Handbook on Social License to Operate for Seaweed Cultivation

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Abstract

This is the fourth version of a handbook describing theory and practice for 'Social License to Operate' (SLO) for seaweed cultivation operations. It provides details on the factors involved in SLO in general and specifically for seaweed cultivation as found in studies undertaken as part of the EU H2020 GENIALG project. It aims to be a guide for seaweed farmers, communities, and policy-makers, to avoid unnecessary community-industry conflicts and promote socially sustainable and acceptable approaches to seaweed cultivation.

Key findings for working towards Social License to Operate for seaweed cultivation in Europe:

- ✓ *Clearly define seaweed industry terms* –Accidental association of terms with the incorrect activity (e.g. wild harvesting with cultivation) is common and can risk social opposition unnecessarily.
- ✓ *Information provision is key* – where information on the environmental impacts of seaweed cultivation is scarce, stakeholders may fill this knowledge gap with experiences from other local industries (e.g. shellfish farming and agriculture), which may negatively influence opinions on seaweed cultivation.
- ✓ *Perceptions of relationships determine trust* – Where stakeholders perceive too-close relationships between scientists, government, and industry, ad hominem arguments are more likely to prevail.
- ✓ *Social license to operate concept perceived as useful to the seaweed cultivation industry* – Smaller-scale seaweed cultivation organisations are already practicing activities that are associated with gaining social license to operate.

Executive summary

There is an increasing recognition that social opposition to aquaculture operations is inhibiting the growth of the industry. Seaweed aquaculture is a potential component of sustainable "Blue Growth", so it is imperative to understand industry-community interactions for this sector. In addition, there is a need to identify steps that can be taken to develop positive relationships between, seaweed cultivation activities and operators and local communities, communities of interest, and other stakeholders.

Social license to operate (SLO) is an industry-coined term used to describe the relationships that industries have with local communities. It can empower communities to seek benefits from industries that have social and environmental costs and provides a framework for industries to go beyond legal compliance with environmental and social regulations. These costs can include the use of space, environmental and visual degradation, and disruptions to normal social life.

Having or not having SLO can affect the viability of an operation or development. Not having SLO can cost time, money, and reputation and can limit access to new sites for development. Having SLO can increased reputation through local support and provide opportunities for expansion. The scientific literature identifies several ways to improve industry-community relationships. These include:

- Understanding the local social context for the industrial activity
- Ensuring that communities have enough information about the activity and can participate in decision-making about it
- Engaging in early, on-going and quality communication between communities and industry
- Building relationships between individuals in the community and the company
- Understanding that economic, environmental and social sustainability are important concerns for communities
- Ensuring that there are local benefits
- Recognizing that local solutions may be perturbed by external parties such as national or international eNGOs or company management boards
- Dealing adaptively with communities, responding to changes in them, in the industry, and the economy
- Being fair and transparent in making decisions that affect the community or local workers.

The fundamental aim of understanding the context of SLO and engaging in the activities listed above is to establish trust between those running industrial operators and local communities and communities of interest. In addition to these factors, findings from research conducted in the H2020 GENIALG project, exploring SLO for seaweed cultivation, show that:

- The seaweed cultivation sector should not neglect the acquisition and maintenance of SLO.
- Small-medium scale farms that are locally owned are more socially acceptable because they are perceived as: more accessible and open to discussion of concerns, more likely to provide jobs to local people and, having lower environmental risk.
- Under-development of public policy and regulation negatively influences how local communities and stakeholders perceive seaweed cultivation.
- The information needed by local communities and stakeholders for the purposes of SLO is not the same as that which might be provided to the general public whilst marketing seaweed products.

Contents

1. Introduction: Social License to Operate

Social license to operate (SLO) is an industry-coined term [1] relating to the relationship that industries, which have social and environmental costs, have with local communities [2], [3]. It was first established in the mining industry and used to explain how some mines were able to operate unobstructed or supported by local communities, whereas others were met with opposition at every step of the way [4], [5].

SLO is described as an on-going relationship between a host community and an organisation (industry, NGO, business) where the organisation is held to certain standards set by the community, in exchange for the trust and support of the community [6]. Recent years have seen the idea of SLO gain traction in the aquaculture industry, with it becoming a popular theory in trying to understand and better the relationships that host communities have with aquaculture activities and operators [7]–[10]. For example, a study in New Zealand documented how transactional relationships (e.g. company pays for new roads in exchange for support) were not as successful at gaining the approval of local communities as relationships that were more emotional and immersive (workers live locally and become part of the community) [11]. Having or not having SLO can impact the viability of an operation through informal processes such as word of mouth, and formal processes such as legislation and voluntary industry standards [2]. SLO can protect the reputational capital of an industry from hostile campaigns, legislative action, or word of mouth. This can effect of the base cost of producing the commodity, and/or the end price of the commodity for consumers.

Campaigns have been used by communities or NGOs to create awareness around the negative impacts of an industry. For example, a local NGO in West Scotland ran a campaign against a proposal for a finfish farm. It involved distributing fliers, online petitions, and creating and promoting a website through social media and word of mouth. The result was that over 800 people objected to the fish farm planning application [12] and opposition to any finfish farming in the locality, is ongoing.

Word of mouth is a grassroots level of communication within and between communities and is one of the ways that communities receive information about the activities of a company or organisation. If a company does not have

A brief history of Social License to Operate

Social licence to operate first came into use in the mining and hydrocarbon sector in the early 1990's [4].

At that time, social attitudes were changing towards the natural environment [3]. The Convention on Biological Diversity and the United Nations Framework Convention on Climate Change both of 1992 are just two examples of an international shift in how humans value the environment.

This heightened sensitivity to the social and environmental impacts of industry resulted in more cases of local action against new or existing developments [3]. These actions caused (and still cause) frequent stoppages or delays in many resource-use projects across the globe [5].

The cost of such delays and the staff time required to handle community-company conflict can run into the $billions per year. A review of the Australian Stock Market identified AUS$21.4 billion in negative share-price impact due to perceptions of "environmental, social, and governance risks" [5].

The concept of Social Licence to Operate was developed to help industry identify the causes of and prevent costly conflicts with local communities [4]. Since its inception, it has been applied to energy, farming and agriculture, pulp and paper manufacturing, forestry, and aquaculture [5].

people living in local communities who naturally feed into the information that is circulated via word of mouth, it can cause speculation and feelings of mistrust and resistance [11].

Legislative action can involve communities taking companies to court over their conduct. For example, a local community in Nigeria took oil and gas company Royal Dutch Shell to court in 2005 over gas flaring in the local area. Despite the community losing their hearing, Shell sold off some onshore Nigerian oil fields because of pressure from ongoing court cases involving communities, local hostility, and security issues [13], [14].

All these types of hostile action can impact an industry indirectly, through effects on company policy as well as the formal regulation of industry by the state. Company policy can include the use of voluntary standards set by the company or by industry groups such as ISO 14001 (an international environmental framework for businesses) or by third parties such as the Marine Conservation Society. These standards can influence the operations of a company, the cost of production, and the products' market prices. For example, organic certified products can sometimes be sold for more than the cost of the certification. Both voluntary standards and regulation are important factor in SLO as voluntary standards can be influenced by local communities and the general public, but these standards can also influence how communities interact with the company. Company polices which actively promote transparent and open relationships with local communities have been shown to contribute to SLO [15].

SLO interacts with the formal process of law for many reasons, the important one being that companies can try to gain SLO as a strategy for managing 'social risk' – the risk of society campaigning against them. In other words, if they are able to gain SLO then environmental regulatory changes are more likely to be voluntary, less strict and/or cheaper to implement than the cost of enforced regulation [1], [15]. From the perspective of communities, SLO is a way to push industries to better comply with environmental regulation, improve the social and environmental conditions in their localities, and to go beyond regulatory environmental and social compliance [2]. It is also a way for local communities to hold companies accountable for their actions, and for companies to make their operations legitimate and acceptable in the eyes of local communities [1].

Environmental and social conservation is sometimes seen as antagonistic to industrial development. For example, a proposal to expand a finfish farm in a Marine Protected Area on the coast of the island of Arran, Scotland, was met with opposition from the local community. The justification for the opposition was based on the reasoning that the expansion would degrade the environment – the very reason for having an MPA [16]. The basic case for SLO is to empower communities to engage with industry so that the social and environmental costs of the industrial activity are not solely born by local communities. However, we prefer to see SLO in the context of the evolution of social-ecological systems – where humans are seen as part of the natural environmental system rather than as isolated entity [17]. Industrial development is necessary to provide people with employment, income, goods and services, but it must take place in a way that is socially and environmentally sustainable. Positive engagement of communities in the industrial development process, and the build-up of trust between citizens and industry representatives, helps to garner SLO.

The processes relating to acquisition of SLO can be seen as amongst those recommended by the 'Ecosystem Approach' of the Convention of Biological Diversity [18], concisely expressed in the three principles of the FAO's 'Ecosystem Approach to Aquaculture' [19]. As such, aquaculture should;

- be developed in the context of ecosystem functions and services (including biodiversity) with no degradation of these beyond their resilience;
- improve human well-being with equity for all relevant stakeholders (e.g. access rights and fair share of income);
- be developed in the context of other sectors, policies and goals, as appropriate.

2. Why is Social License to Operate important for seaweed cultivation?

In order to be economically efficient, most commercial seaweed farms will need to be spatially extensive. Applications to license large farms are likely to encounter two sorts of challenge: from sectoral competition for space, and from social opposition. There is no scientific literature reporting on the social interactions that commercial scale seaweed production has or is likely to have in Europe. However, work done on the AquaSpace H2020 project has identified that a demand for space for aquaculture industries can create stakeholder and user conflicts [12]. There is evidence from Scotland and France, collected through the GENIALG H2020 project, that user conflict and spatial issues will arise if and when the seaweed cultivation industry expands to commercial scale farms.

Both the specific location and type of activity of marine industries, and the world-views of members of the local communities, have a bearing on the social acceptability of different uses of the marine environment [20], [21]. At a commercial scale, seaweed production will have environmental interactions, both positive and negative. People can be aware of environmental impact, or use arguments based on such impact to justify opposition to enterprises or industries. SLO could provide a useful framework for the seaweed industry to manage the social risk of opposition to expansion, by developing communication and best practice strategies, and for communities and other users of the marine environment to negotiate beyond compliance behaviour from the industry.

The following sections present an overview of the scope and methods (section 3) and a brief overview of the results of studies undertaken in the EU H2020 GENIALG project, exploring social license for seaweed cultivation across Europe (section 4). We then describe key overall findings (section 5) and present recommendations on ways to work towards social license to operate for seaweed cultivation, from the perspective of seaweed cultivators, but also for local communities, communities of interest and other stakeholders (section 6). Finally, for the purposes of transparency, we reflect on the limitations of this handbook and its use (section 7) and provide further resources that may be of interest to our readership (section 8). Table 1 provides the definitions of frequently used terms in this handbook. The results from the studies have been submitted to two journals and at the time of writing one has been published (https://doi.org/10.1016/j.aquaculture.2020.736203) and the other is currently under peer-review.

Table 1. Definition of terms used in this handbook.

Term	Definition
Seaweed	Aquatic multi-cellular photosynthesising organisms usually attached to the sea-bed by holdfasts that do not absorb nutrients (i.e. are not roots). Three main types (brown, green and red) that differ greatly in their life cycles, bodily organisations, and biochemistry.
Seaweed cultivation	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 [22]).
Wild harvesting	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 [22]).
Gathering	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 [22]).
Social license to operate	*'The ongoing acceptance or approval of an operation by those local communities stakeholders that are affected by it and who can affect its profitability'* [23]
Community of place/ local community	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.
Community of interest	A group of people who share an interest in a specific subject area or activity, but who may be geographically dispersed.
Stakeholder	A person or organisation with a recognised interest in an operation or activity. E.g. regulators, businesses, environmental Non-Governmental Organisations, citizens.

3. Scope and method of study

This handbook uses three-pronged approach to explore and report on for social license to operate for seaweed cultivation in Europe, as explained below and in Figure 1.

- *A desk-study* of peer-reviewed and grey literature on social license to operate, social acceptability, legitimacy, and seaweed cultivation in developed nations was used as a reference point for developing methods for exploring social license for seaweed cultivation and contextualising the results of the studies carried out by the GENIALG project.
- *Two in-depth case studies* were carried out using interviews and workshops to explore in detail, the perceptions of stakeholders towards seaweed cultivation. The case studies were chosen based on representing two ends of the spectrum of development of seaweed cultivation in Europe. The first is France, which is the largest producer of seaweed by cultivation in Europe, with a well-established industry (albeit small in comparison to Asia). The second is Scotland, which has an embryonic industry, but a strong governmental will to see cultivation develop at a commercial

scale. A Q-method[1] study was employed in Scotland, investigating the "ideal" model for seaweed cultivation development, given the embryonic state of the industry and asking the question: how should commercial seaweed cultivation in Scotland, develop?

- *A survey and interviews* with seaweed cultivation organisations (*n=10*) across from five countries in the European Economic Area was conducted, checking the usefulness of the social license concept to their activities and the interactions that they have with local communities, users of marine space and other stakeholders. For the purposes of anonymity, these companies nor the countries they operate in are detailed, however the survey did cover different scales of operations (from artisanal to larger), and different cultivated organisms (from *Ulva* to *Saccharina*) and methods (e.g. line, net, and others).

Figure 1. *An overview of the methods used to carry out research on social license to operate conducted in the H2020 GENIALG project.*

4. Results

This section briefly outlines the main findings of the desk study on the factors influencing SLO, before providing more detailed results from the two in-depth case studies, France and then Scotland, and the producer survey and interviews.

4.1 Desk study of SLO

In Table 2, we provide some additional information on the specific factors that have been related to SLO for a variety of industrial activities across several sectors including aquaculture, energy, forestry, and mining. All sources are peer-reviewed papers.

[1] A research method used to study perspectives on a particular issue, by sorting and ranking a series of statements. More information can be found here: https://qmethod.org/

Table 2. Brief outline of the findings of a desk study on the factors that relate to social license to operate.

SLO attribute	Brief explanation	Sources
Understanding the social context of the area	Understanding the social and cultural norms of the communities local to an industrial activity is essential for ensuring any communication, community benefits, work-patterns, and working structures are appropriate. It can be essential to understanding what matters most to the community and therefore how to mitigate against any potential impacts.	[24]
Trust and trustworthiness	Trust is the outcome of interactions between two trustworthy parties. Trustworthy traits include; predictability, credibility and commitment, honesty and truth claims (verifiable factual claims).	[11], [25]
Quality contact and engagement	The quality of contact and engagement between an operator and the local community and relevant stakeholders is more important to SLO than the quantity of contact. Quality contact is associated with trust and pleasant and positive experiences with the operator.	[3], [15]
Communication	Communication comprises the ability to understand and be understood by others. However, in the context of SLO it also includes the history of group relations, e.g. the history of operator-community relationships in the local area, as well as the current negotiation.	[23], [26]
Procedural fairness	Procedural fairness is linked with transparent communication about decision-making and community benefits. It relates to the way that operators and regulatory agencies make decisions about the activity, and the workforce and supply-chain required to run it. If decisions are perceived to be fair by local communities and relevant stakeholders, SLO is more likely.	[2], [15], [27]
Relationship-building	Relationship-building includes many of the attributes associated with gaining trust such as; honesty, consistency, good communication, and collaboration. Relational quality is associated with more emotional connections (i.e. embeddedness in the community, shared values, etc.) and less with transactions (i.e. sponsoring local sports teams, monetary compensation for disruptions etc.) *"Relational quality is more important that transactional quantity"* – Baines & Edwards, 2018	[11]
Visual and environmental impact	Visual and environmental concerns are often cited as a motivation for opposition to aquaculture developments, particularly where they may interfere with conservation interests and tourism activities.	[28], [29]
Maintaining social order	Large-scale industrial activities can receive more negative social attention than small scale ones, despite, in some cases, better environmental and social responsibility standards. Small scale, locally owned operations can be viewed as more compatible with existing social order. Large-scale multi-nationals are far removed from local dynamics and can be viewed as an *"imposition"* on local communities. This can be related to understanding local social contexts and being flexible enough to accommodate changes to maintain social order, or gradually introduce changes in close collaboration with local communities and stakeholders.	[30]

4.2 In-depth case study 1: France

Historically, seaweeds were used in France as a source of animal food, fertilizers or were burned for heating. From the 17th century, seaweed was extensively used in the glass industry to produce sodium bicarbonate extracted from ashes. Iodine production from seaweed started during the 19th century as well as the alginate industry and continues on today [31]. Most seaweed cultivation in France is located along the west coast in Brittany and Normandy. However, some developers are currently looking into the possibility of farming seaweed in the Mediterranean Sea. In 2012, French seaweed production was estimated around 70 000 tons/year from mechanical harvesting and hand harvesting. The production of seaweed from farming has increased from 50 tons in 2012 to 350 tons in 2015 [32] and significant sites of up to 150ha have since been authorised in Brittany [33]. Seven companies are currently registered as seaweed farmers by the CEVA algae technology & innovation center, and some of these companies have several farms [34].

In Brittany, there are historical and current issues around a proliferation of green algae due to excessive nutrient run-off from intensive farming of maize, pigs, and chicken, and bay typography [35]. The decomposition of this algae results in hydrogen sulphide, which can be deadly to human and animals and is responsible for the deaths of two people and several wild boar [36]. Within the media, both local and international, and by some of the interviewees this green algae is described as macro-algae or seaweed (see for example http://en.rfi.fr/environment/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).

This social and environmental context was prominent throughout the interviews with industry, regulators, community organisations, and environmental NGOs. Key findings showed that:

- Community groups and NGOs were less likely to view seaweed cultivation as acceptable when it is large scale. The reasons provided include: concerns for the environment such as the negative impacts associated with invasive species; interruptions to normal social functions; fear of storm events causing large amounts of seaweed to be washed ashore – resulting in further beach closures due to decomposing algae; and the poor reputation of aquaculture in general.
- Perceptions of bias in evidence were central to debates over the legitimacy of current coastal resource regulations and engagement activities. Lack of trust by community groups and NGOs in scientific reports commissioned by government, and lack of trust in the engagement process by cultivators, tends to result in *ad hominem* decisions. In these cases the actors involved in discussions were more likely to make decisions based on their perception of the character of person presenting the evidence, rather than on the strength of the evidence and the rationality of the argument.
- Communication was found to be problematic by all parties involved in discussions on seaweed cultivation. Cultivators were doubtful about providing information on their activities in case this led to objections to proposals for expansion. NGOs and community groups objected to some cultivation activities on the very basis of lack of information.

- Top-down policies such as the Blue Growth Agenda clashed with the aims of some community groups and NGOs, who were more concerned with local environmental and micro-economic considerations, such as the provision of local jobs for local people.

4.3 In-depth Case Study 2: Scotland

As with many coastal and island communities in Europe, Scotland has a long history of seaweed use, dating back to at least the Iron Age, where it was used for fertiliser and fodder. From 1720 – 1840's industrial use of *Laminaria* (kelp) in bleaching, soap, and glass-manufacture processes was a significant source of income for Orkney and the Uists [37]. In the 1900's there were several revivals of use of seaweed in industry along the West Coast of Scotland, including for iodine and alginate production[22]. This legacy of seaweed use continues today with several companies still conducting wild harvesting operations of a variety of seaweeds for several uses. All their operations are relatively small-scale and give rise to high added-value. In 2017 the Scottish Government released a Seaweed Cultivation Policy Statement, in support of *'small to medium scale'* seaweed farms [38]. Seaweed cultivation in Scotland is still in its infancy with only a few small commercial operations and small experimental farms.

In 2018, a company based in the south of Scotland submitted a scoping report for harvesting up to 33,000 tonnes of kelp (*Laminaria hyperborea*) per year from the West and North Coast including the islands of Scotland for the purpose of alginate and nanocellulose production [39]. However, opposition to the plans were far reaching, resulting in a Change.org petition started by a local advocate in the West Highlands and signed by 14,000 people (October 2018) [40]. Voices of objection included natural historian and broadcaster Sir David Attenborough [41], the Scottish Green Party [42], and a spokesperson for the Natural History Museum [43]. In November 2018, the Scottish Parliament voted unanimously to include an amendment (14ZA) to the Scottish Crown Estate Bill (2018) prohibiting mechanical harvesting of five species of kelp, for the purposes of *'commercial use'* [44].

This social and environmental context was prominent throughout the interviews with industry, regulators, community organisations, and environmental NGOs. Key findings showed that:

- The scale and prominence of the opposition to the proposal for mechanical seaweed harvesting had raised awareness (amongst all interviewees) of the importance of effective communication and engagement with local communities and stakeholders.
- Building and maintaining positive community-industry relationships was easier when the operations were locally owned and run, because this facilitated access by local people to those who could make changes to operations should an issue arise.
- There was a clear preference for equitable development of the seaweed cultivation sector, where jobs and value were retained locally. Various models that could result in SLO were proposed, including: dispersed small to medium scale locally owned farms; cooperatives; and social enterprises.
- Robust, clearly communicated, and relevant policy and regulation regimes were seen as key to developing SLO. All participants suggested that the current regimes were not fit for purpose, but advised that collaboration between industry, science, and policy as the industry developed could provide a way forward.

4.4 Producer opinions of SLO for seaweed cultivation

Ten producers were interviewed. They came from five countries in the European Economic Area, with scales varying from artisanal to comparatively large (for Europe). All of the producers surveyed agreed that SLO was a relevant concept to them for considering how to improve and maintain positive site-scale interactions with stakeholders, local communities, and other users of the sea. All of them were taking steps to engage and communicate with communities and stakeholders local to their sites. Approaches varied across different cultivation organisations and in different countries/ cultures. However, all producers agreed that:

- Successful seaweed cultivation operations and the ability to expand required social acceptability.
- Communication with local communities, users of the marine environment, and other stakeholders was necessary for gaining and maintaining the positive relationships required for operations to continue smoothly.
- Collaboration with relevant stakeholders such as; chefs, schools, and universities was beneficial and necessary for research and development, but also for education about products from different species of seaweed, cultivation approaches, and broader pro-environmental messaging.
- Smaller scale organisations engaged with stakeholders and communities in an 'organic' way i.e. through collaborations with local schools, casual conversations with other users of the sea (e.g. fishers), open days, and a workforce and ownership embedded in the local area. However, those looking to expand were cognisant of the requirement to maintain these relationships.
- Larger cultivation organisations were more likely to experience social opposition, and felt that they required formal communication and engagement strategies.
- There was a difference between marketing communication and communication for SLO. The former is aimed at the general public and consumers, based on merits of the product(s), and the latter is aimed at specific stakeholders and local communities with a focus on transparency of activities (how the operation works) and decision-making.
- It can take time for people to get used to seaweed cultivation operations in areas where aquaculture has not previously been present. This makes the first approaches to building relationships with local communities and stakeholders, fishers in particular, key to developing trust.

5. Overall findings

The following section overviews the findings from the desk studies, the case studies, and the producer survey.

- Mechanical harvesting of wild seaweeds is often confused with wild seaweed gathering, hand harvesting wild seaweed and seaweed cultivation. SLO is sensitive to the different technologies and presumed environmental impacts. Mechanical harvesting of wild seaweeds seems to be less acceptable than wild seaweed gathering or cultivation. There is, thus, a requirement to clearly define and distinguish these activities. See table 1 for our proposed definitions.
- Understanding the socio-environmental context in which the cultivation is taking place or is likely to take place is key to identifying points of issue or conflict, how and why they might develop, and how they could be resolved. For example, fishers were reported as having the most interactions

with producers, and in many cases conflict was avoided through understanding the historical and cultural importance of fisheries and taking the time to form relationships based on open communication (rather than legal proceedings).

- The relationship between regulators and the scientific organisations that advise them, plays a key role in gaining and maintaining SLO. Where there are perceptions of conflict of interest, social opposition and degradation of trust in scientific research can occur.
- Information, how and by whom it is communicated is a complex issue, dependant on context and the individuals involved in debating the merits (or lack thereof) of specific seaweed cultivation concessions. However, there are clear attributes associated with communication and information that relate to SLO and positive relationships with other marine users, listed in Table 3.
- Social perceptions of environmental and social risk and prior experience of decision-making with other local industries (e.g. mussel or finfish farming and agriculture) that has a perceived impact on the local community, affects the likelihood of social license to operate. This is particularly the case where stakeholders feel that communication and information provision is limited, not relevant, or non-existent.

Table 3. Characteristics of operators' communication strategies that relate to development and continuation of social license to operate for seaweed cultivation.

	Characteristics	**Commentary**	**Relation to SLO**
Who should be communicating	Local representatives embedded in the area who have an understanding of the local socio-environmental, political, and economic context	For smaller operations, communication activities could be accomplished by those who work on/ own the farm and in an 'organic' manner, e.g. word of mouth – informal meetings and casual conversations. For larger operations, there could be (a) dedicated communications officer(s).	Understanding social context, building trust, developing relationships and maintaining social order.
How to communicate	Timely, efficient, broad-spectrum, accessible, correct	Provide information in advance so that people have adequate time to digest and talk about it. Ensure communication is accessible for most education levels, try to reach different groups by using a variety of platforms, and contact strategies, such as newspapers, website, local events, etc.	Procedural fairness and quality contact.

What details to include	Transparent/ descriptive of both positive and negative social, economic and environmental interactions	This will depend on the stage of the cultivation operations and the regulatory framework. However, early and ongoing quality information provision is linked with social acceptability.	Procedural fairness and trust.

6. Working towards Social License to Operate for seaweed cultivation

Negotiating SLO is not an easily definable process, nor is it guaranteed to result in positive outcomes for all parties. Details are likely to be particular to each industry and each community that are involved. For example, a community that has never seen or heard of seaweed cultivation might react differently to a community that is used the industry. Nevertheless, there are several key factors that have been identified that can help seaweed cultivators and communities work towards social license to operate;

- *Know your context* – decisions on the acceptability of seaweed cultivation are affected by a many local issues and characteristics, including: other users of the marine environment; local demography; local socio-economics [24]; and current environmental issues relating to aquaculture and other local industries.
- *Different scales of operations require different approaches* – the nature of smaller cultivation operations means that communities feel less threatened by the activity, find it easier to communicate issues when they arise, and consider this an organic relationship between community and company. Where activities are scaled up, it is necessary to build a formal engagement strategy to ensure quality communication and engagement that is considerate of the local context.
- *Public participation, transparency of actions and information* – communities and stakeholders require access to information about what operators are doing and why. This information needs to be provided in an easy to understand and timely manner [24], [45]. Further, there should be opportunity to debate this information and operators should seriously consider the feedback of local communities and stakeholders, and be willing to make changes where required.
- *Early, ongoing and quality communication* – is where industry makes an effort to start a relationship with local communities at the very start of the development process. Good quality communication that includes transparency around negative social and ecological interactions has been shown to lead to trust between host communities and industry and to grant legitimacy and credibility for the actions of the industry in the eyes of the community [21], [3], [13], [1].
- *SLO is built on relationships* – between individuals in the company and the community [24] [46]. Operations that are locally owned and have a workforce embedded in the local community (e.g. kids attending schools, workers joining local sports activities, and local festivals etc.) may find this easier. Operations that are larger scale may require specific allocation of resources to building these relationships, e.g. employing a local communications and engagement officer to be the main point of contact. When a relationship is functioning well, debates around acceptability are based on evidence about impacts and benefits, rather than the relationship itself [46]. The reverse also applies, when the community-industry relationship is not functioning well, debates focus on the characteristics of the people/ community/ companies (including actions, reputation, and personal beliefs) who are involved in the debate rather than discussion about the activity.

- *Trust and trustworthiness* – the individuals who are involved in building and maintaining relationships between the operators and the community, need to be viewed by each other as worthy of trust. This is linked with building relationships [25] and being consistent and fair in decision-making [15].
- *Fairness in decision-making procedures* – the way in which a company deals with issues related to its workers or the community, influences communities' levels of trust and therefore their likelihood to grant SLO. Interestingly, one study shows that communities do not require that the company always take their side – so long as the procedure for deciding not to give the community what it requested was transparent and fair [15].
- *Environmental and sustainability concerns are key issues for communities* – it must be possible to reconcile the activity with the community's own vision of sustainable development [24]. Where seaweed cultivation operations are perceived as threatening local ecology, they are much less likely to gain SLO. Providing key information on potential environmental impacts as well as improvements and mitigation strategies can help people decide whether the risks are acceptable or not. It can also reduce the credibility of misinformation by showing that both positive and negative sides of the operations have been considered and there is *"nothing to hide".*
- *Providing local benefits* – communities need to see equitably shared benefits as well as compensation for loss [24]. This can come in the form of local employment, community grant schemes, and voluntary stewardship of local areas. The spectrum of cost of these activities is a consideration for seaweed cultivators, however, a study has shown that cheap but more meaningful actions can contribute towards SLO (e.g. running beach cleans) [28].
- *Perceived legitimacy of operator and operations* – there needs to be a belief by local communities and interest groups that seaweed cultivation activities and their operators are desirable, proper, and appropriate for the area [47]. Key to this is balancing the scale of operations that will gain social license to operate with economic viability. Initial research from the GENIALG project suggests that this balance may be met by considering smaller scale farms, owned by the same company or separate small businesses as part of a cooperative, dispersed along the coastline.
- *External influences* – global economic, political and social trends can influence community and public perceptions. It is important for operators and communities alike to understand how these external influences might interact with social license to operate terms and conditions.

6.1 Community and stakeholder engagement

Community and stakeholder engagement and information provision has been studied extensively in the fields of governance and planning. This section presents some of the engagement tools that have been adopted (Figure 2) by companies and governments across Europe.

- *Statutory obligations* – in most European countries, there are statutory obligations within legal planning frameworks to consult with stakeholders. These obligations and commitments vary and it is important to check what the requirements in your area before deciding which tools are appropriate to adopt/ develop.
- *Identification of stakeholders* – ensure that a comprehensive stakeholder mapping exercise [48] is completed before starting engagement activities. This will prevent stakeholders being missed out of communications and reduce the likelihood of subsequent negative consequences. Where seaweed cultivation takes place in the marine environment, it is important to consider shore-based activities and include associated stakeholders as well.

- *Stakeholder and community engagement* – There are four standard levels of stakeholder and community engagement, each using different tools and methods, addressing different objectives and providing different outcomes (for example see Figure 2). In order to work towards SLO, as a bare minimum, it is recommended that seaweed cultivation organisations provide basic information on their activities/ projects to identified stakeholders. Where possible all stakeholder engagement should be recorded, as doing this can provide a good starting point for operator self-reflection and improvement, and may help with planning proposals, or discussions about expansion (e.g. having a list of concerns of communities can help improve decision-making). Appendix one provides more details on methods for stakeholder engagement.
- *Objectives of engagement* – Each engagement type and/or event should have a specific objective, as the tools and methods used may vary. For example, if the objective is to understand stakeholder views of a proposal for a new seaweed farm, then the methods would include information provision and consultation activities. If the objective is to develop a social enterprise, then engagement could include empowering methods.
- *Responding* – Providing timely, tailored and coherent responses to requests, queries and questions, can increase trust in operators and companies. Mechanisms to facilitate this include providing an access point for people to submit their queries. This could, for example, be a free phone line (perhaps more appropriate for larger companies) or a monitored email address.

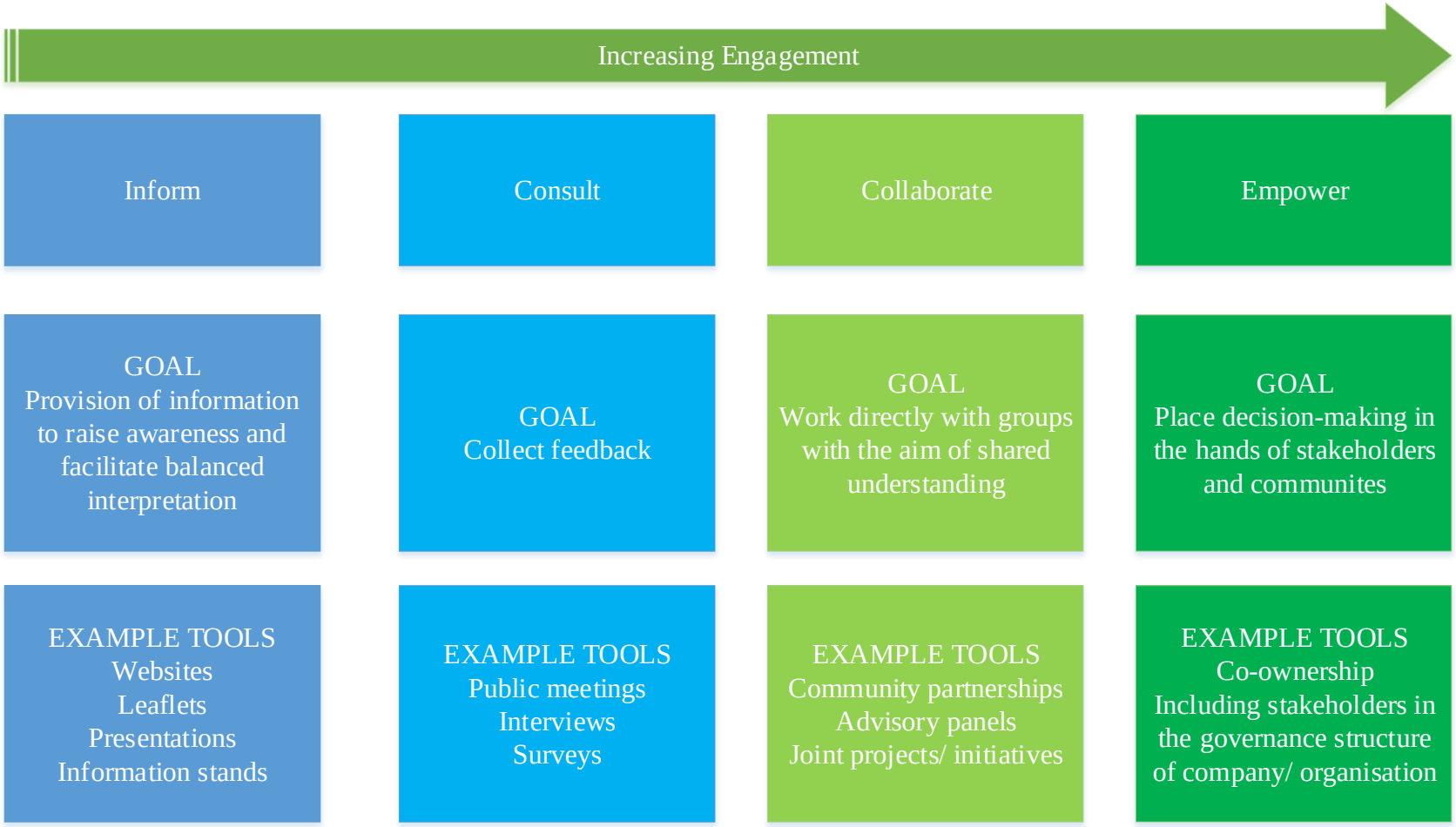

***Figure 2**. Types of engagement according to goals and with provision of some example of how they can be carried out.*

7. Limitations of this handbook

Although we feel that the studies reported on in this handbook are robust, it does contain limitations that we feel readers should be aware of, briefly described below:

- The sensitive nature of the commercial position of some of the seaweed cultivation organisations meant that some of the interviews were short. This could represent a skew in the data, towards those who were more open and willing to speak about their views on social license.
- Interviews with community organisations and associations were only conducted with those willing to speak with us. Although this provides robust information on the topics that are being discussed locally between these stakeholders, regulators and cultivation companies, it does however, mean that findings may not be fully representative of the general population.
- Future research should include more community perspectives, especially focussing on the motivations and drivers of individuals and eNGOs who shape and influence perceptions of seaweed cultivations.

8. Other useful resources

Resource	**Access**
Seaweed cultivation best practice guidelines: Deliverable D6.9 EU H2020 GENIALG Project	Open Access, likely publication date 2021
MacroFuels Project Policy Brief for Future sustainable seaweed industries in Europe – Social and regional aspects	Open Access: https://www.macrofuels.eu/deliverables-1
PEGASUS – Phycomorph European Guidelines for a Sustainable Aquaculture of Seaweeds	Open Access: https://www.phycomorph.org/pegasus-phycomorph-european-guidelines-for-a-sustainable-aquaculture-of-seaweeds
medAID – Assessment of Mediterranean aquaculture sustainability, section 7.3: Analysis of perceptions relating to the social acceptability of aquaculture	Open Access: http://www.medaid-h2020.eu/index.php/deliverables/

9. Acknowledgements

The authors would like to thank Dr Phil Kerrison for his review of this article, SAMS seaweed team for their guidance on seaweed biology, and above all, to the participants of the studies, for giving their time and expertise freely.

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Appendices

Appendix 1. Suggested content / format for engagement methods.

Informing methods	Suggested content/ format	Record example
Website	General information on the project including timescales, locations, and understandable technological and environmental information, and advertisements of opportunities for engagement (e.g. public meetings/ exhibitions)	Number of 'hits'
Information leaflets	General information on the project and opportunities for engagement (e.g. public meetings / exhibitions)	N/A
Presentations / Information Stands	Visual representations of the development and general information on timescales, locations, and technology	Number of visitors Number of conversations held
Newsletter	Updates on the development and upcoming opportunities for engagement.	Responses / comments resulting from the newsletter
Press releases	Updates on the development and upcoming opportunities for engagement. This is of particular importance for empowerment and consultation activities within remote regions.	Responses / comments resulting from the press release

Consulting methods	Suggested content/ format	Record example
Public Exhibitions	Visual information panels Promote conversation, discussions and questioning	Number of visitors Number of conversations
Questionnaires and Surveys	Data collection for a specific question. Can be combined with public exhibitions and meetings.	Number of respondents Content of responses (depending on questions)
One-to-one meetings	Meetings specifically designed to address a particular challenge.	Content of response Action taken because of response
Public meetings and hearings	Visual information through presentations – non-technical and to the point. Q&A session where the public	Number of attendees Content of the Q&A

	can voice ask their questions as well as voice concerns. Provide feedback of where decisions have changed due to community input. Can be facilitated by a third party, or a community council, for example.	
Request for written comments	Planning process and during public meetings / exhibitions	Content of responses Number of responses
Interviews and focus groups (about community benefits)	Targeting specific communities to hear their views on community benefits packages. Facilitated locally.	Content of responses Actions required

Collaborating methods	Suggested content/ format	Record example
Community partnerships	Identify appropriate stakeholders for a community partnership. Provide information and objectives of the partnership so that expectations can be managed and met. Facilitate discussion around community benefits schemes.	Meeting minutes Actions and outcomes Community benefit schemes Successes and challenges
Joint stakeholder initiatives	Bringing together interested parties for a specific purpose. Includes measures for accountability such as published meeting minutes and actions.	Meeting minutes Actions and outcomes Changes made due to initiative
Project advisory panels	A selection of relevant individuals who are able to advise on certain aspects of the project – such as fisheries interactions or ancillary infrastructure planning.	Meeting minutes Actions and outcomes Changes made due to initiative
Community benefits advisory panels	A selection of relevant individuals who are able to advise on proportionate and appropriate community benefit packages.	Meeting minutes Actions and outcomes Development of community benefits packages

Empowering methods	Suggested content/ format	Record example
Co-ownership	Community share options can offer a formalized way for stakeholders and individuals to own part of a company	Normally facilitated through a community share option scheme
Including stakeholders in governance structure of company/ organisation	Including members of stakeholder groups or local communities as Trustees, Board Members or advisors to the Board.	Meeting minutes

Responding methods	Suggested content/ format	Record example
Free phone line	Suggest availability during consultation and commissioning phases to ensure the full spectrum of community voices can be heard.	Number of calls Content of calls
Monitored email address	Timely responses to inquiries providing tailored and relevant information	Number of emails Content of the emails Response rates Time taken to respond

Appendix 2. Methods and results of the studies on SLO for seaweed cultivation within the H2020 GENIALG project

- *Approach:* A constructivist qualitative and case study approach was taken to these studies, as the research questions related to how, why, and who rather than what and how many. The nascent nature of the seaweed cultivation industry in Europe, and the current lack of literature related to SLO for the sector was also a determining factor in taking these exploratory approaches.
- *Case studies* number of interviewees: total *n=31*, France *n=14*, Scotland *n=17*. Representation covered: cultivation organisations (*n=6*), potential cultivation organisations (*n=2*), eNGO (*n=1*), community organisations (*n=6*), regulators (*n=2*), science and research (*n=4*), politicians (*n=1*), supply-chain (*n=3*).
- *Producer survey and interviews* (*n=10*): A list of producer organisations was compiled in consultation with the GENIALG consortium and internet searches. A total of 25 producer organisations were contacted with an initial introduction to the project and request for filling out a survey. In *n=5* cases, organisations stated that they would prefer to talk rather than fill out the survey, hence the use of both methodologies.
- *A Q-method study* was also conducted in Scotland. Q-method is a way to study the subjectivities of human opinion and behaviour in a quantitative manner. This was largely a methodological experiment in testing whether social license to operate can be quantitatively related to the four pillars of sustainability; social, economic, environmental and institutional. More information of the Q-method approach can be found here: *Watts, S., & Stenner, P. (2012). Doing Q methodological Research: Theory, Method and Interpretation. London: Sage Publications* and here https://qmethod.org/.

  For the Q-method study three stakeholder workshops were held in Scotland (November 2017, November 2018, February 2020), with total attendance *n=200+*. Observations of these workshops and Scottish industry conferences over these three years shows a significant increase in attendance, the number and type of organisations and representatives interested in seaweed cultivation. The first workshop in 2017, for example had only 30 attendees, by 2020, it was over 100. Likewise, the first workshop largely included seaweed harvesters, small-scale fishers and only two cultivation organisations.

The 2020 workshop was attended by large aquaculture firms, investment managers, government and insurance brokers.

- *Peer-reviewed papers:* Two papers have been submitted to peer-review journals and are under review. The first is (currently) titled: *Commercial seaweed cultivation in Scotland and the social pillar of sustainability: A Q method approach to characterising key stakeholder perspectives,* and the second is (currently) titled: *Is social license relevant for seaweed cultivation in Europe?*

Appendix 3. Coding report from interviews (France, Scotland, and Producers) – comprises the headings as overarching themes of the interviews, with the subthemes beneath each theme. Overarching themes = 3, total subthemes = 79, theme 1 subthemes = 31, theme 2 subthemes = 29, theme 3 subthemes = 19. Here, it is important to note that the number of subthemes a theme has is not representative of its importance, rather the content of the theme shows its importance and relevance to social license to operate for seaweed cultivation.

Theme 1: Gauges for acceptability	**Theme 2: Evidence, collaboration and decision-making**	**Theme 3: Finance, policy and regulation**
Agricultural issues are projected onto seaweed cultivation	Actors use tactics to delay decisions	Seaweed cultivation is a complex industry
Being local and present	Basis of acceptability is opinion rather than fact	Shellfish cultivators moving into seaweed cultivation
Big companies and large-scale farms are not accepted	Co-construction and shared decision-making	Representation of maritime activities
Competition for space	Collaboration	Shellfish farming is risky financially
Conflict with other marine users	Co-location and diversification	Cost of legal fees
Cultivation is new, harvesting is historic	Combining seaweed harvesting and cultivation	Regulations not followed
Cultivations is more environmentally friendly than other activities	Communication	Relationship between regulators and developers not professional
Environmental concerns	Communication should be done by professionals	Scientific agency not trusted
External companies replacing existing uses	Consistency of opposition but not of arguments	Small number of individuals influencing decisions
Fear of loss of space and use of treatments	Consultation and negotiation is essential	Belief that rules are followed is essential
Fear of privatisation of marine space	Decisions based on local measures of equity	Follow environmental regulations
Fear that seaweed competes with phytoplankton and oxygen	Decisions made on local level	Incorporating local knowledge
Harvesting has environmental impacts (S)	Developer not knowledgeable about their own activities	Interface between industry and government

Harvesting is more acceptable than cultivation (F)	Difficult to communicate with developers	Biosecurity
Lack of transparency	Difficult to communicate with opposition eNGOs	Certification
Local jobs	Education around seaweed cultivations is necessary but difficult	Consultation and consenting processes are detrimental
Natural resistance to change	EIAs conducted by developers are viewed with suspicion	Cultivators must follow the rules
NIMBY view	eNGOs skilled in ecological and legal arguments	Environmental designations are not seen as a barrier
Opposition movements viewed as blocks to progression	Facilitation of science, professional and civil society discussions	Issues around participatory democracy
Primary production is no longer dominant in coastal areas	Feeling ignored	
Providing enough information	Hype around cultivation which is not possible in practice	
Providing environmental benefits	Individual discussion are fruitful, collective discussions are not	
Sabotage of sites	Lack of environmental knowledge results in developments being rejected	
Slow development	Managing marine space and interactions with other users	
Small-scale farms are acceptable	Not enough science being done on cultivation	
Social demographics affect acceptability	Positive messages in the press	
Social enterprise	Science-community interactions	
Social media negative influence	Science-industry communication	
Starting new industry from scratch is difficult	Success requires political backing	
Willingness to adjust the project to suit local needs		

Cultivation too small-scale to see social issues yet (S)		