 of tackling these ‘balance as bias’ situations [65]. This is important to note, as recent evidence
482 suggests that people’s individual opinions, whether they are directly interested in a topic or not, are
483 susceptible to partisan media, and to perceived public support [61]. This can result in affective
484 polarisation of opinion, which increases animosity between citizens and reduces the likelihood for
485 deliberation [62].

486 In their paper on the Fukushima Dai’ishi nuclear power plant disaster, Mabon and Kawabe [64]
487 found that perceptions of trust in governing agencies and industry is linked with the proximity and
488 personal risk associated with their decisions. Hence, the further away the decision is being made, the
489 less likely it is to be trusted by those who are living in the area where that decision is applied.
490 However, where there are government and industry representatives embedded within the local
491 community and co-producing knowledge, relationships are formed and with that comes trust [64].
492 The importance of dissonance of scale and decision-making and opportunities for two-way
493 communication and relationship-building was emphasised in both of our in-depth case studies.
494 However, it was more prominent in France, where perceptions of risk from seaweed cultivation was
495 set within the context of ongoing controversy around green macro-algae blooms, which have been
496 associated with human and animal mortalities [59].

497 Smaller scale cultivation was seen as a risk management strategy for most Scottish interviewees and
498 for local level environmental and community organisations in France. At a small scale, access to
499 those conducting the activities was seen as simple, described as “organic” in nature and based on
500 relationships, contextual knowledge and trust, as opposed to strategies, messaging and technocracy.
501 In this way, social license for seaweed cultivation is more associated with community embeddedness
502 and the relationships that local people and organisations could or do have with the company and/ or
503 individuals conducting the activity, rather than the information and communication methods
504 employed. This is echoed by other social license research, where quality communication [16] and
505 relationship-building are seen as key to socially legitimate operations [24]. Further, Orozco and Veiga
506 [66] found that assumptions around objections to large scale gold mining, and acceptance of small
507 scale gold mining was less related to economic and environmental factors and more related to
508 maintaining social order. This is described by the authors as; *“the practices, values, networks and
509 human interrelationships at the local level that build and enforce certain types of behaviour.”*

510 **5.3. Consent**

511 In our case studies, accountability and scale were linked with consent for the industry. The formal
512 and monetary requirements of holding international corporations to account for errors or accidents,
513 was seen as near impossible by interviewees in Scotland. Large-scale food production systems
514 (finfish in Scotland and agriculture in France) were provided as examples of the difficulty of
515 enforcing mitigation measures for environmental and social impacts. Smaller scale operations in
516 France had consent on the basis of ease of interactions and therefore ability to hold the individuals
517 conducting the activity to account if anything goes amiss. In both Scotland and France, the

518 immediacy of this access to operators by “*being neighbours and friends*” and having shared
519 knowledge of a particular area, seemed to form a significant part of whether an operator (or
520 potential operator) is trusted, and further, whether they are likely to receive consent for their
521 activities. Examples from our case studies included stories associated with specific marine and
522 coastal features that non-locals would not know.

523 When referring to non-locals, interviewees were not talking about ethnic origin or demographics,
524 but rather a typology of behaviours. In relation to seaweed cultivation this included what we are
525 calling ‘hasty actions’, where an organisation, group or individual failed to understand and connect
526 with the local context and people before acting or making a decision that would impact the local
527 area. Within this scenario there is limited space for consent to take place, as there is by default, no
528 understanding of what comprises consent from a local community. In words of one interviewee,
529 these ‘hasty actions’ resulted in “*no chance to come to a consensus*”. Reduction in the acceptability
530 of the aquaculture activities has been linked with economic status and perceptions of the marine
531 environment as leisure opportunity versus use [9], [23]. In our case studies, there was concern that
532 those with power and money (often described as migrants from urban regions) were prioritised in
533 social license negotiations. This issue of ownership of operations and power relations between
534 actors involved in deliberation for social license requires further research. However, these findings
535 are analogous to some social acceptability literature on the role of historical context and
536 deliberation in acceptance of renewable energy technologies in the marine environment (see for
537 example [69] and [70]). Perhaps useful to further enquiries are the established bodies of literature
538 on the role of elite power in transformations (e.g. as described by Sovacool et al [69]) and the role of
539 power in marine planning (as described by Flannery et al [70]).

540 **5.4. Reflections on use of the terms ‘social license’ and ‘social license to operate’**

541 In our methods, we steered away from using the terms ‘social license’ and ‘social license to operate’
542 during the interviews, in an effort to see if the major SLO attributes emerged, or if the term was
543 used without the influence of the researchers. Across both case studies, we found that in all but one
544 interview neither term was used to describe community-cultivation organisation relationships.
545 ‘Acceptability’ was used more frequently. There are three reasons that we propose for this; 1) SLO is
546 a technical term used by large businesses [25], some government departments (for example in the
547 UK and New Zealand), and academics – very few of our interviewees represented these categories;
548 2) the term and concept is less known in seaweed cultivation circles than in other aquaculture
549 sectors and; 3) ‘acceptability’ is less technical and more broadly known by different sectors of
550 society. Nevertheless, when considering the narratives that the interviewees used to describe their
551 relationships, we can see that the three major attributes of SLO are present in both Scotland and
552 France, although with varying contextual details. From the producer survey (where a description of
553 SLO was provided to participants), we can see that the concept was deemed useful, unanimously.
554 Further, there was recognition of the difference between information developed for marketing
555 purposes and information developed for gaining and maintaining SLO. Our study shows that as the
556 industry expands and consolidates, the attributes and concept of SLO, if not the term itself, is likely
557 to become more relevant.

558 **6. Conclusions**

559 From the evidence presented in our cases we can see that for large-scale multi-national owned
560 seaweed cultivation operations the default position for engaged stakeholders is limited trust, lack of
561 consent, and legitimacy based on formal legal and planning processes, resulting in the requirement

562 for undertaking formal activities that will garner social license (e.g. communication strategies,
 563 community grants). Conversely, local small-scale operators already have consent, trust, and informal
 564 legitimacy based on inter-personal relationships, placing them in a much better position to gain
 565 social license, or perhaps already having social license by default. As these two default modes were
 566 found in two different contexts, they are perhaps something that individuals and organisations
 567 looking to cultivate across developed nations, should bear in mind. All of the cultivation
 568 organisations surveyed by this study were already engaged in activities that build relationships with
 569 local communities, and some provided evidence of where issues were solved quickly and in a
 570 deliberative manner because of their embeddedness within the local area and their positive
 571 relationships with other local users of the marine environment. This is most likely a reflection of the
 572 self-selecting nature of the study and that the organisations were all small-scale and locally owned.

573 There is a prevailing assumption, in the wording of many research projects and national and
 574 supranational policies, that because seaweed cultivation is environmentally relatively low-risk [11] it
 575 is therefore more socially acceptable than other marine aquaculture industries. However, this is
 576 clearly not the case [5]. There is potential for unforeseen social and ecological consequences of this
 577 emerging industry [63]. Our study shows that inter-personal relationships, context-related
 578 perceptions of environmental risk, and levels of trust in regulators and operators, feed into social
 579 license for cultivation operations as much as observed environmental impacts. We found that where
 580 formal governance systems bring together actors who have different worldviews and
 581 understandings of science in an effort to democratise decision-making, ad hominem arguments are
 582 more likely. This emphasises the role and qualities of actors and agency in social license negotiation,
 583 rather than of structure, organisations and law.

584 We see the concept of social license to operate as a useful starting point for industry and regulators
 585 across developed nations to improve on or start building relationships with the communities that
 586 might host commercial scale seaweed cultivation activities and the agents that influence their
 587 opinions. Equally, it could provide local communities and interest groups and other marine users
 588 with a means to negotiating better terms for hosting commercial seaweed cultivation operations.

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 595 voluntarily and the SAMS Seaweed Team for sharing their expertise.

596 **Appendix 1**

List of species cultivated (please choose C for species you grow commercially and E for those you grow experimentally):			
1. <i>Saccharina latissima</i>	C/E	2. <i>Osmundea pinnatifida</i>	C/E
3. <i>Alaria esculenta</i>	C/E	4. <i>Ulva</i> spp.	C/E
5. <i>Palmaria palmata</i>	C/E	6. <i>Laminaria digitata</i>	C/E
Type of farm (please tick all of the cultivation methods that apply to your farm):			
Onshore tank			
Onshore pond			

Sea-based net	
Sea-based line	
Other (please describe)	

1. Spatial context of your farm or affiliate farm including; size and proximity to the coast and other marine users <i>[this can be a map or a short description]</i> :
2. Have you had any interactions with local communities, individuals and/ or NGOs up until now? Yes/No
3. If so, please provide a few sentences summarising what the interactions were about and whether they resulted in any outcomes (positive, negative, or otherwise):
4. Do you have a formal communication/ engagement plan within your company about your seaweed cultivation activities outside of any legal or planning obligations? Yes/ No
5. Outside of legal/ planning obligations, how did you communicate with;
a. local communities (including schools)?
b. other users of the area (fishers, fish farmers, tourists etc.)?
c. individuals?
d. others (please specify)?
6. What type of information did you provide;
a. local communities (including schools)?
b. other users of the area (fishers, fish farmers, tourists etc.)?
c. individuals?
d. others (e.g. NGOs)?
7. Have you read the Social License to Operate (SLO) handbook? Yes/ No
8. Do you think that the concept of SLO, presented in the handbook, is useful? Yes/No
9. In what ways do you agree/ disagree with the concept of SLO?

10. Do you think your seaweed farming activities have SLO (as defined in the handbook)? Yes/ No
11. In what ways do you think SLO could be made relevant for your farming activities?
12. If you have any other comments which you think might be useful or relevant for this study, please write them here:

597

598 **Appendix 2**

List of acronyms from Table 2.

Acronym	Acronym phrase, France	Acronym	Acronym phrase, Scotland
Agence de l'Eau	(Regional) Water Boards, 6 in total	APBL	Aquaculture Production Business Licence
AFB	Agence française pour la Biodiversité	CES	Crown Estate Scotland, or subsidiary local non-profit organisation
CCM	(Departmental?) Commission des cultures marines, including representation from DDTM, AFB, IFREMER, CDPMEM, environmental groups	DMA	Disease management area, designated for prevention or treatment of disease
CDPMEM	Comité départemental des pêches maritimes et des élevages marins: deparatmental committee for marine fisheries and aquaculture, including local fishers and farmers	EIA	Environmental Impact Assessment
		FSS	Food Standards Scotland
DDTM	Direction Départementale des Territoires et de la Mer	LA	Local Authority (for Town & Country Planning), tpically a 'county' such as Argyll & Bute
DIRM	Direction interrégionale de la Mer, 4 in total, responsible for marine planning	HRA	Habitats Regulations Appraisal
DSF	Document stratégique de façade, Sea Basin strategy from DIRM	MS MS-LOT MSS MS-FHI	Marine Scotland, including MS Licensing Operations team Marine Scotland Science MS Fish Health Inspectorate
EIE	Etude d'impact environnemental	NMP	National Marine Plan
IFREMER	Institut français de recherche pour l'exploitation de la mer	SHA	(Officially designated) Shellfish Harvesting Area, FSS monitored for harmful algae and bacteria
		SWPA	(officially designated) Shellfish Water Protected Area, monitored by SEPA
		RMP RMPP	Regional Marine Plan, made by Regional Marine Planning Partnership: 11 in total, only 2 currently operational
		SEPA	Scottish Environment Protection Agency
		SNH	Scottish Natural Heritage

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