



PROTECT THE FUTURE OF THE EEL:

To what extent is the Sustainable Eel Standard effective for the recovery of the most endangered marine organism in Europe?

Margreet van Vilsteren

May 2022

Academic Consultancy Training

Deze rapport is opgesteld binnen het project 'Een toekomst voor de paling: Kennisplatform Aal II', mede mogelijk gemaakt door de Europese Unie via het Europees Fonds voor Maritieme Zaken Visserij (EFMZV).



Commissioner

Good Fish

Authors

This report (product) is produced by students of Wageningen University as part of their MSc programme. It is not an official publication of Wageningen University or Wageningen UR and the content herein does not represent any formal position or representation by Wageningen University.

Cover page image:

Import, F. (2021, May 19). Eel from A to Z: 26 things to know about eels. Finedininglovers. Retrieved 22 March 2022, from <https://www.finedininglovers.com/article/eel-z-26-things-know-about-eels>

Abstract

Given the declining trend of the European eel (*Anguilla anguilla*), the Sustainable Eel Group (SEG) launched its own privately governed label, the SEG Standard, that aims to improve traceability and reduce illegal activity to contribute to eel recovery. However, for a standard-setting organization such as SEG and its associated standard to be viable, it must be considered legitimate. In this paper we assessed the legitimacy of the SEG and its Standard by analyzing its potential effects on the socio-ecological system, assessing its compliance with ISEAL requirements and by analyzing its current governance arrangement. Different methods were used, such as an interaction web (for the socio-ecological system), a gap analysis (for ISEAL Code Compliance) and a Policy Arrangement Approach. The SEG Standard affects the socio-ecological system via, for example, restocking and reducing illegal fishing. However, due to the complexity of the system it is difficult to make predictions of future impacts of the standard on the eel population. SEG is currently an ISEAL Community Member and aspires to reach ISEAL Code Compliance within twelve to eighteen months. However, on average, ISEAL Community Members take about three years to reach code compliance after applying for it. SEG governance appears transparent, but risks to impartiality could arise due to the influence of the commercial sector in SEG's Board. This blurs the transparency of SEG's decision-making and creates instability in the governance arrangement due to reduced stakeholder involvement. To conclude, the gap analysis against the ISEAL Codes of Good Practice showed that about half of the requirements were being met. We also provide recommendations for SEG to enhance their legitimacy and to Good Fish regarding the SEG Standard's legitimacy. Finally, we suggest that SEG and Good Fish should find common ground for collaboration within the policy domain of eel management.

Keywords: Sustainable Eel Group, Legitimacy, Policy Arrangement Approach, European eel (*Anguilla anguilla*)

Table of Contents

1. Introduction	6
1.1 European eel	6
1.2 Decline.....	7
1.3 Legislation & Eel management plans	7
1.4 (Sustainable Eel Group) SEG Standard and Legitimacy	8
1.5 Problem statement & Good Fish introduction	8
2. Research questions	9
3. Stakeholders.....	10
4. Data Sources and methods	11
4.1 Data sources.....	11
4.2 Methods	11
4.2.1 Modelling the socio-ecological system.....	11
4.2.2 ISEAL gap analysis	11
4.3.3 Policy arrangement approach.....	12
4.4 Ethical concerns	12
5. Results: Socio-ecological system.....	12
5.1 Description	12
5.2 Components and interactions.....	13
5.3 Feedback loops and takeaways	16
6. Results: ISEAL gap analysis.....	17
6.1 ISEAL background.....	17
6.2 Gap analysis against Community Member requirements	18
6.3 Gap analysis against Code Compliance.....	18
6.3.1 Gaps against ISEAL's Standard setting code	18
6.3.2 Gaps against ISEAL's Assurance code	19
6.3.3 Gaps against ISEAL's Impacts code	21
6.4 Takeaways.....	24
7. Results: Policy Arrangement Approach	25
7.1 SEG organizational governance	26
7.2 Policy Arrangement Approach	27
7.2.1 Actors and coalitions.....	27

7.2.2 Resources and power.....	29
7.2.3 Discourses	30
7.2.4 Rules of the game	31
7.3 Takeaways.....	33
8. Discussion.....	34
8.1 Input legitimacy	35
8.2 Throughput legitimacy	36
8.3 Output legitimacy	37
8.4 Observations and limitations	39
9. Conclusion and recommendations	39
References	40
Appendices.....	45
Appendix 1: Long-list stakeholders.....	45
Appendix 2: Stakeholder interviews	46
Appendix 3: ISEAL Community member requirements	47
Appendix 4: Contact information	48

1. Introduction

1.1 European eel

Currently, there is a global trend of declining fishery biomass within the populations of commercially exploited fish species, compared to the levels in the mid-20th century (Palomares et al., 2020). This decline has been largely attributed to fishing pressure and has been reflected in a decline in global fish catches (Pauly et al., 2002; Pauly & Zeller, 2016). Fish comprise a large percentage of the global diet and their continued availability is crucial for ensuring food security as 59 million people rely on fisheries and aquaculture for their livelihoods and food intake (FAO, 2018). Additionally, fish comprises at least 20% of protein intakes for 3.2 billion people (FAO, 2018). Therefore, it is essential that the declines of fishery biomass are understood and counteracted to preserve biodiversity, economic growth, and food security at the global scale.

Of the hundreds of impacted fish species, a species of international interest is the European eel (*Anguilla anguilla*). The European eel is a catadromous species, meaning that it spends its life in freshwater ecosystems such as rivers and lagoons and returns to saltwater to spawn, and is panmictic within the European continent, meaning it exists as one large population. During their approximately 15-year lifespan, European eels are born as leptocephali larvae in the Sargasso Sea (IUCN, 2014) (Figure 1). Eels spend approximately two years in the larval stage during which time they are transported by the Gulf Stream towards the European coast (Bonhommeau et al., 2008; Zenimoto et al., 2011). At the point where they enter the brackish coastal waters, the larvae have grown into glass eels (IUCN, 2014). Following this stage comes the yellow eel stage which is the primary growth phase. The final stage of their lifecycle is the silver eel in which they begin their migration back to the Sargasso Sea, which is estimated to take half a year, and where they likely die after spawning (IUCN, 2014).

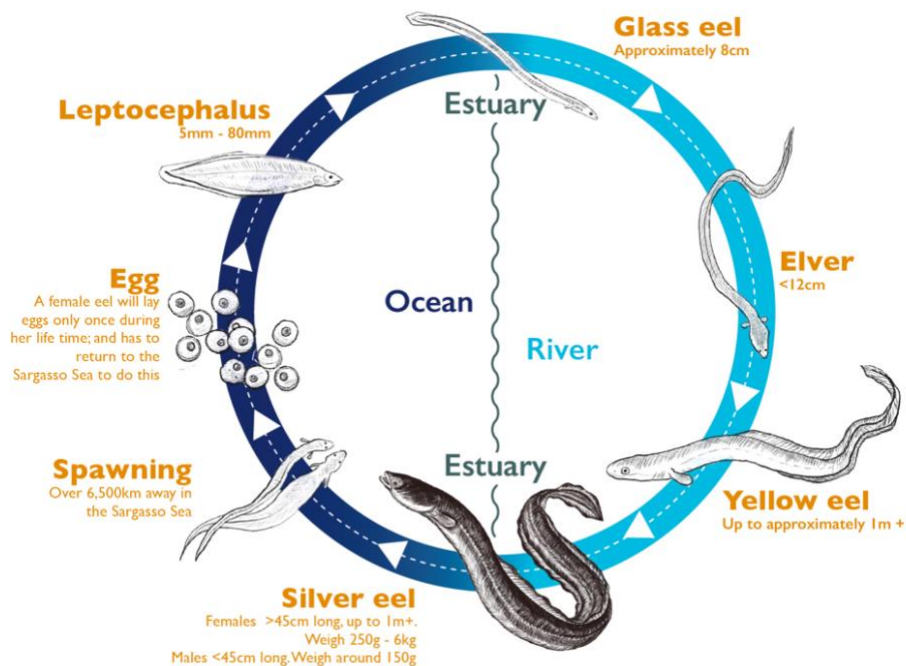


Figure 1: The lifecycle of the European eel and its marine and aquatic divisions (Thames Rivers Trust, 2021).

1.2 Decline

The European eel has seen a decline of 98% in its population since the 1980s and has been labelled as critically endangered by the International Union for Conservation of Nature (IUCN) since 2008 in addition to being added to Appendix II of the Convention on International Trade in Endangered Species (CITES) in 2011 (Sonne et al., 2021). Described drivers of this steep stock decline include reduced survival rates of larvae due to Gulf Stream shifts, habitat and water quality degradation, waterway barriers, disease and parasites, and pollution (Feunteun 2002; Harper, 2022; Magnusson & Dekker, 2020; Pike et al., 2020). After excluding the major difficulties put forth by the life-history traits of the species, fisheries themselves and the associated consumer demand are contributing heavily to diminishing the European stock (Dekker, 2019; van den Thillart, 2013). In addition to legal fishing pressure, there is the issue of harmful fishing practices such as poaching, unreported fishing, the use of harmful fishing gear, and illegal trading.

According to the International Council for the Exploration of the Sea (ICES) report of 2021, the current level of recruitment for all life stages of the eel remains low and overall catches have declined since the 1900s (ICES WGEEL, 2021). The recruitment of glass eels has declined approximately 90% since the 1980s throughout Europe and was estimated to be only 0.6% in 2021 in the “North Sea” area (Norway, Sweden, Denmark, Germany, Netherlands, and Belgium) and 4.5% in the “Elsewhere Europe” area (United Kingdom, Ireland, France, Italy, Portugal, and Spain) compared to the 1960-1979 average (ICES, 2021; ICES WGEEL, 2021) (Figure 2). The overall catch of glass eels has decreased from 2000 tons in 1980 to an average of 59 tons between 2015-2019 in commercial fisheries (ICES WGEEL, 2021). For yellow eels, the recruitment was 16% in 2020 compared to the 1960-1979 average (ICES, 2021). Both the populations of yellow and silver eels have decreased more than 50% over 45 years and their cumulative landings decreased from 18000-20000 tons in the 1950s to an average of 3273 tons between 2015-2019 in commercial fisheries (IUCN, 2014; ICES WGEEL, 2021). Based on these declines and the low recruitment, ICES advised zero catches in 2022, including those related to restocking and aquaculture (ICES, 2021).

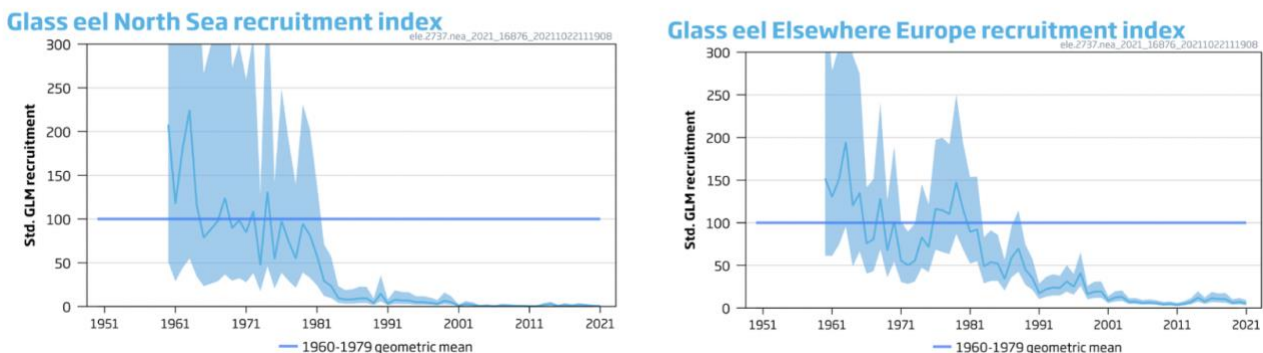


Figure 2: Glass recruitment indices estimates for the “North Sea” and “Elsewhere Europe” areas. Values are scaled against the 1960-1979 geometric mean (ICES, 2021).

1.3 Legislation & eel management plans

To address the concerning decline of the European eel, the government of the European Union implemented the Eel Regulation Plan in 2007, among other measures. However, as the eel population has not recovered, it appears that these measures and regulations have been relatively unsuccessful. Although there has been a small decrease in anthropogenic mortality between 2008-2016 because of the Eel Management Plans (EMPs) implemented by the EU, it is not large enough to remove the eel from its critically endangered species status (Pike et al., 2020; van de Wolfshaar et al., 2015). Furthermore, in 2013,

the ICES Workshop on Evaluation Progress Eel Management Plan assessed the EMPs and of the 81 plans, only 17 were meeting the biomass targets while 42 were not and 22 failed to report data (ICES WKEPEMP, 2013). Up until now, management strategies have not been significantly successful in turning the tide for the eel and it remains at risk of further collapse (Sonne et al., 2021).

1.4 Sustainable Eel Group and legitimacy

To promote recovery, either changes to legislation or supplementary measures must be considered. The Sustainable Eel Group (SEG) was formed in 2009 and launched a revised version of its privately governed label, the SEG Standard, in 2018 that aims to improve traceability and reduce illegal activity (SEG, 2021). The goal of SEG is to establish a healthy eel population, healthy aquatic ecosystems, and promote sustainability in the eel sector (SEG, n.d.-a). They also aim to reach ISEAL Code Compliance for the SEG Standard. ISEAL, which initially was an acronym for International Social and Environmental Accreditation and Labelling, is a global, non-governmental organization for credible sustainability standards (Loconto & Fouilleux, 2013). In November 2020, ISEAL recognized SEG as a Community Member, which reflects a commitment to improvement to achieve full ISEAL Code Compliance. However, for a standard-setting organization such as SEG and its associated standard to be viable, it must be considered legitimate. This is consistent with a global trend in environmental governance and with developments in the sustainable seafood movement for e.g., MSC, ASC, Seafood Watch (Cashore, 2002; Roheim et al., 2018). Hence, the legitimacy of SEG and its standard must first be assessed.

For legitimacy to be upheld, governance actors, arrangements, and policy instruments all need to be seen as legitimate or credible, fit for the job, and able to deliver results by those who are implicated (Toonen, 2022). However, legitimization of state actors is more anchored (e.g., electoral democracy, institutions like parliament, ministries) than that of non-state actors. To assess the legitimacy of actors, in this case a non-state actor, SEG, the concept of legitimacy can be broken down into 3 components: input, throughput, and output legitimacy. According to Fuchs et al. (2011):

Input legitimacy refers to the criterion of participation, while throughput legitimacy tends to be interpreted as combining aspects of transparency, responsiveness, and fairness of the procedures of a governance institution. The concept of output legitimacy comes from the notion that legitimacy can arise from the ability to provide results rather than from the existence of participatory norms and procedures or the presence of checks and balances (p. 359)

In simpler terms, input legitimacy focuses on representation; it includes the extent to which stakeholders are engaged in the process and are involved in the decision-making process. Throughput legitimacy focuses on quality and transparency; it includes fairness in procedures, accessibility, and accountability. The fairness of procedures includes the degree to which certain stakeholders can influence the process, accessibility refers to how public and open information is, and accountability refers to independent controls and checks on a process. Output legitimacy focuses on delivery of what was agreed; it includes coverage and efficacy. Coverage refers to the stakeholders bound by rules and efficacy refers to the extent that the rules are relevant to solving the issue at hand (Carballo Cárdenas, 2021; Mena & Palazzo, 2012).

1.5 Problem statement & Good Fish introduction

The current legislation and measures in place remain unsuccessful at promoting recovery of the European eel. Organizations such as SEG seek to establish a healthy and sustainable eel population and promote a certification scheme to contribute to this goal. However, the legitimacy of the standard must first be

assessed, including SEG governance, the gaps versus ISEAL Codes of Good Practice, and the potential effects on the socio-ecological system.

Good Fish is an NGO and the owner of the Fish Guide (VISwijzer). The long-term goal of Good Fish is to have sustainable fish by 2030 and to create awareness to provide consumers with the choice to eat sustainably (Good Fish, n.d.). Good Fish aims to see a future in which the eel is no longer a critically endangered species and is interested in the potential contribution of the SEG Standard to the eel's recovery. As Good Fish aims to create more awareness and ensure a sustainable future for the eel sector, it is essential that they gain insights into the impacts of the SEG Standard regarding the recovery of the eel population.

Therefore, Good Fish commissioned this project to determine to what extent the SEG Standard can aid in the recovery of the European eel by assessing its legitimacy.

2. Research questions

During this project, the problem statement was addressed by answering the following main research question:

To what extent does the SEG Standard have legitimacy in aiding the recovery of the European eel?

This main research question was broken down into 3 sub questions:

1. What are the potential effects of the SEG Standard on the socio-ecological system?
2. To what extent is the SEG Standard already compliant with ISEAL requirements and what are the gaps, if any?
3. What are the current governance arrangements around the SEG Standard?

3. Stakeholders

There are numerous organizations and individuals involved with the eel issue in Europe with varying levels of interest and power in influencing the policies and actions surrounding it. This report considers the most important stakeholders presented in this section (short-list) and includes a more comprehensive list (long-list) in Appendix 1. The short-list of stakeholders considered are:

Good Fish: Good Fish, the commissioner of this project, has great interest in this project and its outcomes. They have the power to influence the retailers in the Netherlands through the Fish Guide and through forming coalitions with other NGOs.

SEG: The Sustainable Eel Group is a conservation organization with the aim of aiding eel recovery. In 2020, SEG published their vision on the status of the European eel stock and suggested solutions for the population recovery (SEG, 2021). They have great interest in the eel topic and seem have sufficient resources and funding to affect the eel sector.

European Commission: They act as an executive body of the EU and represent the EU in the international field. They are responsible for legislative activities such as creating proposals, budget management, and EU law enforcement. They play a big role in tackling the eel issue and they have the power to influence European countries or to give directives to them.

DUPAN: Duurzame Palingsector Nederland is a foundation with partner bodies with the aim of promoting activities that will contribute to the recovery and the conservation of the eels in the Netherlands. They are also part of the Eel Stewardship Fund (ESF) (DUPAN, n.d.). They represent Dutch eel fishers, breeders, and traders. They have high interest in the field and high power in terms of funding and in terms of influencing the decision-making process. They have influence over their members and the commercial sector.

ESA: The Eel Stewardship Association is an administrative organization and founder of the ESF. ESA was established in 2015 by Dutch industry organizations with the goal to ensure a sustainable use of the eel stock (ESA, n.d.). ESA has great interest in the eel sector and enough power and funds to influence and promote changes.

ISEAL: They provide membership and partnership to sustainability standard organizations. Their mission is to improve the impact of ambitious sustainability systems to accelerate innovative change (ISEAL, n.d.-c). In their work, they define credible practice for sustainability systems, and they are involved because SEG is attempting to achieve ISEAL Code Compliance for the SEG Standard. ISEAL has low power to influence the decision-making process and low interest in general, but they are a key stakeholder for the SEG Standard.

FishSec: The Fisheries Secretariat (FishSec) is a politically independent non-profit organization with the aim of the protection and restoration of marine ecosystem services, with a particular focus on fisheries. FishSec has high interest and low power to influence the decision-making process (FishSec, 2022).

4. Data sources and methods

4.1 Data sources

To answer the research questions, a variety of data sources were used, and various methods were implemented during this study. Each of the three sub questions contributed to assessing the legitimacy of SEG's current governance: the potential effects of the SEG Standard on the socio-ecological system served as an indicator of output legitimacy, the ISEAL gap analysis served as an indicator of all three forms of legitimacy, and the policy arrangement approach (PAA) served as an indicator of input and throughput legitimacy.

Data was collected through a literature study and from interviews. A literature desk study was conducted for the socio-ecological system and the PAA methods. In addition to literature and reports, websites of stakeholders (e.g., SEG, ESA) were important supplements. Interviews were conducted with seven key stakeholders to compliment the methods in this study (Appendix 2). Only one stakeholder from the commercial sector was interviewed as other parties (e.g., DUPAN) declined a request for an interview or did not respond. All interviews were conducted through Microsoft Teams and took approximately one hour each. Questions were pre-determined based on the interviewee and their relevance to each study topic to gain targeted information. Recordings were made (with permission of the interviewee) and used to transcribe the interview afterwards. Interviewees were provided with the completed transcript and provided the opportunity to make corrections, if needed. Additionally, a consent form was supplied to gain consent on usage of the received information. Within this document the interviewee was also given the choice to remain anonymous.

4.2 Methods

4.2.1 Modelling the socio-ecological system

To predict the potential effects of the SEG Standard and its potential ISEAL Code Compliance, the socio-ecological system surrounding the European eel was modelled using an interaction web. The use of an interaction web allowed us to identify a broad range of factors that both directly and indirectly affect the eel population and make better sense of a complex system. A socio-ecological system consists of ecological components, social and economic components, and the links and effects between the components. By taking the SEG Standard as a function that changes the socio-economic system, the effect on the ecological system could be predicted. The impacts of implementing the SEG Standard could not be directly assessed as it takes many years for a policy to reflect on a species, especially in the case of eels with their long life-histories. Therefore, the modelling system was clearly defined and limited and is discussed further in section 5. The potential ecological effects of implementing the Standard were determined based on the goals of the certification schemes and from a literature study. The potential socio-economic effects were predicted from a literature study and supplemented with information from interviews with stakeholders.

4.2.2 ISEAL gap analysis

To understand how close the SEG Standard is to being ISEAL Code Compliant, a gap analysis was performed. The analysis had two components: 1) determine to what extent the SEG Standard is already compliant with ISEAL Codes of Good Practice and 2) if gaps do exist, what are they and how long will they take to correct. The documents related to SEG Standard and ISEAL requirements were analyzed to compare the two policies and identify any shortcomings. To aid in this process, interviews were conducted with key stakeholders to gain further insights.

4.3.3 Policy arrangement approach

To assess the current governance around the SEG standard, within the policy domain of eel management, the PAA was used. The PAA had four components: 1) identifying the actors and possible coalitions; this made clear which stakeholders and organizations were connected to each other, 2) understanding the resources and power; this pertained to how resources were divided and which stakeholder held the most power and influence, 3) understanding policy discourses; this included the views and narratives of the actors and their potential coalitions, and 4) determining the rules of the game; this included both formal rules of interactions and also informal and unspoken rules (Liefferink, 2006). The governance of SEG was clarified using documents available on their website which detail their governance structure. Additionally, interviews were conducted with key individuals to understand different viewpoints on the SEG Standard and its governance.

4.4 Ethical concerns

The issue of the future of the European eel is sensitive due to the involvement of a variety of stakeholders with different interests and competing interests were clear while working on this project. The outcomes of this project could, for example, have implications for the fishery sector. For that reason, all stakeholders approached during this project were completely informed about the purpose and role of the team. The privacy of individuals and their statements was ensured to the best abilities when so requested. Furthermore, all members of the team acted independently from and do not represent the views of the commissioner, Good Fish. The creation of this report followed the rules and guidelines prescribed by Wageningen University for an ACT project. Research was conducted according to the principles stated in the Netherlands Code of Conduct for Research Integrity, such as providing consent forms to interviewees and anonymizing the data when requested by the participant.

5. Results: Socio-ecological system

5.1 Description

To understand the socio-ecological system surrounding the eel in Europe, an interaction web was created that consisted of the range of the European eel population (Figure 3). Several factors known to affect the eel were excluded from this study and are further outlined below: climate change, pollution, microplastics and disease (including pathogens, parasites, etc.). There is current evidence that climate change is leading to decreased productivity in subtropical oceanic gyres, which decreases the food sources for the larval stage of the eel and may hinder migration speeds of silver eels (Coates, 2021; Feunteun & Prouzet, 2020). Because climate change is a long-lasting and slow process, it was excluded from the interaction web as it does not integrate with the timescale of other processes. Studies on pollution have concluded that pollution is not a cause of significant mortality for the European eel except in isolated incidents (Feunteun, 2002). Of greater concern are persistent, sublethal levels of pollutants which may affect the physiology and migration of eels or results in egg or larval mortality (Feunteun & Prouzet, 2020; IUCN, 2014). However, no conclusive evidence yet exists regarding pollution and was therefore excluded from this study. Furthermore, to consider the impacts of pollution, it must be broken down into more specific types of pollutants (e.g., PCBs, POPs, PABs) and input sources, which was not feasible to study given the project duration. Similarly, the effect of microplastics was excluded as this has been identified as a new risk for larvae, but few studies have been conducted (Feunteun & Prouzet, 2020). Lastly, the effects of diseases, parasites, pathogens, etc., were not considered in this study due to the highly complex and differential roles that they play in eel mortality. Further, the factors that affect the role diseases play are difficult to identify and quantify.

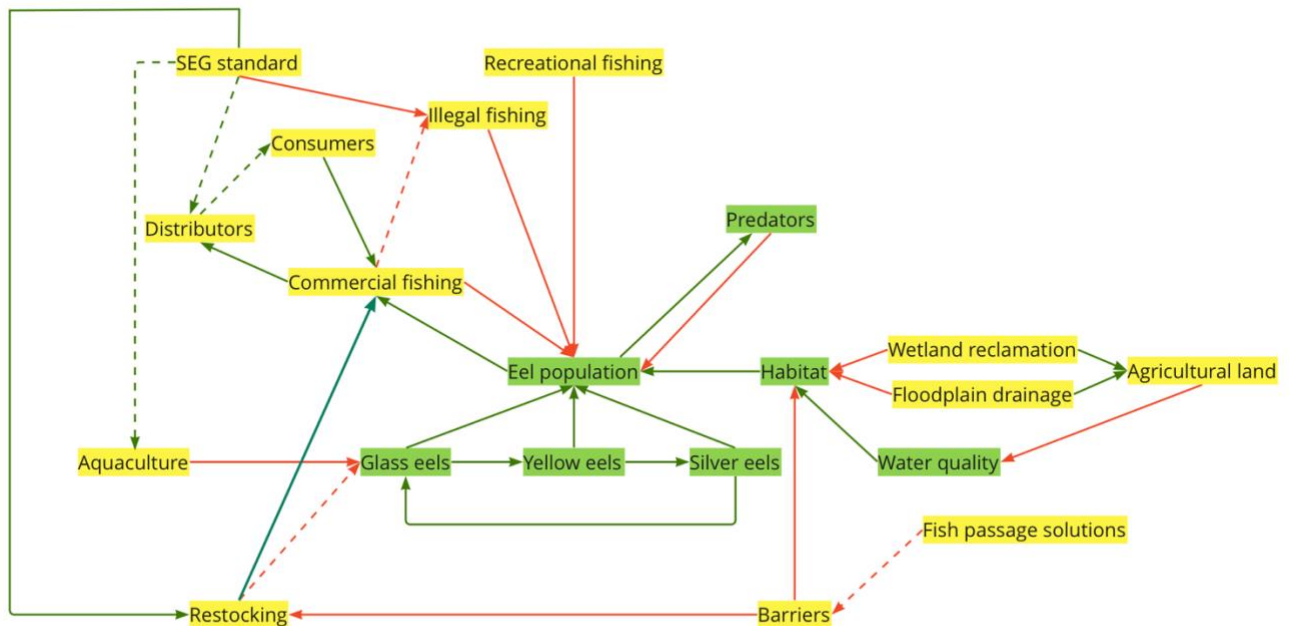


Figure 3: Interaction web of the socio-ecological system surrounding the European eel's European population. Yellow boxes represent socio-economic components and green boxes represent ecological components. Green arrows indicate a positive effect and red arrows a negative effect. Dashed arrows indicate that the effect of the relationship is unclear. An effect is positive if an increase in the starting element leads to an increase in the ending elements; the opposite holds for negative effects.

5.2 Components and interactions

The core of the interaction web is the European eel population, which can be broken down into three distinct life stages (excluding the marine larval stage): glass, yellow, and silver eels. Habitat loss, degradation, and fragmentation negatively impact the eel population as it directly reduces the amount of space available to them. The loss of habitat occurs mainly through wetland reclamation in coastal or estuarine environments or through the draining of floodplains (Feunteun, 2002). The aquatic habitat of the eel can be improved if water quality increases, but this may be negatively affected by runoff from agricultural land. Europe has lost 50-90% of its wetland habitats in the last 100 years and habitat restoration rarely occurs although it is likely one of the best ways to restore the inland eel stock (Coates, 2021; Feunteun, 2002). The major barrier to restoring habitat is a lack of legislation, as it should be implemented at the EU level instead of the national level and requires reclaiming land that often belongs to the agricultural sector which opposes these measures and brings into question financial compensation and the issue of ensuring food security in the process (Coates, 2021; Feunteun, 2002; P. Brotherton, personal communication, April 5, 2022).

In addition to habitat loss, barriers directly negatively impact the eel population. Barriers include objects such as dams, pumping stations, and flood defense structures that are placed in a river and block eels from continuing through the river. The barriers are especially problematic for silver eels migrating back to the Sargasso Sea as barriers may prevent them from reaching the ocean. There are two potential solutions to mitigating this risk: removing barriers or using fish passage solutions. In Europe, the Adaptive

Management of Barriers in European Rivers (AMBER) has already identified 630,000 barriers that block waterways and there are likely more, but many of these barriers are derelict; their original purpose has been abandoned but the structures remain in place (AMBER, n.d.). The organization Dam Removal Europe is currently working to remove barriers, both functional and derelict ones, together with the help of NGOs, such as Wetlands International and RAVON, to both raise awareness and promote legislation to help mitigate the barrier issue. Regarding the Netherlands, RAVON investigated the entire water system and revealed that 40% of Dutch waters are inaccessible to eels (Groen et al., 2021). Another potential solution for these barriers is the use of fish passage solutions, which may decrease the issue of barriers in rivers. However, this relationship is unclear as there have been limited studies into their effectiveness for eels (Tamario et al., 2018). The use of eel ramps was not found to improve the presence of eel in upstream areas in Sweden and technical fishways also may be ineffective as they are built for strong-swimming species such as salmonoids (Tamario et al., 2019). There are tentative conclusions that nature-like fishways may increase the success of eels found upstream, but future studies are needed to confirm this before specific conservation measures can be implemented (Tamario et al., 2019).

Based on the precautionary advice of ICES (2021), restocking practices have a negative impact on the (glass) eel population as glass eels must be removed from their location to be transferred elsewhere. However, the overall effect of restocking on the eel population is unclear as scientific studies have not concluded if it is effective in aiding long-term recovery. This is due in part to the numerous knowledge gaps on the biology of the eel, which makes it difficult to assess the effectiveness of restocking measures (Podda et al., 2021). Additionally, commercial fishing is still taking place in restocking areas. In this way, the glass eels, that were restocked to meet the escapement targets, will eventually be caught. Restocking thus positively affects commercial fishing (Moriarty & Dekker, 1997; van der Hammen, 2018). In the past, restocking in contained areas has been beneficial for local eel production and for local employment (Pedersen, 2000; Psuty & Draganik, 2008; Rosell et al., 2005; Wickström et al., 1996). However, today it is unclear to what extent restocking is appropriate for the recovery of the stock and beneficial when the issues of habitat loss, migration barriers, and commercial fishing in restocking areas remain problematic for the later life stages of the eel (Feunteun, 2002; P. Brotherton, personal communication, April 5, 2022). However, to reduce restocking may be very difficult as restocking is sometimes considered the only way European Member States may be able to achieve the required 40% escapement target, outlined in the current Eel Regulation Plan, and if changes to the legislation are not made, restocking might remain the only solution for certain countries to meet the silver eel escapement targets (Podda et al., 2021).

The European eel not only has an ecological function but has an important function in the socio-economic system. This species offers income for many fisheries and distributors, but also functions as fish for recreational fishing. In this regard, glass eel fishing has a leading role, with a yearly catch of 60 tons in recent years (SEG, 2018). These glass eels are caught for consumption and restocking (SEG, 2018). Additionally, yellow and silver eel are important for the commercial fishing sector, despite ICES' advice of zero catch (ICES, 2021). Both yellow and silver populations have decreased more than 50% over 45 years and their cumulative landings decreased from 18000-20000 tonnes in the 1950s to an average of 3273 tonnes between 2015-2019 in commercial fisheries (ICES WGEEL, 2021; IUCN, 2014). Recreational fishing also negatively impacts the eel population. As the wild eel stocks are very low, recreational fishing needs to be regulated (Beardmore et al., 2011).

To help the eel population recover and to support sustainable use for the benefit of local economies, the SEG Standard has been implemented. This will mainly affect eel trade between businesses. Approximately 75% of the glass eel sector (fishermen, farmers, producers, and retailers) is already SEG certified (SEG, 2021). Eel producers and retailers (distributors) that are SEG certified may differentiate themselves in the

market. When the SEG Standard is not only implemented in the glass eel sector, but also in the other sectors (yellow eel and silver eel), certification creates a difference between sustainably caught eel and unsustainably caught eel. This leads to a less elastic price demand for the certified product and reduced substitutability between certified and uncertified products. This implies that the certified product gains market share, while the market share of the non-certified product decreases (Roheim & Zhang, 2018). Therefore, further implementation of the SEG Standard may cause a structural shift in market shares of certified and uncertified eel. However, the effect of implementing the Standard is dependent on the procurement policies of the distributors.

The potential impact of implementation of the SEG Standard is that retailers in Europe may state in their procurement policies that they will only procure and hence sell European eel that is certified with the SEG Standard. This means that when a retailer is not certified, they cannot sell eel to other retailers that are certified with the standard, without the retailers in the value chain losing the standard. However, there are some exceptions in which uncertified eel is sold, examples of these are the selling of eel at marketplaces or in fish shops. These distributors don't mind selling uncertified eel as this is not illegal and the demand for eel in general will be the same. The supply of certified eel is therefore dependent on the incorporation of the Standard in the retailers' procurement policies (A. Kerr & D. Bunt, personal communication, April 6, 2022).

The effect of the SEG Standard on consumers' food choice remains unclear, as it is not certain if supermarkets will sell both certified and uncertified eel. When supermarkets only supply certified eel, the consumer will automatically pay for certification. Moreover, as the SEG Standard is a certification measure between businesses, the effects of the standard on consumers are indirect, via the distributors. The SEG standard will influence the ESF logo, which will have the subscript 'sustainable' underneath it when the businesses are SEG certified. In this way, the consumer can in theory see the traceability. Regarding the retail channel, traceability and legitimacy will be increased directly (NGO 2, personal communication, April 8, 2022). Another reason for unclear relationships between distributors and consumers is the demand for SEG certified eel. If the standard is ISEAL Code Compliant, the demand for certified eel might become higher, but it is very difficult to make predictions on this change in demand, as this is dependent on the willingness of the retailers to supply certified eel and on the willingness to pay of the consumer. Based on previous studies such as the MSC standard, consumers may prefer a certified product (in this case, SEG certified) over a non-certified one (Bronnmann & Hoffmann, 2018). This could have a benefit for eel fishers and producers that are certified (M. van Vilsteren, personal communication, April 6, 2022). Therefore, there is a positive relationship between consumers and the commercial fishing sector. Some eel fishers may choose not to sell SEG certified eel. This could be for various reasons, for example due to lack of financial means and community and traditional customs (Naranjo-Madrigal et al., 2015). This uncertified eel is eventually also bought by fish shops and markets. Considering this, the total demand for eel will likely stay the same (NGO 2, personal communication, April 8, 2022).

Maintaining eel fisheries, by the implementation of the SEG Standard, may reduce illegal (unreported) fishing practices. The increased traceability through the whole supply chain may lead to a reduction in illegal activities and by producers and retailers becoming SEG certified there is a reduction in the demand and supply of eels for illegal export activities (SEG, 2018). Therefore, there is a negative relationship between the SEG Standard and illegal fishing. Additionally, fishermen have more insights into illegal activities, and this could benefit the detection and controlling of illegal practices. There may also be a negative relationship between the commercial eel fishery and illegal fishing. It has been argued that keeping commercial fisheries open ensures that there is legal oversight and regulations in comparison to

closing them in which case there would be no more oversight and illegal activity would be easier and possibly increase (D. Bunt, personal communication, April 14, 2022).

The SEG Standard also has a positive effect on restocking. Currently, SEG estimates that only 40-50% of total glass eel catch in Europe goes towards restocking in comparison with the 60% value outlined in the current Eel Regulation plan. For companies to receive the SEG Standard, they must be able to provide documentation to prove that they comply with the 60% restocking rate. Therefore, increased certification of companies by SEG would lead to an increase in the restocking of glass eel. Additionally, the implementation of the SEG Standard will lead to a higher survival of glass eels being caught for restocking as certified companies must provide documentation to prove measures against glass eel mortality (Matondo et al., 2022). Fifteen years ago, the mortality rate of caught glass eels was 42%, while now this mortality rate has decreased to 5% (D. Bunt, personal communication, April 6, 2022). However, this positive effect of the SEG Standard on restocking does not imply that the SEG Standard also has a positive effect on the eel population. As stated earlier, it is unclear if restocking benefits the eel population.

The direct effect of the SEG Standard on the eel biomass produced by aquaculture is still unclear. The implementation of the standard will not increase the amount of eel farms, but it has a positive effect on the quality of eel aquaculture. The standard ensures that the aquaculture sector is efficient, responsible, and effective as possible. Only farms that achieve good values for mortality, food conversion, water quality and do restocking achieve the SEG Standard. Additionally, in aquaculture systems the survival of glass eels and the conversion of glass eels to adult eels is higher than that for glass eels in the wild (D. Bunt, personal communication, April 14, 2022). The abovementioned characteristics of SEG certified aquaculture thus have a positive effect on the conversion of glass eels to silver eels. Also, considering the low recruitment rates of eel, aquaculture might be an effective way to reduce the fishing pressure on wild glass eel stocks (Okamura et al., 2014).

In the interaction web, the direct influence of different parties (e.g., DUPAN, ISEAL, and Wetlands International) were not included as they are not quantifiable impacts. The SEG Standard, however, was included as it was incorporated as a measure of the companies certified and was therefore quantifiable. Good Fish could possibly also have indirect influence on the elements in the system. Good Fish can support distributors to choose for SEG certification or not. In addition, they could influence the consumer by recommending or discouraging the consumption of (certified) eel by the use of their Fish Guide.

5.3 Feedback loops and takeaways

To investigate the effect of changes in the system, we used feedback loops. In this way we analyzed the reactions on disturbances in the system. The socio-economic system consists of 1) key elements, 2) relations between interacting key elements, and 3) the effect of the key elements on each other. When an increase in the value (e.g., eel population, number of commercial fishers) of an element leads to an increase in a connected element, the sign is positive (+). If an increase in an element causes a decrease in the connected element, the sign is negative (-). Subsequently, we identified if the feedback loops were overall positive or negative by multiplying the plusses and minuses. Positive feedback loops have a reinforcing effect, while negative feedback loops are self-regulating and stabilizing (Downing et al., 2014).

There are two potential feedback loops in this modelled system (symbols in brackets refer to the unclear effects described above):

- 1) Eel population → + commercial fishing → + distributors → (+) consumers → + commercial fishing → - eel population
- 2) Eel population → + commercial fishing → + distributors → (+) consumers → + commercial fishing → (-) illegal fishing → - eel population

The first feedback loop is negative or stabilizing, regarding the eel population. An increase in the eel population may lead to an increase in commercial fishing (based on effort to catch ratio), followed by an increase in distributors, and a potential increase in consumers which is described in the above sections. If this potential increase holds, it would be followed by an increase in commercial fishing, which then has a negative effect on the eel population. The second feedback loop is a positive or reinforcing, regarding the eel population. This loop follows the same process as the first up until the commercial fishing. In this case, commercial fishing potentially causes a decrease in illegal fishing as described in the above sections. If this potential decrease occurs, the negative effect of illegal fishing on the eel population could be reduced.

6. Results: ISEAL gap analysis

6.1 ISEAL background

About six years ago, SEG started their journey of becoming a member of the ISEAL community. By joining the ISEAL community, SEG shows its commitment to continuous sustainable development and improvement of the SEG Standard. ISEAL, is a global, non-governmental organization for credible sustainability standards like the Marine and Aquaculture Stewardship Councils (MSC, ASC), FairTrade USA and MarinTrust. It is ISEAL's mission to strengthen sustainability standards to benefit both people and the environment. ISEAL pursues this goal by defining credibility principles and good practices for voluntary sustainability standards (Païement, 2016).

The framework for effective and credible sustainability standards is provided in the three ISEAL Codes of Good Practice, which are currently under revision (ISEAL Alliance, n.d.). These Codes of Good Practice are related to the development, structuring, and improvement of the standard (Standard-Setting Code), assessment of compliance with the standard (Assurance Code), and monitoring and evaluation of the impacts of the standard (Impacts Code). Besides providing the norms for standard setters, ISEAL also provides a learning platform to facilitate the exchange of knowledge and experiences between stakeholders involved in sustainability standard-setting (Païement, 2016). Though ISEAL emphasizes the credibility of sustainability standards, it does not automatically grant legitimacy. Legitimacy is gained through the process of adopting good and sustainable practices. As code requirements represent credible, good practices that support sustainable outcomes, code compliance does contribute to legitimacy. However, code requirements are only proxies used to measure good practices. Therefore, legitimacy is more about the intrinsic will of sustainability systems to adopt good procedural approaches and to put these into practice (Organization 1, personal communication, April 13, 2022).

Since November 2020, ISEAL has adopted a new membership structure to allow a wider range of sustainability systems to join the learning community. The ISEAL membership structure now has three categories. The first category is that of ISEAL Community member. Community Members are committed to continuous improvement of their standard, share experiences, build trust, and demonstrate transparency. Once an organization has been a Community Member for at least twelve months, it can

participate in ISEAL’s compliance program to become ISEAL Code Compliant. To reach the status of ISEAL Code Compliance, organizations must adhere to the normative requirements of ISEAL’s Codes of Good Practice. The compliance program allows for evaluations to be completed over a period of four years (Organization 1, personal communication, April 13, 2022) Lastly, an organization can be an ISEAL Accreditation Member. Accreditation Members adhere to ISO/IEC 17011:2017, which specifies requirements for competence, consistent operation, and impartiality of accreditation bodies (ISEAL, n.d.-b).

In September 2019, SEG joined the ISEAL community and became what was previously called an Associate Member (D. Bunt, personal communication, April 6, 2022). As a result of ISEAL’s new membership structure, this was converted into the category of Community Member in November 2020. SEG stated their aspiration to adhere to the ISEAL Codes of Good Practice within twelve to eighteen months (D. Bunt, personal communication, April 14, 2022). However, this has not yet happened. To identify whether, and if so, what gaps need to be closed to be fully code compliant, we conducted a gap analysis of the SEG Standard program against the three ISEAL Codes of Good Practice (Standard-Setting, Assurance, and Impacts). To carry out the analysis effectively, SEG provided us with a document of their gap analysis dating from November 2020. It is important to keep in mind that some of the identified gaps have already been addressed since then. In addition, SEG mentioned that they have appointed a consultant to help create a more up-to-date overview of the ISEAL requirements that are still to be met (D. Bunt, personal communication, April 14, 2022). Our findings on the gap-analysis are detailed in the following sections.

6.2 Gap analysis against Community Member requirements

SEG stated that they are already an ISEAL Community Member, and this was confirmed by the ISEAL alliance (D. Bunt, personal communication, April 6, 2022; Organization 1, personal communication, April 13, 2022). Hence, they have fulfilled the entry requirements for ISEAL Community Membership detailed in Appendix 3. We did, however, have a couple of observations in this regard. First, the reach (also called coverage) data versus the scope of the standard was not clearly available on the SEG website. There was reference to reach data in a presentation, but this does not clearly compare the actual reach against the scope and relevant indicators stated in the SEG Standard (Kerr, 2020). Second, we noted in the interviews that the NGO stakeholders felt that stakeholder engagement was superficial since stakeholder comments during the standards consultation process were not addressed in the Standard and that in some cases no rationale was provided for the comments not being addressed (M. van Vilsteren and NGO 1, personal communication, April, 2022; SEG, 2017). This is symptomatic of a “democratic deficit” similar to the issues that plagued MSC when it was perceived as being dominated by Unilever (Bernstein, 2011).

6.3 Gap analysis against ISEAL Code Compliance

6.3.1 Gaps against ISEAL’s Standard-Setting Code

Table 1 provides an overview of SEG’s gap analysis against ISEAL’s Standard-Setting Code. As can be seen from the table, the Standard-Setting Code is mostly compliant. This is in line with the statement made by Andrew Kerr, chairman of SEG, that the Codes of Good Practice have served as a structure that enabled the development of the SEG Standard (A. Kerr, personal communication, April 6, 2022). We confirmed this with the results obtained through analysis of SEG’s website. Most documents that are required to be publicly available by the ISEAL Standard-Setting Code were accessible through the SEG website. However, according to the gap analysis, the revisions procedure still needs to be developed and made publicly

available. In addition, with regards to resolving complaints, decisions taken on complaints made by stakeholders should at least be disclosed to affected parties.

Table 1: Gap analysis against ISEAL's Standard Setting Code. 'Requirements' here refer to the requirement sections of respective ISEAL code, 'Status' refers to the current status of the SEG Standard system's compliance to the respective ISEAL code, and 'Gaps' refers to gaps in SEG Standard system against the ISEAL requirements.

Clause no.	Requirements of ISEAL code	SEG Status	Gaps against the requirements
4.1	Standard-Setting Procedures	Complete	No gap
4.2	Consistency Between Standards	Complete	No gap (except for aspirational criteria, which are not considered for reaching Code Compliance)
5.1	Terms of Reference	Complete	No gap
5.2	Stakeholder Identification	Complete, but review needed	No gap (except for aspirational criteria, which are not considered for reaching Code Compliance)
5.3	Public Summary	Complete	No gap
5.4	Public Consultation	Complete	No gap (except for aspirational criteria, which are not considered for reaching Code Compliance)
5.5	Feasibility Assessment	Aspirational	Not considered for reaching Code Compliance.
5.6	Decision-Making	Complete, but review needed	No gap
5.7	Standards' Availability	Complete, but review needed	No gap (except for aspirational criteria, which are not considered for reaching Code Compliance)
5.8	Review and Revision of Standards	Partially done	Partial gap (revisions procedure needs to be developed and made publicly available)
5.9	Transition Period	Complete	No gap
5.10	Records	Complete	No gap
5.11	Resolving Complaints	Partially done	Partial gap (decisions taken on procedural complaints are disclosed at least to the affected parties)
6.1	Sustainability Outcomes	Complete	No gap
6.2	Performance Level	Complete	No gap
6.3	Consistent Interpretation	Complete	No gap
6.4	Local Applicability	Complete	No gap

6.3.2 Gaps against ISEAL's Assurance Code

As can be seen in Table 2, there are gaps against the ISEAL Assurance Code. SEG planned to address most of these gaps versus the Assurance Code in 2021, however only about half of these have been addressed (D. Bunt, personal communication, April 14, 2022). SEG now plans to address the remaining gaps in 2022 through obtaining additional resources (see section 6.4 for more details). Based on our assessment, there

are three significant gaps (highlighted in red in Table 2). First, additional assurance activities on other recognized schemes, for example ESF, need to be put in place. Second, risks to impartiality need to be documented, monitored, and managed. Third, information regarding assurance processes needs to be current and publicly available (Table 2). The gap relating to clause 5.2 is not a significant gap due to recent updates to this by SEG in terms of appointing a Conformity Assessment Body (CAB) (D. Bunt, personal communication, April 14, 2022).

Table 2: Gap analysis against ISEAL's Assurance Code. 'Requirements' here refer to the requirement sections of respective ISEAL code, 'Status' refers to the current status of the SEG Standard system's compliance to the respective ISEAL code, 'Gaps' refers to gaps in SEG Standard system against the ISEAL requirements.

Clause No.	Requirements of ISEAL code	Status	Gaps against the requirements
4.1	Scheme owner is responsible for and makes improvements to the assurance system	Minor amendment needed to ensure this is covered	Partial gap
4.2	Risks to the integrity of the assurance system are managed	To be done	Full gap (risk management plan and mitigation plan for liabilities arising from operations needs to be in place)
4.3	Assurance model is fit for purpose	To be done	Not clear
4.4	Assurance data is relevant and accurate	To be done, developed, or described	Full gap
4.5	Effectiveness and efficiency of the assurance system are maintained and improved over time	To be built into a procedure, done, and recorded	Full gap
5.1	Operating procedures support consistent implementation of the assurance system	Methodology that specifies requirements for assessment that assurance providers need to follow is present	Partial gap (Review of Assurance and Accreditation system outstanding, some procedures need to be updated, Monitoring activities to mitigate misrepresentation or corruption need to be put in place)
5.2	Assessment is implemented according to operating procedures	Not done	Full gap (Internal audits and oversight bodies need to be added to system – there has been progress now in adding the Conformity assessment body)
5.3	Outputs of recognized schemes are equivalent	Not done	Full gap (Additional assurance activities on other recognized schemes (e.g., ESF) need to be put in place)
5.4	There is independent oversight of implementation	Accreditation bodies comply with the current version of ISO/IEC 17011	Partial gap (Training to be developed for assessment staff in oversight body)

5.5	The assurance system is implemented competently	Partly done	Partial gap (assurance provider and oversight body auditors and other assurance personnel, including the scheme owner's assurance staff, receive initial training and ongoing professional development, auditor competence needs to be demonstrated on a recurring basis through evaluation by assurance providers, oversight bodies, or other entities, using defined verification mechanisms that include witnessing auditor performance)
5.6	The assurance system is implemented impartially	Not done	Full gap (risks to impartiality need to be documented, monitored and managed)
6.1	Assurance system delivers additional value to clients	Complete	No gap
6.2	Barriers to access are minimized	Documented risk management protocol to assess the risk level of clients or assurance providers	Partial Gap (publicly available information that describes eligibility requirements for assurance providers and clients, and the rationale behind any restrictions on access)
6.3	Information about how the system operates is easily available	Not done	Full (Gap) The following information needs to be current and publicly available: Description of the structure of the assurance system including decision-making; Information on data ownership and availability; Criteria for accepting ass. providers and clients to the scheme; Application procedures for clients; Current list of oversight bodies and assurance providers that are approved to work in the assurance scheme

6.3.3 Gaps against ISEAL’s Impacts Code

Table 3 summarizes the gaps against the ISEAL Impacts Code. As can be seen from this table, SEG is about halfway to being compliant with this Code of Good Practice. We have identified the following main gaps related to monitoring and evaluation (M&E). The M&E system should be further developed, and a data management system should be put into place to monitor performance. Moreover, quality assurance measures of performance monitoring need to be implemented and impacts and outcomes should be documented accurately and made publicly available. Furthermore, there should be opportunities for

stakeholder consultation and results of consultation meetings should be documented and publicized as well (see Table 3 for more details). In addition to the normative requirements, the Impacts Code includes several aspirational good practices. Though these are recommended practices, they are not considered for reaching the status of Code Compliance.

Table 3: Gap analysis against ISEAL's Impacts Code. 'Requirements' here refer to the requirement sections of respective ISEAL code, 'Status' refers to the current status of the SEG Standard system's compliance to the respective ISEAL code, 'Gaps' refers to gaps in SEG Standard system against the ISEAL requirements.

Clause No.	Requirements of ISEAL code	Status	Gaps against the requirements
5.1	Monitoring and Evaluation System	Complete	No gap
5.2	Scope and Boundaries of the M&E System	Complete	No gap
5.3	Plan for Expansion	Partially done	Partial gap (documentation of how the M&E system is expected to evolve over time in order to monitor and evaluate intended and unintended effects)
5.4	Resources	Complete	No gap
5.5	Roles and Responsibilities	Complete	No gap
5.6	Data Management	Partially done	Partial gap (development of a data management system for monitoring data)
5.7	Data Confidentiality and Use	Complete	No gap
5.8	Integrating M&E in the Organization	Aspirational	Not considered for reaching Code Compliance.
5.9	Integrating M&E in the Organization	Aspirational	Not considered for reaching Code Compliance.
6.1	Stakeholder Identification	Complete, but will be improved	Not clear
6.2	Stakeholder Consultation	Partially done	Partial gap (opportunities for stakeholders to comment on the M&E system need to be provided and publicized)
7.1	Intended Impact and Outcomes	Complete	No gap
7.2	Causal Pathways	Partially done	Partial gap (causal pathways need to be illustrated or described)
7.3	Unintended effects	To be done	Full gap (need for consultation with stakeholders to identify possible unintended effects. Results should be documented)
7.4	Influencing factors	Aspirational	Not considered for reaching Code Compliance.
8.1	Performance monitoring and outcome and impact evaluation	Partially done	Partial gap (implementation of M&E system that includes performance monitoring, and outcome and impact evaluations)

8.2	Indicators	Partially done, part of new strategy and review of M&E system.	Partial gap (indicators employed in the M&E system and to what impacts they contribute need to be defined; identification of which indicators are to be included in performance monitoring activities, outcome and/or impact evaluations)
8.3	Performance monitoring	Partially done, part of new strategy and review of M&E system.	Partial gap (data collection on an ongoing basis. Production and analysis of reports on results observed through M&E)
8.4	Quality Assurance for Performance Monitoring	To be done	Full gap (implementation of data quality assurance measures)
8.5	Outcome and Impact Evaluations	Partially done	Partial gap (if the standard system has been operational for at two years, it undergoes at least one in-depth impact evaluation per year; at least some of the evaluations are independent; each impact evaluation addresses the four questions stated in the Impacts Code)
8.6	Quality Assurance for Outcome and Impact Evaluations	To be done	Full gap (implementation of measures to ensure that each impact evaluation is accurate, relevant and reliable; measures need to be documented)
8.7	Monitoring and Evaluation Reports	To be done	Full gap (performance monitoring reports shall include: a) purpose of the evaluation; b) list of people involved in evaluation; c) methodology; d) findings and conclusions; e) limitations; f) effect of context on results; g) recommendations)
8.8	Indicator Alignment	Aspirational	Not considered for reaching Code Compliance.
8.9	Communication of Evaluation Results	Aspirational	Not considered for reaching Code Compliance.
8.10	Benefits of M&E for Entities Involved in the Standard System	Aspirational	Not considered for reaching Code Compliance.
8.11	Ethical Guidelines	Aspirational	Not considered for reaching Code Compliance.
9.1	Internalizing Learning and Improving	Partially done, ensure described in System and then ensure on Board agendas	Partial gap (ensure that the standards system's definition of intended change and reports from M&E are distributed and discussed throughout the organization)

9.2	Improving M&E System Effectiveness	Partially done. Ensure described in System, and then ensure on Board agendas.	Partial gap (ensure that the results from M&E and the learning from these activities are used for a periodic review and refinement of the intended change and of the M&E strategy)
9.3	Responding to and Using M&E Results	Aspirational	Not considered for reaching Code Compliance.
10.1	Publicly Available Information	Complete	No gap
10.2	Transparency of Evaluations	Partially done. Ensure in System, and then published and recorded.	Partial gap (outcomes from M&E should be made publicly available and public summaries should be accurate)
10.3	Substantiating Claims	Partially done	Partial gap (claims or statements made in reports are accurate and linked to actual findings and conclusions from M&E)
10.4	Increased Transparency, Public Access, and Engagement	Aspirational	Not considered for reaching Code Compliance.

6.4 Takeaways

Voluntary sustainability standard systems such as the SEG Standard must deliver sustainability results and assure buyers that their purchases are supporting sustainable production. Recently, standard systems are ramping up efforts to evaluate their systems and collaborate with independent researchers to understand better the impact of these systems (Schmitz-Hoffmann et al., 2014).

SEG stated that they have built their standards system based on the ISEAL codes. They have been an ISEAL Associate Member since September 2019, an ISEAL Community Member since November 2020, and aspire to become ISEAL Code Compliant in twelve to eighteen months (D. Bunt, personal communication, April 14, 2022). Achieving ISEAL Code Compliance is critical in terms of credibility of voluntary sustainability standards systems (Bernstein, 2011). SEG stated and we can confirm that the biggest gaps they have currently are in the ISEAL Assurance Code, also because this is the more extensive part of the ISEAL codes (D. Bunt, personal communication, April 6, 2022). The SEG Standard appears to be most compliant to the ISEAL Standard-Setting Code, which reflects the fact that they built their standards based on the ISEAL codes (SEG, 2020b). In terms of the ISEAL Impact Code, the SEG Standard seems to be halfway there (SEG, 2020b).

Based on the information supplied by SEG and discussions with Organization 1, the gaps in the areas of Assurance and Impact Code are significant since they require a high amount of resource investment especially in areas such as the monitoring and evaluation system (Organization 1, personal communication, April 13, 2022). Based on our discussion with NGO 2, the investment required in terms of resources to address these requirements on an ongoing basis is also significant (NGO 2, personal communication, April 8, 2022). Hence, the question arises whether SEG has sufficient funding to address these resource requirements. We asked this question of SEG, and the rough funding estimate provided by them was 20000 – 50000 euros. The question remains whether this funding estimate is low since they

anticipated achieving Code Compliance in twelve to eighteen months while the average taken by ISEAL members is three years after they enter/start that program, which SEG has not yet started (D. Bunt, personal communication, April 14, 2022). In addition, SEG themselves highlighted the amount of work required (e.g., documenting procedures, introducing new procedures, developing an information management system, development of training, etc.), in the gap analysis they provided to us. Hence, the question remains as to what a more accurate cost estimate for this is and whether SEG will be able to obtain the necessary funds for this resource investment.

Compliance to these codes is critical to help SEG Standard achieve legitimacy. The Standard-Setting Code is key to achieving input legitimacy. The Impacts Code is critical to help the standard achieve output legitimacy. The Assurance Code “contains requirements for the institutional relationship that voluntary sustainability standard bodies have with auditors, and basic requirements for auditing practices in the sustainability sector” and is critical to achieving throughout legitimacy (Paiement, 2016). Hence, it is critical that SEG prioritizes the funding and resources to address the gaps and achieve code compliance in the appropriate timeframe, as stated by them. If this is not possible, this would negatively affect the extent of legitimacy that the SEG Standard has, potentially delaying their goals in aiding the recovery of the European eel.

7. Results: Policy Arrangement Approach

In this section, our aim was to study the current governance arrangements of SEG and its standard. We did this by analysing the SEG organization and using the PAA to study the governance arrangements regarding the SEG Standard, and the policy domain of eel management. The PAA is an analytical tool that is used to understand the dynamics in policy processes (Liefferink, 2006). By using the PAA, we were able to investigate both the structure and substance of the policy domain by looking at how stakeholders, their vision, discourses (this included the views and narratives of the actors), coalitions, formal procedures or norms influence the policy domain (Liefferink, 2006). Additionally, we examined resources such as funding and knowledge and how these affected the power relations of the various actors. Based on this, we assessed the governance arrangements of the SEG Standard, and how they contribute to its legitimacy. To further clarify the concept of the PAA, the main dimensions are visualized in Figure 4.

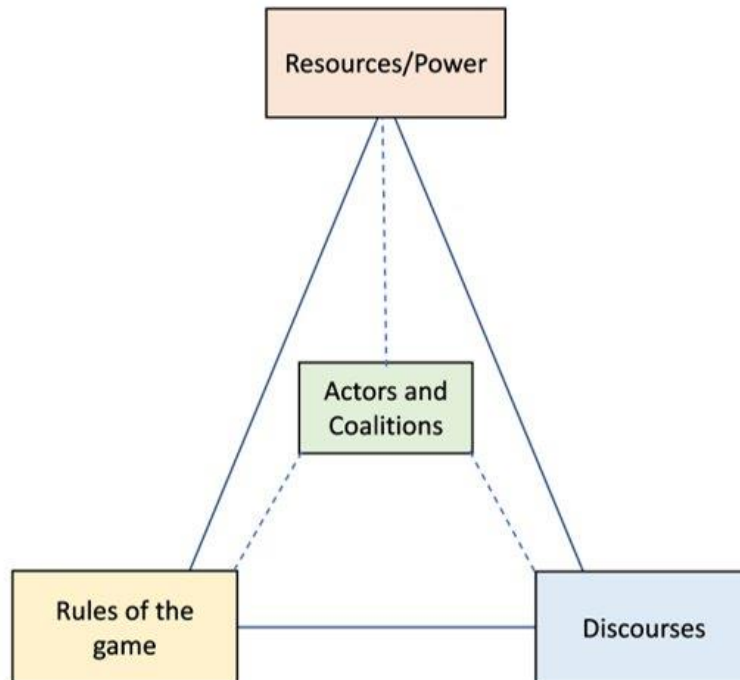


Figure 4: Analytical perspective on the different dimensions of policy arrangement approach (Liefferink, 2006).

7.1 SEG organizational governance

In this section, an overview of SEG’s organizational governance is assessed and presented. It describes the general structure, the composition of the board, SEG membership, the decision-making process, and their projects. This sub-section provides some background on the organization governance of SEG.

SEG is a not-for-profit private company, which aims to accelerate the recovery of the European eel by working with partners from scientific, commercial, and conservation sectors (SEG, 2020a). They are involved in sustainable projects and promote measures to cope with eel trafficking, barrier removal, and habitat restoration. SEG raises awareness about eel conservation in both the freshwater and marine environment, promote scientific education and research regarding eels, advance measures by public and private organizations for eel conservation, and undertake projects to promote eel sustainability (SEG, 2020a). SEG has a general structure composed of a board of directors and members. The board of directors oversee SEG and are elected by the members in the Annual General Meeting. The nomination for a director is made by a proposal to the Chairperson and must be supported by 5 members (SEG, 2020a). Together, the directors compose the board, which makes internal decisions by a majority vote. The general decision-making process is conducted within general meetings with the presence of all the members (SEG, 2020a). The SEG Board of Directors is composed of representatives from three sectors: commercial (i.e., commercial fishing of eels, eel aquaculture), science (i.e., eel ecology, water quality), and conservation (i.e., wetland management, eel conservation) (SEG, 2020a). According to the interview we had with SEG, Andrew Kerr and David Bunt stated that their intent is that no unbalanced decisions are made, and no sector is prioritized over another; all sectors have an equal say and the interests of all three sectors are combined (A. Kerr & D. Bunt, personal communication, April 6, 2022). The current board is

composed of five directors and a chairman, and the board also acts as the organization's executive team. Andrew Kerr is the Chairman, with a background in conservation, Alexander Koelewijn (commercial sector, affiliation) is the commercial director, and Alexander Waver (commercial sector, affiliation) is the commercial specialist. Willem Dekker (science sector, affiliation) is the director of science, and he is the researcher SEG relies on for scientific advice. Yurena Lorenzo de Quintana (affiliation) is the director of conservation and David Bunt is the director of the conservation operations and chair of the SEG Standard Panel (SEG, n.d.-b).

Given the fact that SEG is a not-for-profit organization, it is recognized that there might be potential conflicts of interests. Therefore, SEG has an approach to identify and address these potential conflicts. For each of the board members, SEG identified possible conflicts of interests with the objectives and the vision of the organization and published them in its website (SEG, n.d.-b). This is concerning whether there is a potential risk of individuals' opinions and decision-making being influenced by their respective interests. To cope with this, SEG aims to see that every sector has equal power to influence the decision-making process. Membership is granted at the discretion of the board and every member must be in sympathy with the objectives of SEG and share its overall vision to be granted membership. In addition, each member must pay an annual subscription fee determined by the board of directors. Lastly, it is important to mention that the SEG Standards Panel had been established by the Board of Directors but has been dissolved and the board of Directors covers its tasks currently (D. Bunt, personal communication, April 6, 2022).

7.2 Policy Arrangement Approach

7.2.1 Actors and coalitions

We identified four different categories of stakeholders involved in the recovery of the eel and in the SEG label: actors who have a primary interest in the sustaining the eel commercial sector, those with a primary interest in eel protection, some who have shown interest in both, and other stakeholders.

First, the actors with interest in sustaining the eel commercial sector. DUPAN, as one of the members of ESA, represents the Dutch eel fishers, farmers, and traders. They have high interest in the sector and high power in terms of actions and in terms of influencing the decision-making process inside SEG due to their presence inside the SEG executive Board. They have influence over their members and over various NGOs involved in the field (M. van Vilsteren, personal communication, April 6, 2022). They are promoting the SEG Standard and the socio-economic sustainability of the sector. They have a partnership with SEG and they share parts of their overall visions regarding the future of the eels. DUPAN has the power to influence the legitimacy and transparency of SEG because of the presence of DUPAN's representatives inside the SEG Board, even if SEG assured in the interview that we conducted, that the power in the decision-making process is equally distributed to the three sectors (conservation, commercial, and scientific). Their interest in the SEG Standard is linked to the possible impacts on the eel commercial sector.

Second, the actors with interest in eel protection. Good Fish, according to Margreet van Vilsteren, one of the founders of the organization, believes in regulations and would like to keep fishing the eels but in a more sustainable and traceable way (i.e., sustainable fisheries). The SEG Standard could be an opportunity or a good tool to use if effective and efficient. They would like to remove the interests and hidden influences of sectors (e.g., commercial) from the discussion of the eel issue. Good Fish has some conflicts of vision with SEG because they are unsure about the transparency of SEG. The relationship between SEG and DUPAN may raise some doubts about the real interests behind the label because Good Fish considers

DUPAN as acting unreliable and being untrustworthy as they are not transparent in their finances, and they are not following scientific advice. They delay the involvement of NGOs in the debate by actively boycotting a conversation with NGOs and influencing all their members to do the same (M. van Vilsteren, personal communication, April 6, 2022).

In addition to Good Fish, we identified FishSec as part of the informal coalition with an interest in eel protection. Additionally, Wetlands International, a not-for-profit organization, has been put in this category. Wetlands International is more involved in tackling the eel issue by removing redundant barriers and the restoration of wetland habitat (P. Brotherton, personal communication, April 5, 2022). Wetlands International works closely with SEG through a partnership in Europe. According to the interview with Paul Brotherton, the freshwater manager of Wetlands International, they do not have a lot of interest in the SEG Standard, since they believe that the main issue for the eel population nowadays is represented by the migratory barriers and habitat loss and that fishing is only a part of the problem (P. Brotherton, personal communication, April 5, 2022).

Third, actors who have interest in both areas. SEG published its vision on the status of the European eel stock and suggested solutions for the population recovery (SEG, 2021). SEG believes that the Standard would be useful for various improvements in the sector, and they believe that ending fishing on the eel would increase cases of illegal poaching and trafficking and they do not want this to happen. The European Commission plays a big role in tackling the eel issue and they have the power to influence European countries or to give directives to them. The Commission has promoted concrete actions with the national eel management plans, but it has not recommended to stop fishing so far. Therefore, many actors are now lobbying the Commission to follow the scientific advice of ICES and close the fisheries (NGO 1, personal communication, April 5, 2022). The European Commission could have the power to influence the Standard by following the ICES' advice and closing eel fisheries in the European Union.

Additionally, other stakeholders are involved in this domain. Their role appears secondary in comparison to the stakeholders mentioned above, but they have power and interests in the field:

- The Dutch Government: The Ministry of Agriculture, Nature and Food Quality launched the “Netherlands Eel Management Plan” in 2009, with guidelines concerning restocking, monitoring, and measures to take to tackle the issue of the eel population decrease (Ministry of Agriculture, Nature and Food Quality, 2009). The Dutch local Government is interested in helping eel recovery, but it is also interested in preserving the economic role of local fishermen and the Dutch cultural point of view.
- ISEAL: They provide membership and partnership to voluntary standard setters across the world concerning the field of sustainability. Their mission is to improve the impact of ambitious sustainability systems to accelerate innovative change (ISEAL, n.d.-c). ISEAL is the body that will assess the code compliance of the SEG Standard to the ISEAL codes of good practices. ISEAL has a neutral position about the SEG Standard.
- ICES: This organization aims to provide impartial scientific advice on marine sustainability. In 2021 they published their zero-catches-advice about the eel's population for 2022. They have indirect political power because they give scientific advice and have a clear position against any commercial use of the eel (ICES, 2021).

7.2.2 Resources and power

In this section, we start with analyzing resources such as funding (Table 4) and knowledge and show the effect of these on the power relations between actors. SEG is funded through grants such as the European Maritime Fisheries Fund (EMMF), and through funding from the sector through the ESF (IFEA, 2018; SEG, 2020a). In addition to funding traceability tools like the SEG Standard, the ESF also funds activities eel conservation activities such as restocking programs, sustainable aquaculture, scientific research, and unblocking of migratory pathways (ESA, n.d.). The ESA, as the founder and administrator of the ESF, provides the money to its members in the Netherlands, Germany, and the UK for the conservation activities mentioned above. DUPAN as the ESA member in the Netherlands obtains funding through the ESF in this manner to carry out its eel conservation activities. In addition, the Netherlands Eel management plan provides an annual subsidy of 300000 euros through the ministry of LNV (Ministerie van Landbouw, Natuur en Voedselkwaliteit) from the European Fisheries Fund (EFF). This restocking program is coordinated by DUPAN (The Netherlands Eel Management Plan, 2009). DUPAN is also collaborating with Wageningen Livestock Research (WLR) through an initiative called EELRIC which aims to function as a platform for the reproduction of eel in captivity and to develop methods for the propagation of eel to make aquaculture independent of the supply of glass eels from nature (Wageningen University and Research, 2017). Research institutes from eight European countries and Japan, New Zealand, and the United States are collaborating on this platform of EELRIC (Wageningen University and Research, 2017). Based on this, DUPAN has considerable funding and is making use of this to further its goals as relates to the eel.

Table 4: Summary of funding sources for the key actors.

Organization	Funded by	% Funding	Is funding...
SEG	EMMF	~53% of total SEG income (Based on SEG Income statement from 2019). Varies from year to year.	SEG Standard, activities for restocking, sustainable aquaculture, scientific research, and unblocking of migratory passages etc.
	ESF	40% of total SEG income (based on SEG Income statement from 2019)	
DUPAN	ESF	Not studied	Conservation activities
	Ministry of LNV	€300000 towards restocking program cost	Restocking program
Good Fish	Nationale Postcode Loterij	Not studied	“Power to the eel” campaign
Fish Sec	Waterloo foundation	Not studied	Advocacy work to strengthen the management and conservation of the European eel
Wetlands International	Nationale Postcode Loterij, Private grants through CBF	Not studied	Policy relating to habitat protection and river restoration at the European Commission

Good Fish, FishSec, and Wetlands International are funded through a combination of grants and donations. Specifically, the “Power to the eel campaign” has been funded through the Nationale Postcode Loterij (Power to the Eel, n.d.). In addition to this, FishSec has received funding from the Waterloo foundation in March 2020 for advocacy work to strengthen the management and conservation of the European eel (FishSec, 2020). Wetlands International does not have a specific eel project since they work on improving wetlands and rivers across Europe for habitat restoration and removing blocks for migratory fish. On their website, they indicate funding from the Nationale Postcode Loterij and private grants through the CBF, which is the charity supervisor in the Netherlands (Wetlands International, n.d.). Good Fish and other NGOs rely on existing research and scientific advice from ICES, which recommends zero catches of eel across its life stages (ICES, 2021). SEG, on the other hand, has commissioned several

scientific studies published in peer-reviewed journals and these are available through their website (SEG, n.d.-c).

In terms of lobbying, it appears that DUPAN has a strong influence on the Dutch government as evidenced by the fact that they have lobbied them successfully to source only SEG certified eel in the Netherlands (DUPAN, 2022). In addition, they are running the restocking programs since the Netherlands Eel Management plan was agreed upon in 2009 (Ministry of Agriculture, Nature and Food Quality, 2009). Moreover, DUPAN may leverage its ability to change the narrative of their constituents, and influence participation in activities that they do not consider 'in alignment' with their views. Therefore, there is a perception that they exclude other stakeholders from participating in eel-related projects (M. van Vilsteren, personal communication, April 6, 2022). DUPAN is represented on the SEG Board and provides funding from ESA through the ESF to SEG, which seems to be impacting the perception of the democratic legitimacy of SEG, thereby affecting the legitimacy of the SEG Standard (IFEA, 2018; NGO 1, personal communication, April 5, 2022; M. van Vilsteren, personal communication, April 6, 2022). This may be similar to the situation that MSC found itself in, in its early stages, where the dominance of Unilever contributed to its limited uptake from environmental and social groups (Bernstein, 2011). However, SEG has recently installed a conformity assessment body (CAB) called GreenPartner to independently certify the companies, effectively increasing legitimacy. Wetlands International is a member of several coalitions such as Living Rivers Europe collation and Dam Removal Europe, through which it lobbies to influences policy relating to habitat protection and river restoration at the European Commission level (P. Brotherton, personal communication, April 5, 2022). Good Fish works through consumers to make them aware of the current status of the European eel. They also influence policy through consumer activism for example, the "Power the eel petition" (Power to the Eel, n.d.). With regards to regulations for the European eel, FishSec is lobbying for closing the fisheries as advised by ICES. To achieve this, FishSec collaborates with different actors such as the European Commission, national and regional politicians, and NGOs (NGO 1, personal communication, April 5, 2022). In response, SEG lobbies for keeping commercial fisheries open. This organization did a lot of coordinated lobbying in the past few months, for example, they have shared documents and assistance to advisory councils. SEG sent these out to stakeholders that are participating and to regional bodies. However, the decision papers that have been sent by SEG to the advisory councils consist partially of NGOs, but most of the advisory councils are fishing sectors. This creates an imbalance between the fishing sector and environmental organizations, which often leads to the environmental organizations being on the losing end (M. van Vilsteren, personal communication, April 6, 2022; NGO 1, personal communication, April 5, 2022).

7.2.3 Discourses

The first type of discourse is about the two discourses on the future development of the European eel stock which can be distinguished within this policy domain. One suggests that the current recruitment of European eel is very low (0.9-5.4%) and that therefore a precautionary approach is warranted with a zero catches policy across all habitats (ICES, 2021; NGO 1, personal communication, April 6, 2022). The other proposes that the European eel is not near extinction, and that due to current regulations the steep decline of the glass eel has halted and shows signs of recovery (A. Kerr & D. Bunt, personal communication, April 6, 2022). These discourses seem mutually exclusive. However, regulations such as the Eel Regulation (2007), trading restrictions (2010), and adopting the measure of changing the eel fishery into a seasonal one (European Commission, n.d.) are put forth from advisory organizations such as ICES, CITES, the Convention of Migratory Species of Wild Animal (CMS), and IUCN. SEG has incorporated some of these into their Standard's framework to further support the regulations that are already in place and add to the regulatory power of the legal framework. Although, there is consensus among stakeholders such as

Good Fish, SEG, and the commercial sector that fisheries should be regulated, the question is raised whether SEG and their Standard, specifically, contributes to the sustainable use and recovery of the eel stock, especially as this is against the scientific advice of ICES, which advises zero catches, no restocking, and calls for a minimization of anthropogenic mortalities. In this regard, some stakeholders argue that it is impossible to create a sustainable fishery for eel and argue that the label could be considered more a traceability label to reduce illegal fishing, trading and create a transparent value chain (M. van Vilsteren, personal communication, April 6, 2022; NGO 1, personal communication, April 5, 2022).

The second discourse type is related to transparency in governance arrangements, where the legitimacy of stakeholders is screened against the ISEAL credibility principles (ISEAL, n.d.-a). In this, SEG already strived to comply since they built their Standard against the credibility principles/codes of good practice. Additionally, during our initial interview with SEG, they proved transparent by providing information and releasing confidential company documentation to further transparency. Furthermore, they initiated consultation on their standard, showing stakeholder involvement (SEG, 2017). With that, they seem open to discussion and able to work with different groups to ensure transparent business practices. However, a representative of the Good Fish Foundation stated that “how and when” stakeholders are asked to provide feedback during the SEG certification process should be made more transparent (SEG, 2017). Additionally, internal research of documentation proved difficult at times since the website proved intricate to navigate, where some pages contained no or outdated information. Moreover, what appeared to shape the substance this policy domain was the selective interest of the commercial sector interact to interact with other interdisciplinary parties (M. van Vilsteren, personal communication, April 6, 2022; NGO 1, personal communication, April 5, 2022).

Other discrepancies in points of view between stakeholders can be contributed to due to a lack of data on effectiveness of current eel-related measures (i.e., how effective they have proven to be under the current Eel Regulation). This is leading to different outcomes in discourse or regulation, such as adopting non-scientific or mitigative measures, which are then contested by opposing stakeholders, for example there is not enough scientific data to support claims that either restocking or guaranteed escapement works (ICES, 2021). Yet, they are put forth as one of the mitigative measures, with supporting and opposing discourses as a result. Additionally, the lack of sufficient data could be perpetuated due to the fragmented implementation of the Eel Management Plans, proposed by each of the European member states.

7.2.4 Rules of the game

The rules of the game refer to the “mutually agreed formal procedures and informal routines” (Liefferink, 2006, p.56) of the interaction between actors involved in the policy arrangement concerning the European eel. Since 2003, ICES has been advising to adopt a precautionary approach and reduce all anthropogenic impacts on the European eel to levels as close to zero as possible. This advice has translated into policymaking and led to the establishment of the EU Eel Regulation (EU Council Regulation no. 1100/2007). After this, EU countries implemented plans on different geographical scales to manage eel fisheries and provide conservation measures. The eel management plans (EMPs) consist of measures that ensure at least a 40% escapement of the adult eel population to the sea. These measures include restrictions on commercial fishing, limiting recreational fishing, measures for restocking and habitat restoration and measures on hydro turbines and aquaculture. Besides this, there is the target for glass eel fisheries to release 60% of the caught glass eels for restocking (European Commission, 2014). In addition, the EU Member States enacted a law in 2010 that banned trade in European eel in countries outside the

EU. Later in 2018, the EU implemented a fishing closure of three months per year, which applies to commercial as well as recreational fishing (European Commission, 2020).

Another decision that was made by the EU is the implementation of the Water Framework Directive (WFD) in 2000. The WFD had big impacts on water management in member states of the EU and led to re-organization of water management by catchment areas, instead of national borders, with the objective to improve the quality of surface water and groundwater. The focus in this directive lies on aquatic ecology, which is used to assess the quality of the water bodies (Hering et al., 2010). Considering the eel, the WFD does not seem to be an effective measure for recovery of the species. The Habitat Directive (Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora), on the other hand, does benefit recovery of the eel. Despite the eel not being covered by the Habitat directive, eels in Natura 2000 areas are effectively protected due to the network. Important measures that are included in the Habitat Directive are the removal of barriers, such as dams and the restoring wetland habitats. To protect the eel more efficiently with these measures, the interaction of WFD and the Habitat Directive with eel management plans must be investigated, monitored, and eventually improved (P. Brotherton, personal communication, April 5, 2022).

Furthermore, international conventions such as CITES and the Convention of Migratory Species of Wild Animal (CMS) have adopted the European eel in their Appendices. The European eel has been listed in CITES Appendix II since 2009. CITES Appendix II lists species that are not necessarily threatened with extinction now but may become so if trade remains uncontrolled. This means that current export and import of the European eel from and into the EU is prohibited (CITES, n.d.). Though CITES does not have the European eel listed in Appendix I for critically endangered species, the IUCN does categorize the European eel as critically endangered (Jacoby & Gollock, 2014). Within the CMS framework, the European Eel is listed under Appendix II, which covers migratory species to be managed and conserved through international agreements. These agreements may vary from legally binding treaties to informal instruments, such as action plans or species initiatives. The aim of these conventions is to aid the recovery of the eel through more comprehensive coordination and cooperation on an international level and involving the range states to incentivize removal of migratory barriers and create species specific management.

In addition to these formal rules, there are a set of informal rules that shape the policy arrangements around the European eel. The most apparent example of such an informal arrangement is the SEG Standard, which is considered a non-state-market-based instrument. Through voluntary labelling, SEG aims to support the EU Eel Regulation by ensuring that certificate holders have a positive contribution to eel populations. Their standard is aimed to cover the entire supply chain, from source to end consumer (SEG, 2018). At the moment, the SEG Standard has about 75% of the glass eel sector under their certification scheme, including fishers, eel farmers and traders (D. Bunt, personal communication, April 6, 2022). Key principles for voluntary standards such as that of SEG are transparency and stakeholder engagement. Through the process of stakeholder engagement, stakeholders can share their opinions and expertise and should thus be able to influence decision-making.

As described in previous sections of the PAA, SEG and DUPAN are partner organizations. Though the organizations are transparent about their partnership, the actual influence of DUPAN on SEG remains obscure. The influence of the commercial sector on SEG could potentially be high as about half of SEG's funding comes from the commercial sector through the ESF and due to the presence of DUPAN in SEG's executive board (SEG, 2016; SEG, 2020a). Moreover, there is a stakeholder perception that DUPAN has a

high influence on SEG and their decision-making process. Some stakeholders have voiced concerns that DUPAN is using SEG as an instrument to pursue their own interest (J. A. Aguirrebarrena, personal communication, April 22, 2022; M. van Vilsteren, personal communication, April 6, 2022). These unclaritys and suspicions result in unclear rules of the game and possibly reduced legitimacy. We also found DUPAN to be selectively transparent towards external interested parties. To illustrate, DUPAN has denied our request for an interview which creates a knowledge gap with regards to their actual influence in the policy domain. Moreover, actors within the commercial sector seem to exclude stakeholders from the discursive process (M. van Vilsteren, personal communication, 6 April; NGO 1, personal communication, April 5, 2022). Though DUPAN appears to be selectively transparent on their business practices they also seem to have a strong influence on both formal and informal decision-making.

Other informal rules on the preservation of the eel stock are driven by NGOs through petitioning or lobbying for better regulation. NGOs can make requests for public participation, access to information, and access to outcomes to build relationships with policymakers and develop strategies which increases their ability to influence the decision-making process (Pettersson, 2022). In addition, policy institutions such as the European Commission will regularly launch public consultations, such as the Evaluation of the Eel Regulation in 2018. This allows stakeholders to give feedback on eel regulation (NGO 1, personal communication, April 6, 2022). Furthermore, an example of petitioning in this case is the petition of Good Fish and RAVON on the protection of the eel. By using these informal rules, such as petitioning and using the right to make requests, these parties try to influence the public as well as policymaking (Power to the eel, n.d.).

7.3 Takeaways

Overall, SEG is transparent regarding their governance structure. Information on their Board of Directors, Standard, and membership requirements is accessible on the organization's website and additional information was provided when approached. One potential issue is that the executive team also acts as the board, which is not considered to be a best practice of governance since they are responsible for both decision making and maintaining an oversight on organizational governance (OECD, 2011). However, due to the size of SEG, this may not be a great concern in terms of the legitimacy of the organization.

However, by mapping resource dependencies within the policy domain of eel regulation, it seems that DUPAN, as a part of ESA has created a strong resource coalition of important stakeholders from the commercial sector, with an addition of SEG as a conservation organization. This does warrant the question in what way ESA, or DUPAN itself is able to determine outcomes with the help of their available resources as relates to eel management, SEG or their Standard (IFEA, 2018; J. A. Aguirrebarrena, personal communication, April 22, 2022; M. van Vilsteren, personal communication, April 6, 2022). In addition, it appears that DUPAN has the power to shape the rules of the game. This tends to blur the overall transparency and impartiality and create instability in this arrangement because of reduced stakeholder involvement. Due to the perception of high involvement of stakeholders from the commercial sector for funding and decision making at SEG, the legitimacy of the SEG Standard could be impacted. These and other key findings of the PAA are summarized below in Figure 5.

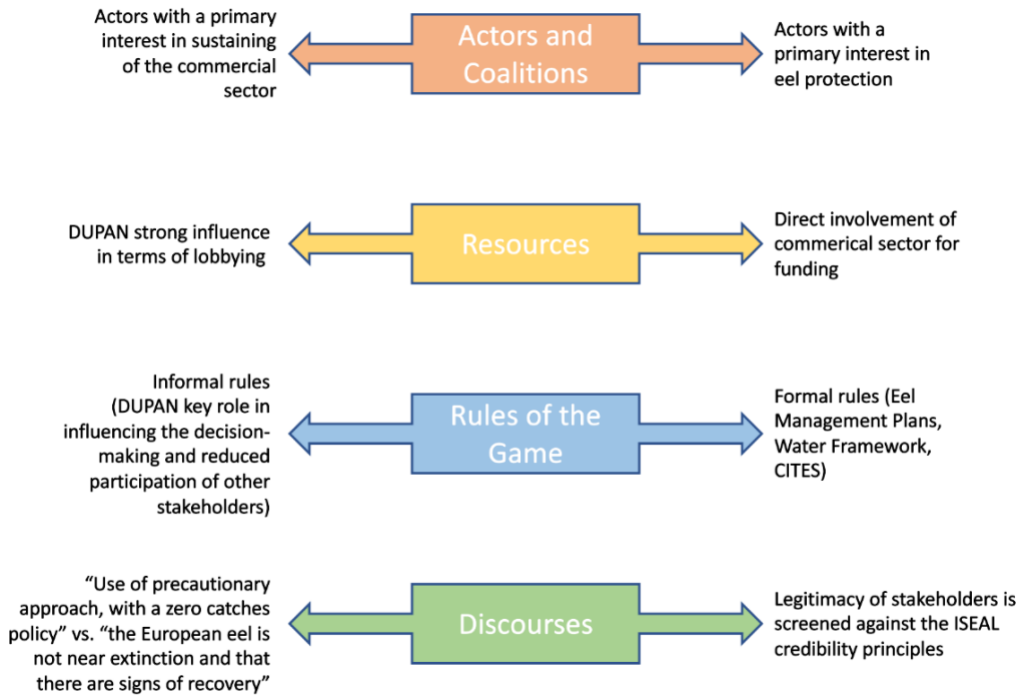


Figure 5: Main PAA findings (Actors and coalitions, resources, rules of the game, and discourses).

8. Discussion

In this section, we map our results from the interaction web, ISEAL gap analysis and PAA to the input, throughput, and output forms of legitimacy. This mapping is shown clearly in Table 5 and is detailed in the sub-sections below.

Table 5: Mapping between assessment methods and the components of legitimacy. Both positive and negative aspects of the results are noted in each section.

	Input legitimacy	Throughput legitimacy	Output legitimacy
Interaction web			<ul style="list-style-type: none"> -Traceable and legitimate (+) -Improved aquaculture and restocking practices (+) -Reduced glass eel mortality (+) -Not sustainable per scientific advice (-) -Dependent on procurement policies (-)

ISEAL gap analysis	<ul style="list-style-type: none"> -In (+) -Standard-Setting Code mostly compliant (+) -Stakeholder perception of exclusion (-) 	<ul style="list-style-type: none"> -GreenPartner CAB (+) -Additional assurances for ESF needed (-) -Transparency into assurance process (-) -Risks to impartiality (-) 	<ul style="list-style-type: none"> -75% coverage of glass eel (+) -Monitoring and evaluation system (-) -Published impact reports (+) -Unclear communication of impacts (-) -Yellow and silver eels not included (-) -Definition and consistency of indicators (-) -Timeline estimation (-)
PAA	<ul style="list-style-type: none"> -Standard built on ISEAL Code of Good Practice (+) -Stakeholder perception of exclusion (-) 	<ul style="list-style-type: none"> -Sharing documentation (+) -Outdated or inaccessible information online (-) -Influence of commercial sector (-) -Unclear decision-making process (-) 	<ul style="list-style-type: none"> -GreenPartner CAB (+)

8.1 Input legitimacy

Input legitimacy is translated into the participation of the people or stakeholders during the decision-making process. Additionally, it refers to the necessity of active inclusion of stakeholders from the governing body towards those who are going to be governed, according to the new rules or policies (Boedeltje & Cornips, 2004). If the governing body is deemed legitimate or democratic then the governing body will be accepted as credible (Tyler, 1997; Boedeltje & Cornips, 2004). With the initial implementation of SEG and their standard, elements of input legitimacy were provided due to the way SEG approached the standard-setting process. From the ISEAL gap analysis and the PAA, three major findings were put forward. When SEG set out to become ISEAL Code Compliant, they structured their governance around the existing credibility and good practice principles, which warrants some input legitimacy, since ISEAL's code requirements represent credible and good practices that support sustainable outcomes. The main finding here is that the SEG standard is mostly compliant with the ISEAL Standard-Setting Code.

Additionally, SEG was able to engage stakeholders during the first policy setting processes of the SEG Standard (D. Bunt, personal communication, April 6, 2022; SEG, 2017). However, the perception of the stakeholders was that there was not enough involvement, or they were not sufficiently informed as to how they could participate in the introductory process of the standard setting (M. van Vilsteren, personal communication April 6, 2022; SEG, 2017). Furthermore, it has been noted that comments provided on the standard were not addressed or no sufficient explanation was provided for content or feedback (M. van Vilsteren, personal communication, April 6, 2022; NGO 1, personal communication, April 5, 2022; SEG,

2017). This creates a discrepancy in the actual stakeholder engagement process put forth by SEG and the perception of the stakeholders. This should be considered as an obscurity in input legitimacy.

8.2 Throughput legitimacy

Throughput legitimacy is “interpreted as combining aspects of transparency, responsiveness, and fairness of the procedures of a governance institution” (Fuchs et al., 2011). In simpler terms, throughput legitimacy is a function of factors such as promotion of consensual orientation as relates to decision making, transparency of structure and processes and accountability – both internal and external.

The ISEAL Assurance Code “contains requirements for the institutional relationship that voluntary sustainability standard bodies have with auditors, and basic requirements for auditing practices in the sustainability sector” and is critical to achieving throughput legitimacy (Paiement, 2016). As mentioned in the ISEAL gap analysis results, the SEG Standard has the biggest number of gaps against the Assurance Code, which relates to the assessment of compliance with the standard, among the ISEAL Codes of Good Practice. We only discuss the significant gaps here. First, additional assurance activities on other recognized standards such as ESF need to be put in place (SEG, 2020b) to address the Assurance Code requirement that “outputs of recognized schemes are equivalent” (ISEAL, n.d.-b). This also relates to the finding that the impact of the SEG Standard, being a business-business certification, on consumer behavior is unclear. Hence, additional assurance activities on ESF, as the proposed consumer label for SEG certified eel, would enhance transparency to consumers and other stakeholders. Second, there is a partial gap against the Assurance codes regarding public access to assurance processes (SEG, 2020b), which require that SEG ensures that information about their assurance system and its implementation is “current and publicly available” (ISEAL, n.d.-b). While SEG has addressed this partially, addressing the remaining part of these requirements e.g., summary of resolved complaints, general information on fees charged to clients and applicants etc. would improve the perception of transparency and fairness of procedures of the SEG standard. Third, there is also a gap against the requirement that “the assurance system is implemented impartially” (ISEAL, n.d.-b). Specifically, SEG needs to document, monitor, and manage risks to impartiality, and this would contribute to the perception of fairness of procedures (SEG, 2020b).

At the same time, we see that SEG has been making progress, albeit slower than their stated goals, against the Assurance codes (SEG, 2020b). A key example here is the appointment of the Conformity Assessment Body (CAB) called GreenPartner (SEG, 2022) to provide independent certification services to companies involved in the trade of eel. This contributes to improving external accountability and to the perception of fairness of procedures.

An integral part of throughput legitimacy in an organization is transparency of information. Information should be readily and easily available both to members of the organization itself and to external third-party viewers. In general, SEG is transparent with their information and are open and willing to share documents, including those not available to the public, with third parties upon request. This was reflected in this project in that SEG shared previous documentation on the organization’s vision and their documented ISEAL gap analysis. However, the internal research of documentation and information via SEG’s website is not ideal. Links on the website led to pages with no information or, in some cases, outdated information that members were even not aware was still able to be seen by the public. As SEG is open and willing to share information, these values should be reflected on their website as well and are a point for future improvement on their side.

A more concerning issue regarding throughput legitimacy is the possible high influence of third-party discourses on the decisions taken by SEG. SEG is involved with the commercial sector through representation in their Board and through the targets of their certification scheme. For example, some stakeholders perceive that SEG excludes the inputs from certain stakeholders regarding their standard. Furthermore, this is reinforced by the funding between SEG and ESA via DUPAN. SEG is 50% funded from ESF which in turn is also partially funded by DUPAN, who sit on the board of SEG. This brings into doubt the procedural fairness in deliberation, for example, the role of the commercial sector in influencing decisions taken by SEG. MSC encountered a similar issue with its partnership with Unilever when the latter was perceived as being dominant in developing MSC and ultimately led to minimal willingness to apply the MSC label by external groups (Bernstein, 2011). In response, MSC reviewed their own governance structure and made changes to improve the transparency towards stakeholders (Bernstein, 2011). Therefore, SEG may encounter a similar problem of perception with their relationship with organizations representing the commercial sector when aiming to enhance the legitimacy of the SEG Standard in the near future.

Lastly, the decision-making process within SEG (e.g., the board and members) remains unclear. As per the publicly available minutes of SEG's annual general meetings, some members never appear to participate. For example, the conservation director did not appear to be attending and it is therefore unclear to what extent the conservation sector is involved in the decision-making process. While the reasons for these absences are unclear, it still leads to unclarity when part of the representation is absent from important decision-making meetings and requires further study and understanding to make a conclusion about its impacts.

8.3 Output legitimacy

Output legitimacy regarding the SEG Standard can be defined as the effectiveness of the standard in achieving the desired goals. Therefore, the focus lies on salience and impact. To reinforce output legitimacy, SEG must ensure high coverage and efficacy as well as enforcement (Mena & Palazzo, 2012). Coverage implies the proportion of corporate actors that are governed, included, and bound by their standard. An important aspect in coverage is effectiveness, which unites the stakeholders. Efficacy is the extent to which the rules fit the issue that is being addressed to solve it effectively. Considering this, the SEG Standard might not provide an efficacious solution for the problems around eel recovery, either because the requirement of corporate efforts is not enough or because even when it addresses the issue with the eel correctly, the standard creates additional negative externalities, for example, the exclusion of small companies that cannot meet SEG standards. Besides that, there is the enforcement of the standard. We define enforcement as the ability of the Standard to ensure that established rules are followed and applied in practice (Mena & Palazzo, 2012). In the next sections we elaborate on the coverage, efficacy, and enforcement of the SEG standard.

SEG already has good coverage of glass eels as 75% of the European glass eel market is currently certified under the SEG Standard. This percentage consists of about 80% of the glass eel fisheries, 75% of glass eel farmers and 75% of the traders (D. Bunt, personal communication, April 6, 2022). The more firms are bound by the Standard, the more it will attract other glass eel companies as their non-participation can be perceived as a competitive disadvantage (Husted & Allen, 2006). Greater coverage is thus expected to contribute to SEG's legitimacy (Mena & Palazzo, 2012). However, there seems to be a significant gap with regards to the coverage of the SEG Standard. Currently, the SEG Standard only issues certificates to the glass eel industry. Though yellow and silver eel are taken up in the standard, SEG has little penetration in these fisheries since the sector is very dispersed. Despite the complexities involving yellow and silver eel

fisheries, SEG does plan on moving towards penetrating the yellow eel market within the next ten years as they do not have the resources to realize this at the moment (D. Bunt, personal communication, April 6, 2022). In addition, SEG has limited geographic coverage. SEG started by targeting parts of Europe where they had better contacts and access to, such as Netherlands, Germany, and France. The motivation behind this is to start with targeting people who are receptive to change and to spread out from there. However, SEG has expressed that they still have limited penetration in other countries (D. Bunt, personal communication, April 6, 2022).

One positive aspect in terms of efficacy is the traceability of the SEG Standard for the retail channel. Good record keeping is key for traceability and SEG operates a system that allows tracking and tracing from the beginning (purchase of eel) till the end (sale of eel) of the supply chain. Additionally, good record keeping ensures that the claims of SEG for eel are genuine, which is important for the customers, as they want assurance that the Standard certifies responsible sources (SEG, 2018).

Another way in which the efficacy of the SEG Standard is shown is in their recommended practices, which have resulted in the reduction of glass eel mortality in restocking practices and aquaculture. For achieving the label, companies must prove with documentation that they maintain the 60% restocking rate. By the increase of companies certified by SEG there will be an increase in restocking of glass eel (D. Bunt, personal communication, April 14, 2022). However, the positive effects of restocking remain partially unknown based on recent research (Podda, 2002; Feunteun, 2002; ICES, 2021). Additionally, the Standard ensures the efficiency and responsibility of aquaculture and herewith it has a positive effect on the conversion of glass eels to silver eels. As described in section 5, in restocking as well as in aquaculture there is higher survival of glass eel (D. Bunt, personal communication, April 14, 2022). A reason for the high survival of glass eels to silver eels is the absence of parasites and internal lesions and the low pollutant loads correlated with eel density (Matondo et al., 2022). This increase in survival of glass eels is in line with the vision of SEG to establish a healthy eel population.

However, a significant gap in efficacy can be addressed in the goal of SEG. Part of their goal is to promote sustainability in the eel sector, but according to current scientific advice, the eel cannot be caught in a sustainable way (SEG, 2021; ICES, 2021). Finally, there is the fact that the efficacy of the SEG Standard is dependent on the procurement policies of the retailers. Only when they choose to certify with the standard, traceability and legitimacy can be implemented. If retailers do not recognize the standard, it will be inefficient (A. Kerr & D. Bunt, personal communication, April 6, 2022). Such exclusion from participation in SEG certification can be the case for smaller fisheries that lack the necessary resources (economic and social) to adhere to the best management regulations. Often, they also lack funding and scientific data to get accreditation for sustainability practices (Belton et al., 2009).

ISEAL's Impacts Code feeds directly into enforcement since it describes the norms for evaluation of the impacts with regards to the objectives of the SEG Standard. According to ISEAL, all Community Members should have a monitoring and evaluation (M&E) system in place three years after reaching Community Member status. SEG has shared that the M&E system is more or less in place (D. Bunt, personal communication, April 14, 2022). However, as became apparent through the ISEAL gap analysis, there are still quite some gaps regarding the Impacts Code that need to be addressed to become fully code compliant. For example, a data management system should be developed to monitor performance. In addition, there should be opportunities for stakeholders to comment on the M&E system and to identify possible unintended effects of the standard. These results should be publicized and claims or statements made in reports must be accurate and linked to actual findings and conclusions from M&E (SEG, 2017). Development and continuous improvement of the M&E system is an expensive aspect of the standard

system which could possibly hamper SEG's compliance process (Organization 1, personal communication, April 13, 2022; Mena & Palazzo, 2012).

A positive aspect with regards to enforcement is the fact that SEG has appointed GreenPartner as CAB to provide third-party, independent certification services to companies involved in the trade of the European eel (SEG, 2022). External third-party monitoring is expected to provide more compliance than first- or second-party monitoring. The independent status of GreenPartner contributes to legitimacy through separation of powers (Mena & Palazzo, 2012).

8.4 Observations and limitations

Overall, in our interactions with SEG, they were willing to share all information we requested from them including their gap analysis of the SEG Standard against the ISEAL Codes of Good Practice, which even ISEAL commented was a big positive (Organization 1, personal communication, April 13, 2022). This can be viewed from a transparency perspective and helps the SEG Standard gain legitimacy.

At the same time, there are two key observations regarding timelines which negatively impacts SEG credibility. First, they have only achieved 33% of their own timeline commitments to address gaps against ISEAL codes (SEG ISEAL gap analysis code). Second, they have underestimated the time required to achieve ISEAL Code Compliance significantly, by at least 18 months (Organization 1, personal communication, April 13, 2022; D. Bunt, personal communication, April 14, 2022). This may reflect underlying issues with obtaining funding and resources for this effort.

Within this study, several shortcomings have been identified and warrant further study to remove bias and create a high-resolution depiction of all the information available. Due to the high information-load within the policy domain of European Eel management, the timeframe of eight weeks proved insufficient to interview and closely study all related stakeholders and available information. Therefore, we narrowed the scope and focused on the most important actors regarding this study. We conducted at least one interview per stakeholder, with the exception of important stakeholders in the commercial sector. They did not agree to be interviewed or did not respond, which could have led to an information bias. We also simplified the socio-ecological system surrounding the eel as we did not have the time or resources to investigate all aspects and an expansion of the system should be considered in future studies. Furthermore, due to scientific knowledge gaps on accurate catch data or formally defined reference points for the lower limit of eel recruitment and current stock biomass, assessing the true state of the stock and the effectiveness of certain conservation regulations was difficult (ICES, 2021). This translated into a direct effect on the outcome of our advice, where we had to take current non-scientific or mitigative measures into account which might prove to have a negative result in the end.

9. Conclusion and recommendations

SEG has also positive and valid intentions and they have proven themselves to be transparent in the sense that they shared their own confidential data with us. Furthermore, they intend to become ISEAL Code Compliant which is a positive reflection of their willingness to become legitimate. However, the continued extension of the timeline to become code compliant and their own possibly overly ambitious goal of twelve to eighteen months diminishes their credibility towards external parties and brings doubts about their available resources. Lastly, there is also the issue of receiving funding from the commercial sector who SEG certifies. This impact has been diminished to some extent by the appointment of a CAB but should be further studied.

Based on these conclusions, we provide recommendations to both SEG and Good Fish. First, the recommendations for SEG:

1. SEG should acknowledge a more realistic timeframe in their ambitions to becoming ISEAL Code Compliant. A longer timeline is not a problem but having an unrealistic one or continuing to extend it diminishes their credibility in the eyes of stakeholders and makes it difficult for stakeholders to work with them.
2. They should make a firm commitment to and acknowledge the resources required to achieve and maintain ISEAL Code Compliance and apply for ISEAL's code compliance program to emphasize their intentions.
3. To increase their legitimacy and transparency, we also recommend considering making annual public statements of income and funding, which is considered normal practice among non-profit organizations such as ASBLs. This would help decrease the potential issue of commercial funding described above.
4. The SEG Standard presents a misleading idea of sustainability; the Standard is a good traceability standard for the eel sector but (by scientific definitions) not a sustainability one and this should be reflected in the goals and vision of the SEG Standard.
5. SEG should enhance their governance to address the perception of high influence of the commercial sector on their decision making. Increasing the participation of the conservation sector in the Board meetings would help in this regard. As mentioned earlier, a similar issue was addressed by MSC through setting up a Stakeholder Panel to increase engagement with stakeholders.

We advise Good Fish that the SEG Standard is good at providing traceability in the eel sector, which is a crucial part of the process, but cannot be considered sustainable considering the precautionary advice of ICES and given the scientific knowledge gaps surrounding the eel.

Finally, we recommend Good Fish and SEG to collaborate with each other through finding common ground, as both share a vision of European eel recovery and its sustainable use. For example, there could be greater collaboration on working towards filling in the gaps in scientific knowledge or becoming involved in the standard setting and revision process through a stakeholder panel.

References

- AMBER. (n.d.) *Amber barrier atlas*. <https://amber.international/european-barrier-atlas/>
- Belton, B., Little, D., & Grady, K. (2009). Is responsible aquaculture sustainable aquaculture? WWF and the eco-certification of tilapia. *Society and Natural Resources*, 22(9), 840-855.
- Bernstein, S. (2011). Legitimacy in intergovernmental and non-state global governance. *Review of International Political Economy*, 18(1), 17-51. <https://doi.org/10.1080/09692290903173087>
- Boedeltje, M., & Cornips, J. (2004). Input and output legitimacy in interactive governance (No. NIG2-01). NIG Annual Work Conference 2004 Rotterdam. Retrieved from <http://hdl.handle.net/1765/1750>
- Beardmore, B., Dorow, M., Haider, W., & Arlinghaus, R. (2011). The elasticity of fishing effort response and harvest outcomes to altered regulatory policies in eel (*Anguilla anguilla*) recreational angling. *Fisheries Research*, 110(1), 136-148.
- Bonhommeau, S., Chassot, E., Planque, B., Rivot, E., Knap, A.H., & Le Pape, O. (2008). Impact of climate change on eel populations of the Northern Hemisphere. *Marine Ecology Progress*

- Series*, 373, 71-80.
- Bronnmann, J., & Hoffmann, J. (2018). Consumer preferences for farmed and ecolabeled turbot: A North German perspective. *Aquaculture Economics & Management*, 22(3), 342-361.
- Carballo Cárdenas, E. (2021). *Lecture 4: Private approaches to governing risk. Issues of legitimacy* [PowerPoint slides]. ENP 35806. Wageningen University.
- Cashore, B. (2002). Legitimacy and the privatization of environmental governance: How non-state market-driven (NSMD) governance systems gain rule-making authority. *Governance*, 15(4), 503-529.
- CITES. (n.d.). How CITES works. <https://cites.org/eng/disc/how.php>
- Coates, P.A. (2021). Protecting Eurofisch: an environmental history of the European eel and its Europeanness. In Wöbse, A-K., & Kupper, P (Eds.). *Greening Europe: environmental protection in the long twentieth century – a handbook* (pp. 101-128). Leck, Germany: CPI books GmbH.
- Dekker, W. (2019). The history of commercial fisheries for European eel commenced only a century ago. *Fisheries Management and Ecology*, 26(1), 6-19. <https://doi.org/10.1111/fme.12302>
- DUPAN. (2022, February 3). Palingkwekerijen volledig over op SEG-gecertificeerde glasaal. <https://dupan.nl/palingkwekerijen-volledig-over-op-seg-gecertificeerde-glasaal/>
- DUPAN. (n.d.). Visie. <https://dupan.nl/visie/>
- Downing, A. S., van Nes, E. H., Balirwa, J. S., Beuving, J., Bwathondi, P. O., Chapman, L. J., ... & Mooij, W. M. (2014). Coupled human and natural system dynamics as key to the sustainability of Lake Victoria's ecosystem services. *Ecology and Society*, 19(4).
- ESA. (n.d.). *Eel stewardship association*. <https://www.esf.international/eel-stewardship-association/>
- European Commission (EC). (2007). Council Regulation (EC) No. 1100/2007 of 18 September 2007 establishing measures for the recovery of the stock of European eel. O.J.E.U. (L248) 17-23.
- European Commission (EC). (2014, October). *Report from the Commission to the Council and the European Parliament on the outcome of the implementation of the eel management plans, including the evaluation of the measures concerning restocking and of the evolution of market prices for eels less than 12 cm in length*. (No. 52014DC0640). <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM:2014:640:FIN>
- European Commission. (n.d.). *Eel*. https://ec.europa.eu/oceans-and-fisheries/ocean/marine-biodiversity/eel_en
- European Commission, Directorate-General for Maritime Affairs and Fisheries, MacNab, S., Luchetta, G., Nimmo, F. (2020). *Evaluation of the Eel Regulation: final report*. Publications Office. <https://data.europa.eu/doi/10.2771/679816>
- FAO. (2018). *The state of world fisheries and aquaculture – meeting the sustainable development goal*. Food and Agriculture Organization of the United Nations. <https://www.fao.org/documents/card/en/c/I9540EN/>
- Feunteun, E. (2002). Management and restoration of European eel population (*Anguilla anguilla*): an Impossible bargain. *Ecological Engineering*, 18(5), 575-591. [https://doi.org/10.1016/S0925-8574\(02\)00021-6](https://doi.org/10.1016/S0925-8574(02)00021-6)
- Feunteun, E., & Prouzet, P. (2020). Forty years of decline and 10 years of management plan: are European eels (*Anguilla anguilla*) recovering? In Ceccaldi, H.J., Komatsu, T., Sautour, B., Hénocque, Y., Prouzet, P., & Yoshida, J (Eds.), *Evolution of Marine Coastal Ecosystems under the Pressure of Global Changes: Proceedings of Coast Bordeaux Symposium and of the 17th French-Japanese Oceanography Symposium* (pp. 269-295). Bordeaux, France: University of Bordeaux.
- FishSec. (2020, March 10). *FishSec receives funding for work on European eel*. <https://www.fishsec.org/2020/03/10/fishsec-receives-funding-for-work-on-european-eel/>

- FishSec. (2021, February 23). Work and goal. <https://www.fishsec.org/our-work-and-goal/>
- Fuchs, D., Kalfagianni, A., & Havinga, T. (2011). Actors in private food governance: The legitimacy of retail standards and multistakeholder initiatives with civil society participation. *Agriculture and Human Values*, 28, 353-367. <https://doi.org/10.1007/210460-009-9236-3>
- Good Fish. (n.d.). *Over ons*. <https://www.goodfish.nl/over-ons/>
- Groen, M., D. van der Hak, M. Verhofstad & M.E. Schiphouwer, Onderzoek naar de bereikbaarheid van ons water. Power to the Palingprijs 2021. RAVON, Nijmegen. Rapportnummer 2019.404.
- Harper, R. (2022, January 11). Eel sector slams ICES fishing ban advice. *Fishing News*. <https://fishingnews.co.uk/news/eel-sector-slams-ices-fishing-ban-advice/>
- Hering, D., Borja, A., Carstensen, J., Carvalho, L., Elliott, M., Feld, C.K., Heiskanen, A-S., Johnson, R.K., Moe, J., Pont, D., Solheim, A.L., & van de Bund, W. (2010). The European Water Framework Directive at the age of 10: A critical review of the achievements with recommendations for the future. *Science of the Total Environment*, 408(19), 4007-4019. <https://doi.org/10.1016/j.scitotenv.2010.05.031>
- Husted, B.W., & Allen, D.B. (2006). Corporate social responsibility in the multinational enterprise: Strategic and institutional approaches. *Journal of International Business Studies*, 37(6), 838-849. <https://doi.org/10.1057/palgrave.jibs.8400227>
- ICES. (2021). Advice on fishing opportunities, catch, and effort ecoregions in the Northeast Atlantic. ICES. <https://doi.org/10.17895/ices-advice.7752>
- ICES, WGEEL. (2021). Workshop on the Future of Eel Advice (WKFEA) ICES Scientific Reports. <https://doi.org/10.17895/ices.pub.5988>
- ICES WKEPMP. (2013). Report on the Workshop on Evaluation Progress Eel Management Plans (WKEPMP). In: ICES Advisory Committee (ed.).
- IFEA. (2018, October). *Protokoll der mitgliederversammlung der initiative zur förderung des europäischen aals e.V. NR. 1/2018*. Unpublished company document.
- ISEAL. (n.d.-a). *ISEAL credibility principles*. <https://www.isealalliance.org/defining-credible-practice/iseal-credibility-principles>
- ISEAL. (n.d.-b). *ISEAL Code of Good Practice*.
- ISEAL. (n.d.-c). *Our mission*. <https://www.isealalliance.org/about-iseal/who-we-are>
- Jacoby, D., & Gollock, M. (2014). *Anguilla anguilla*. The IUCN Red List of Threatened Species 2014. <https://dx.doi.org/10.2305/IUCN.UK.2014-1.RLTS.T60344A45833138.en>
- Kerr, A. (2020). *Bending the curve for the European eel* [PowerPoint slides]. <https://www.sustainableeelgroup.org/wp-content/uploads/2020/12/SEG-Impacts-report-Dec-2020.pdf>
- Liefferink, D. (2006). The dynamics of policy arrangements: Turning round the tetrahedron. *Institutional dynamics in environmental governance* (pp. 45-68). Springer, Dordrecht. https://doi.org/10.1007/1-4020-5079-8_3
- Loconto, A., & Fouilleux, E. (2013). Politics of private regulation: ISEAL and the shaping of transnational sustainability governance. *Regulation & Governance*, 8(2), 166-185. <https://doi.org/10.1111/rego.12028>
- Magnusson, A.K., & Dekker, W. (2020). Economic development in times of population decline – a century of European eel fishing on the Swedish west coast. *ICES Journal of Marine Science*, 78(1), 185-198. <https://doi.org/10.1093/icesjms/fsaa213>
- Matondo, B.N., Delrez, N., Bardonnnet, A., Vanderplasschen, A., Joaquim-Justo, C., Rives, J., Benitez, J-P., Dierckx, A., Séleck, E., Rollin, X., & Ovidio, M. (2022). A complete check-up of European eel after eight years of restocking in an upland river: Trends in growth, lipid content, sex ratio and health status. *Science of the Total Environment*, 807, 151020.
- Mena, S., & Palazzo, G. (2012). Input and output legitimacy of multi-stakeholder initiatives. *Business*

- Ethics Quarterly*, 22(3), 527–556. <https://doi.org/10.5840/beq201222333>
- Ministry of Agriculture, Nature and Food Quality. (2009). The Netherlands Eel Management Plan. <https://netviswerk.nl/wp-content/uploads/2018/07/Nederlands-Beheerplan-aal-aangepast.pdf>
- Moriarty, C., & Dekker, W. (1997). Management of the European eel. Marine Institute.
- Naranjo-Madrugal, H., van Putten, I., & Norman-López, A. (2015). Understanding socio-ecological drivers of spatial allocation choice in a multi-species artisanal fishery: A Bayesian network modelling approach. *Marine Policy*, 62, 102-115.
- OECD. (2011). Achieving Effective Boards: A comparative study of corporate governance frameworks and board practices in Argentina, Brazil, Chile, Colombia, Mexico, Panama and Peru. <https://www.oecd.org/brazil/48510039.pdf>
- Okamura, A., Horie, N., Mikawa, N., Yamada, Y., & Tsukamoto, K. (2014). Recent advances in artificial production of glass eels for conservation of anguillid eel populations. *Ecology of Freshwater Fish*, 23(1), 95-110.
- Paiement, P. (2016). ISEAL Alliance and the administrative governance of transnational sustainability standards. *Tilburg Law Review*, 21(2), 144-168. <https://doi.org/10.1163/22112596-02102004>
- Palomares, M.L.D., Froese, R., Derrick, B., Meeuwig, J.J., Noël, S.-L., Tsui, G., Woroniak, J., Zeller, D., & Pauly, D. (2020). Fishery biomass trends of exploited fish populations in marine ecoregions, climatic zones and ocean basins. *Estuarine, Coastal and Shelf Science*, 243, 106896. <https://doi.org/10.1016/j.ecss.2020.106896>
- Pauly, D., Christensen, V., Guénette, S., Pitcher, T.J., Sumaila, U.R., Walter, C.J., Watson, R., & Zeller, D. (2002). Towards sustainability in world fisheries. *Nature*, 418, 689-695. <https://doi.org/10.1038/nature01017>
- Pauly, D., & Zeller, D. (2016). *Global atlas of marine fisheries: A critical appraisal of catches and ecosystem impacts*. Island Press.
- Pedersen, M.I. (2000). Long-term survival and growth of stocked eel, *Anguilla anguilla* (L.), in a small eutrophic lake. *Dana*, 12, 71-76.
- Petersson, M. T. (2022). Transparency in global fisheries governance: The role of non-governmental organizations. *Marine Policy*, 136, 104128. <https://doi.org/10.1016/j.marpol.2020.104128>
- Pike, C., Crook, V., & Gollock, M. (2020). *Anguilla anguilla*. IUCN Red List. <https://www.iucnredlist.org/species/60344/152845178>
- Podda, C., Palmas, F., Pusceddu, A., & Sabatini, A. (2021). Hard times for catadromous fish: the case of the European eel *Anguilla anguilla* (L. 1758). *Advances in Oceanography and Limnology*, 12(2). <https://doi.org/10.4081/aiol.2021.9997>
- Power to the Eel. (n.d.). *Power to the eel*. <https://powerpaling.nl/en>
- Psuty, I., & Draganik, B. (2008). The effectiveness of glass eel stocking in the Vistula lagoon, Poland. *Acta Ichthyologica et Piscatoria*, 2(38), 103-111.
- Roheim, C. A., & Zhang, D. (2018). Sustainability certification and product substitutability: Evidence from the seafood market. *Food Policy*, 79, 92-100.
- Roheim, C. A., Bush, S. R., Asche, F., Sanchirico, J. N., & Uchida, H. (2018). Evolution and future of the sustainable seafood market. *Nature Sustainability*, 1(8), 392-398.)
- Rosell, R., Evans, D., & Allen, M. (2005). The eel fishery in Lough Neagh, Northern Ireland – an example of sustainable management? *Fisheries Management Ecology*, 12(6), 377-385.
- Schmitz-Hoffmann, C., Schmidt, M., Hansmann, B., Palekhov, D., & Smyth, D.M. (2014). *Voluntary Standard Systems: A Contribution to Sustainable Development*. Heidelberg: Springer.
- SEG. (2016, September). *The Sustainable Eel Group governance summary*. <https://www.sustainableeelgroup.org/wp-content/uploads/2016/09/004-SEG-Governance-Summary-V1.2.pdf>
- SEG. (2017, November 30). *Review of the Sustainable Eel Group Standard*. Retrieved from

- <https://www.sustainableeelgroup.org/seg-standard-consultation-2017/>
- SEG. (2018). *The SEG Standard*. Version 6.
<http://www.sustainableeelgroup.org/wpcontent/uploads/2018/06/SEG.Standard6.0.pdf>
- SEG. (2020a). *Governance and income 2019*. <https://www.sustainableeelgroup.org/wp-content/uploads/2020/10/014-SEG-Governance-and-Income-2019.pdf>
- SEG. (2020b). *SEG ISEAL Codes Gap Analysis November 2020 V3*. Unpublished company document.
- SEG. (2021, November). *SEG vision on protection and recovery of the European eel*.
<https://www.sustainableeelgroup.org/wp-content/uploads/2021/11/SEG-position-on-protection-and-recovery-Fall-2021.pdf>
- SEG. (2022, March 4). *GreenPartner appointed as conformity assessment body for SEG*.
<https://www.sustainableeelgroup.org/wp-content/uploads/2022/03/220304-Press-release-SEG-CAB.pdf>
- SEG. (n.d.-a). *About us*. <https://www.sustainableeelgroup.org/about-seg/>
- SEG. (n.d.-b). *Conflict of interest policy*. <https://www.sustainableeelgroup.org/conflict-of-interest-policy/>
- SEG. (n.d.-c). *Science: Scientific publications*.
<https://www.sustainableeelgroup.org/scientific-publications/>
- Sonne, C., Peng, W.X., Alstrup, A.K.O., & Lam, S.S. (2021). European eel population at risk of collapse. *Science*, 372(6548), 1271. <https://doi.org/10.1126/science.abj3359>
- Tamario, C., Calles, O., Watz, J., Nilsson, P.A., & Degerman, E. (2019). Coastal river connectivity and the distribution of ascending juvenile European eel (*Anguilla anguilla* L.): implications for conservation strategies regarding fish-passage solutions. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 29(4), 612-622. <https://doi.org/10.1002/aqc.3064>
- Tamario, C., Degerman, E., Donadi, S., Spjut, D., & Sandin, L. (2018). Nature-like fishways as compensatory lotic habitats. *River Research and Applications*, 34(3), 253-261.
<https://doi.org/10.1002/rra.3246>
- Thames Rivers Trust. (2021). *Complex life cycle of an eel* [online image].
<https://www.thamesrivertrust.org.uk/thames-catchment-community-eels-project/life-cycle-of-an-eel/>
- Tyler, T. R. (1997). The psychology of legitimacy: a relational perspective on voluntary deference to authorities. *Personality and Social Psychology Review*, 1(4), 323-345.
https://doi.org/10.1207/s15327957pspr0104_4
- van de Wolfshaar, K.E., Griffioen, A.B., Winter, H.V., Tien, N.S.H., Gerla, D., van Keeken, O., & van der Hammen, T. (2018). Evaluation of the Dutch Eel Management Plan 2018: Status of the eel population in 2005-2016 (No. 18.009). Stichting Wageningen Research, Centrum voor Visserijonderzoek (CVO).
- van den Thillay, G.E. (2014). European eels: Dutch fisheries, culture, and eel migration. In *Eels and Humans* (pp. 61-74). Springer, Tokyo. https://doi.org/10.1007/978-4-431-54529-3_4
- van der Hammen, T. (2018, September). *Evaluation of glass eel and ongrown eel restocking practices in The Netherlands* (1825402.TvdH-ih). Wageningen Marine Research.
- Wetlands International. (n.d.). <https://www.wetlands.org>
- Wickström, H., Westin, L., & Clevestam, P. (1996). The biological and economic yield from a long-term eel-stocking experiment. *Ecology of Freshwater Fish*, 5, 140-147.
<https://doi.org/10.1111/j.1600-0633.1996.tb00046.x>
- Zenimoto, K., Sasai, Y., Sasaki, H., & Kimura, S. (2011). Estimation of larval duration in *Anguilla* ssp., based on cohort analysis, otolith microstructure, and Langrangian simulations. *Marine Ecology Progress Series*, 438, 219-228.

Appendices

Appendix 1: Long-list stakeholders

Good Fish: Good Fish, the commissioner of this project, has great interest in this project and the outcomes. They have the power to influence the retailers in the Netherlands through the Fish Guide.

SEG: The Sustainable Eel Group is a conservation organization with the aim of aiding eel recovery. In 2020, SEG published their vision on the status of the European eel stock and suggested solutions for the population recovery (SEG, 2021). They have lots of interest in the eel topic and seem have sufficient resources and funding to affect the eel sector.

European Commission: They act as an executive body of the EU and represent the EU in the international field. They are responsible for legislative activities such as creating proposals, budget management, and EU law enforcement. They play a big role in tackling the eel issue and they have the power to influence European countries or to give directives to them.

DUPAN: Duurzame Palingsector Nederland is a foundation with partner bodies with the aim of promoting activities that will contribute to the recovery and the conservation of the eels in the Netherlands. They are also part of the Eel Stewardship Fund (ESF) (DUPAN, n.d.). They represent Dutch eel fishers, breeders, and traders. They have a big interest in the field and high power in terms of funding and in terms of influencing the decision-making process. They have influence over their members and the commercial sector.

ESA: The Eel Stewardship Association is an administrative organization and founder of the ESF. ESA was established in 2015 by Dutch industry organizations with the goal to ensure a sustainable use of the eel stock (ESA, n.d.). In this assessment, ESA has great interest in the eel sector and enough power and funds to influence and promote changes.

ISEAL: They provide membership and partnership to more than a hundred countries concerning the field of sustainability. Their mission is to improve the impact of ambitious sustainability systems to accelerate innovative change (ISEAL, n.d.-c). In their work, they define credible practice for sustainability systems, and they are involved in the discussion about the eels because SEG is attempting to achieve ISEAL code compliance for the SEG Standard. ISEAL has low power to influence the decision-making process and low interest in general, but they are a key stakeholder for the SEG Standard.

FishSec: The Fisheries Secretariat (FishSec) is a politically independent non-profit organization with the aim of the protection and restoration of marine ecosystem services, with a particular focus on fisheries. FishSec has high interest and low power to influence the decision-making process (FishSec, 2022).

Dutch Government: The Ministry of Agriculture, Nature and Food Quality launched the Netherlands Eel Management Plan in 2009, with guidelines concerning restocking, monitoring, and measures to take to tackle the issue of the eel population decrease (Ministry of Agriculture, Nature and Food Quality, 2009). The local Dutch government is interested in helping the recovery, but it also has the interest to preserve the economic role of local fishermen and the Dutch cultural point of view, so its mitigation actions are sometimes very connected to the EU ones.

Instituut voor Natuur en Bosonderzoek: They are a research institute based in Brussels, Belgium. They work to raise awareness and to share information and innovative knowledge. According to the stakeholder’s diagram, they are a ‘defender’ and should be kept informed.

MSC: The Marine Stewardship Council is an international non-profit organization involved in the protection of the oceans and wants to guarantee seafood supplies for the future. They promote ecolabels and certifications for rewarding sustainable fishing practices and for raising awareness and influencing consumers and national and international distributors (Marine Stewardship Council, 2022). MSC has high power to promote the eel’s recovery with its influence, international importance, and reputation, but it has low interest in this specific topic.

GSSI: The Global Sustainable Seafood Initiative is an organization that aims to make seafood sustainable and provides certification schemes. They have higher power in making decisions and their interest is in between the category of ‘latents’ and ‘promoters’.

Dutch Fishermen: They are represented by DUPAN and have individual interests in the eel problem. They have high interest but low power as individuals. They should be kept informed.

Distributors: Companies and people who distribute eel to the market. They have high power but low interest and should be kept satisfied.

Consumers: The people who are purchasing eel products. In general, they have low interest and low power to promote changes and are considered ‘apathetics’ that should be monitored.

Eel farmers: They are more involved in the glass eels trade, but a label could also influence their work. They have a lot of interest in the sector, but low power. Like the fishermen they are represented by DUPAN. They should be kept informed.

ICES: The International Council for the Exploration of the Sea is an organization that aims to provide impartial scientific advice on marine sustainability. They have low interest and low power and need to be monitored.

Appendix 2: Stakeholder interviews

Interview were conducted with a number of key stakeholders regarding the objectives of the projects and are summarized in supplementary table 1 below.

Supplementary table 1: Overview of people and organizations interviewed. Organizations represented by interviewees that wish to remain anonymous or that did not fill out the consent form are codified.

Codification	Organization	Interviewee
No codification	Wetlands International	Paul Brotherton
NGO 1	Anonymous	Anonymous
No codification	Sustainable Eel Group	Andrew Kerr, David Bunt
No codification	Good Fish	Margreet van Vilsteren

NGO 2	Anonymous	Anonymous
Organization 1	Anonymous	Anonymous
No codification	Group Aguirrebarrena	Jose Antonio Aguirrebarrena

Appendix 3: ISEAL Community Member requirements

S. No.	Requirements
1	An eligible organization must: a) Be registered as a legal entity and shall declare to ISEAL its corporate structure and annual incomes b) Have a sustainability-focused mission c) Define a voluntary standard, performance level, or improvement pathway (e.g., KPIs and targets) relative to one or more sustainability topics d) Undertake monitoring, verification or assurance of its standard, performance level, or improvement pathway e) Manage claims related to its standard(s), performance level(s) or improvement pathway(s) f) Have a conflict-of-interest policy or policies that applies to its governance and decision-making bodies, staff and, consultants
2	An eligible organization must make the following information publicly available and provide this to ISEAL as a system overview: a) Its theory of change (defined sustainability outcomes and strategies for achieving these) b) Its standard(s), performance level(s), or improvement pathway(s) c) A description of its monitoring, verification or assurance system d) A description of its claims model and the claims it allows e) Its income sources and its governance structure f) A description of stakeholder engagement in the development and revision of both its theory of change and its standard, performance level or improvement pathway
3	An eligible organization must have a publicly available complaint or dispute resolution mechanism
4	An eligible organization must undergo a gap analysis against the Standard-Setting, Assurance and Impacts Codes and provide a clear rationale where elements of a Code do not apply to its model or system
5	An eligible organization agrees that should they be approved as an ISEAL Community Member, ISEAL will make the following information publicly available: Basic scope and reach data Status of participation in the compliance program (i.e., assessed, not assessed) and the allowed claims
6	An eligible organization agrees that should they be approved as an ISEAL Community Member, ISEAL will make the following information available to other Community Members: System overviews Entry assessments against ISEAL's Standards-Setting, Assurance and Impacts Codes Annual improvement plans against ISEAL's Codes and annual progress reports against these plans

Appendix 4: Contact information



Kerkewijk 46
3901 EH Veenendaal
The Netherlands
+31 318 76 92 87
info@goodfish.nl
www.goodfish.nl