State of Sustainability Initiatives Review:

STANDARDS AND THE BLUE ECONOMY

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SSI State of Sustainability Initiatives

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Note from the SSI Management Team

The State of Sustainability Initiatives (SSI) project was founded under the auspices of the UNCTAD/IISD Sustainable Commodity Initiative and is implemented by the International Institute for Environment and Development (IIED), the International Institute for Sustainable Development (IISD) and the Finance Alliance for Sustainable Trade (FAST). The SSI is motivated by recognition of the need for improved information exchange among stakeholders in voluntary sustainability initiatives and among voluntary sustainability standards themselves. The objective of the SSI is to stimulate regular reporting on the state of play across voluntary sustainability initiatives, offering a framework for understanding the characteristics, important issues and market trends for select sustainability initiatives and standards operating in global markets.

It is hoped that the SSI Review can serve as a tool for learning and strategic decision making between the public and private sectors as well as sustainability initiatives themselves.

The SSI management team

The Swiss State Secretariat for Economic Affairs (SECO) is a founding and core donor of the SSI project. Current funding for the SSI is provided as part of a larger initiative led by SECO entitled the VSS Information System Programme, which supports data collection and dissemination to enable more strategic decision making by investors and other stakeholders in sustainable supply chains.

Foreword

The concept of the "blue planet" for many people conjures up a sense of the unknown, the unsettling and the unmanageable. It is the realm of the explorer still, and without a doubt, many important discoveries are yet to be made. Many involve the science of sustainability—and the mechanisms required to successfully manage our use of the world's seas and coastal areas. Success is critical for many reasons. Above all, we are destroying biological diversity and habitats of our "one ocean" in ways that make sustainable use of resources and ecological services increasingly difficult wherever we live. Certainly, climate change impacts on the ocean are already closing options for people in all parts of the planet. Whether in the Himalayan highlands, the coastal regions and island states throughout the world, or inland deserts, there is a dependency for food and services linked to the health of the blue planet. These dependencies will continue to grow and become more complex over time.

It is fashionable now to speak of a "blue economy." In the mindset of some, this is primarily an exercise in how to extract more economic value from the oceans. For others, it is a clever twist to seek higher economic and social value while providing greater ecological security of use. This is much the same as the more generally applied "green growth" and "green economy" concepts. Or so it might seem. Yet it really is not the case. The knowledge gap is far greater for the blue economy, and the necessary instruments are far less developed. It would be nice to believe, for example, that we truly understand the complex interactions within ocean ecosystems necessary for sustainable fisheries management, or that we have achieved sustainable aquaculture. Or that the problems of waste from land-based sources of marine pollution have been solved. But the warning signals concerning the health of our ocean signal serious danger ahead.

The State of Sustainability Initiatives (SSI) project is a multi-institutional effort to understand and report on market-based approaches to sustainable commodity production and trade. Specifically, the SSI analyzes the valuable global effort under way now for more than two decades to develop and gain widespread acceptance of voluntary sustainability initiatives and standards such as those applied to a wide variety of agricultural and forest products. The current report uses the analytical framework devised and used for a number of land-based commodities but here adapted to ocean wild fish and aquaculture. The study is a pioneering effort that assembles and comparatively analyzes an information and analytical base covering some major marine and freshwater sustainability-oriented certification initiatives.

This report is a key contribution to the SSI, relevant to both small and large producers and helpful to a range of stakeholders, including those who may be thinking about but are not actively engaged with the voluntary standards, best practices and certification systems examined. Most of the world's fish producers do not participate in these systems at present. While globalization in aquatic food supply chains has taken off in the past 20 years, there has not been commensurate uptake in voluntary measures for sustainability. Progress appears to be mainly concentrated in developed-country markets, plus some locations in developing countries with export-oriented products. Given that the greatest expansion of future supply and demand will involve developing countries, including from their offshore waters

and aquaculture, expanded participation of local producers is essential. This is one of the main themes running through the document, including careful analysis of the need to give attention to social and economic considerations.

Another important matter covered in some detail is the issue of Chain of Custody. With globalized supply chains, even the species identity can be in doubt. Fish caught off West Africa may be transshipped to a European port, then exported to China or another country for processing, then re-exported as a semi-finished product to Canada, processed there, and then end up in an American supermarket or restaurant. Tracking is made worse if record keeping along the chain is inadequate. The important efforts of the Food and Agriculture Organization (FAO) and other organizations to stamp out illegal, unreported and unregulated fishing can be helped by voluntary certification efforts. Readers are presented with adequate information to see how well or poorly the various mechanisms are working.

Aquaculture standards and certification have been given a lot of attention in the past decade. Much of this attention is for relatively new systems in developing countries, such as pangasius in Vietnam and tilapia in China. These are examples where integrated approaches can be taken, since there are now well-developed fish meal certification standards, plus sound environmental, social and economic indicators. Generally, efforts with aquaculture can be introduced in a stepwise fashion, a point that is evident for a number of the cases analyzed.

This very comprehensive report is intended to be as rigorous as the databases permit. The authors are not promoting any particular approach, nor are they setting out to challenge what has been a valiant and adaptive effort on the part of individual certification systems. At the same time, they also note the need for customized approaches for the specific circumstances found in particular locations, levels of sophistication and so on. The document is a snapshot of efforts that will mature and hopefully attract greater attention in the coming years.

Returning to my opening point, the blue planet is in trouble, and standards, indicators and certification can help us improve our use and put in place modern safeguards for ocean sustainability. The blue economy must be understood in its broadest and most ecological dimensions. For the sea truly is the foundation of our home, our natural wealth and our well-being.

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We express our deep gratitude to all the sustainability initiatives that agreed to provide information to the SSI project, both directly and through the International Trade Centre's T4SD database. The shared commitment to transparency demonstrated by these organizations is particularly appreciated within the context of the limited resources of most initiatives. Participating organizations include the Aquaculture Stewardship Council (ASC), Friend of the Sea (FOS), Global Aquaculture Alliance (GAA) Best Aquaculture Practices (BAP), Global Partnership for Good Agricultural Practice (GLOBALG.A.P.), International Federation of Organic Agriculture Movements (IFOAM), Marine Stewardship Council (MSC), and Naturland.

We are also very grateful to our expert reviewers: Simon Bush, Arthur Hanson and James Sullivan—their insight and guidance has been invaluable to strengthening the relevance and accuracy of the report.

Finally, the *SSI Review: Standards and the Blue Economy* would not have been possible without the contribution of the State Secretariat for Economic Affairs (SECO). This report was also financially underwritten by the IISD, IIED and FAST.

Methodology, Data Sources and Disclaimers

The State of Sustainability Initiatives (SSI) was launched in 2008 with a view to providing an international baseline for understanding key performance characteristics associated with voluntary sustainability initiatives.[1] A key aspect of the SSI analysis is its use of standardized indicators and methodologies throughout its reporting. A full listing of the SSI indicators, including modifications adopted for reporting specifically on seafood standards, can be found in Appendix I.

One of the objectives of the SSI project is to contribute to the development of a more harmonized infrastructure for data collection and reporting. To that end, the SSI has worked in close partnership with a number of other leading organizations that share a similar objective, including, among others, the International Trade Centre (ITC), the International Social and Environmental Accreditation and Labelling Alliance (ISEAL), and the Research Institute of Organic Agriculture/Forschungsinstitut für biologischen Landbau (FiBL).

In particular, and in order to promote efficiency and accuracy, we have both fed data to, and drawn data from, the ITC's Standards Map database wherever possible. For data not covered under the ITC Standards Map database, we have relied primarily on assessment of the standard documents, direct communication with standard-setting bodies and third-party literature. Below is a brief listing of data sources, unless otherwise specified in the report:

- Standard system data: standard documents and websites, the ITC, and standard bodies
- Governance data: standard websites, standard bodies and the ITC
- Standard system content and criteria data: standard documents and the ITC
- Market data: standard bodies, institutional documents and third-party literature

Unless otherwise reported, all of the market analysis and numerical representations of all data, regardless of the source, are strictly the work and responsibility of the SSI. For a complete listing of assumptions and methodologies used throughout the report, please see Appendix II. Although we have done our best to ensure that our reporting reflects the data as provided by these sources as accurately as possible through a three-stage vetting process,[2] the SSI takes full responsibility for all data and analysis contained within this report.

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1 The full set of SSI indicators, including the content and criteria indices, were developed with the oversight of the advisory panel to the *SSI Review 2010*. These indicators were subsequently integrated directly into the ITC T4SD Standards Map database and represent the backbone of the ITC's global framework for tracking standard-related data and information (ITC, 2015). For the *SSI Review,* social, environmental and economic indicators were added specific to the aquaculture and wild catch fisheries sector that will be incorporated into the ITC T4SD standards map. These aquaculture and wild catch specific indicators were assessed directly from standards documents by the SSI team.

2 The report is vetted by a series of expert reviewers, the SSI Advisory Panel and the standard bodies included in the report.

Acronyms

ASC	Aquaculture Stewardship Council
BAP	Best Aquaculture Practices
CoC	Chain of Custody
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization of the United Nations
FiBL	Research Institute of Organic Agriculture / Forschungsinstitut für biologischen Landbau
FIP	fishery improvement project
FOS	Friend of the Sea
GAA	Global Aquaculture Alliance
GATT	General Agreement on Tariffs and Trade
GFSI	Global Food Safety Initiative
GGN	GLOBALG.A.P. number
GLOBALG.A.P.	Global Partnership for Good Agricultural Practice
GMO	genetically modified organism
GRASP	GLOBALG.A.P. Risk Assessment on Social Practice
GSSI	Global Sustainable Seafood Initiative
IDH	Sustainable Trade Initiative
IFOAM	International Federation of Organic Agriculture Movements
IISD	International Institute for Sustainable Development
ILO	International Labour Organization
IRF	Iceland Responsible Fisheries
ISEAL	International Social and Environmental Accreditation and Labelling Alliance
ISO	International Organization for Standardization
ITC	International Trade Centre
IUU	illegal, unreported and unregulated
MSC	Marine Stewardship Council
nei	not elsewhere identified
NGO	non-governmental organization
OECD	Organisation for Economic Co-operation and Development
SDG	Sustainable Development Goal
SSI	State of Sustainability Initiatives
TPP	Trans-Pacific Partnership
UNCLOS	United Nations Convention on the Law of the Sea
UNFSA	United Nations Fish Stock Agreement
UNEP	United Nations Environment Programme

Normative Documents

1966	United Nations Convention on Fishing and Conservation of the Living Resources of the High Seas
1982	United Nations Convention on the Law of the Sea
1992	Agenda 21 of the Rio Declaration, Section 17.1
1995	FAO Code of Conduct for Responsible Fisheries
1995	United Nations Fish Stocks Agreement
2001	Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem
2005	Mauritius Strategy for the Further Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States
2009*	FAO Guidelines for the Ecolabelling of Fish and Fishery Products From Marine Capture† Fisheries
2011	FAO Guidelines for the Ecolabelling of Fish and Fishery Products From Inland Capture Fisheries
2011	FAO International Guidelines on Bycatch Management and Reduction of Discards
2012	FAO Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security

Units of Measure

€	Euro
£	Pound sterling
ha	Hectare
kg	Kilogram
mt	Metric ton
US$	US dollar

* First edition 2005.

† The terms wild catch fisheries and capture fisheries are used interchangeably throughout this report. The FAO uses the term capture fisheries.

Executive Summary

The seafood industry represents a critical source of food protein and global employment. In 2014, the overall trade value of the seafood sector was estimated at US$140 billion, making it one of the most valuable non-petroleum products traded internationally. An estimated 3 billion people depend on seafood as their primary source of protein, while an estimated 10 to 12 per cent of the world's population is either directly or indirectly dependent on seafood for their livelihoods. Growing demand for seafood products globally has continued to put pressure on global fish stocks, with an estimated 88 per cent of fish stocks being either fully exploited or overexploited. While farmed fish has the potential to relieve the burden on wild fish stocks, it too faces a number of sustainability challenges associated with ecosystem destruction, synthetic inputs, feed and waste management.

Recently, considerable attention has been turned to the importance of ocean resources in setting the foundation for social, environmental and economic sustainability, particularly among coastal nations. Building on this observation, many stakeholders are calling for the development of a "blue economy"—an integrated approach to sustainable development that builds on the understanding that the world's oceans not only account for more than 70 per cent of the planet's surface area, but also form the foundation of global economic sustainability.

Within this context the seafood sector has a particularly important role to play. An estimated 80 per cent of all seafood is produced in developing countries, with more than 90 per cent of fishers and fish farmers being located in Africa and Asia.

The close relationship between seafood production and global sustainability has given rise to a host of voluntary sustainability standards seeking to ensure the application of sustainable practices in the sector. While one of the main purposes of such initiatives is to facilitate consumer choice, their multiplication is presenting consumers and manufacturers with ever more complex choices. The *State of Sustainability Initiatives Review: Standards and the Blue Economy* offers a rare analysis of the market and performance characteristics of international sustainability standards operating across both the wild catch and aquaculture sectors. Below is a summary of the main findings of our review.

Production of certified seafood has grown rapidly over the past decade and now represents a significant portion of global production.

Between 2003 and 2015, certified sustainable seafood (both aquaculture and wild catch) grew from 500,000 metric tons (0.5 per cent of global production) to 23 million metric tons (14 per cent of global production) at a rate of 35 per cent per annum (10 times faster than the growth of global seafood production over the same time period).

The estimated retail value of certified seafood reached US$11.5 billion in 2015, with demand being driven by manufacturers and retailers in developed-country markets.

Global demand for sustainable seafood is driven almost entirely by Japan, North America and Europe. Manufacturers and retailers serving these markets have driven demand through corporate commitments to sustainable sourcing. Near-term growth in demand for sustainable seafood is likely to be driven by continuing efforts to fulfill corporate commitments and market access requirements, rather than by consumers seeking sustainable products or individual companies seeking brand differentiation.

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Eighty per cent of certified seafood is wild catch, but certified aquaculture is growing twice as fast as certified wild catch.

Historically, the most pronounced seafood-related sustainability challenges have revolved around the maintenance of stock levels of wild fish. As a result, the supply and demand for seafood certification has largely focused on capture fishing. Over the last decade, as a result of supply constraints in certified wild catch combined with the growing importance of aquaculture production, certified aquaculture production has grown 76 per cent per annum, more than twice the rate of growth of certified wild catch.

Five species groups account for more than two-thirds of certified seafood production.

Sustainable seafood is concentrated in a relatively small number of species groups. With the exception of certified Peruvian anchoveta (29 per cent of sustainable seafood production), the main species groups, cod (16 per cent, including Alaska pollock), salmon (15 per cent), tuna (8 per cent) and mackerel (4 per cent), represent high-value species destined for developed-country retail markets. By comparison, these same species groups account for a mere 15 per cent of total global seafood production.

Five countries account for two-thirds of certified seafood production.

Certified seafood production is highly concentrated among a limited number of countries: Peru (25 per cent), the United States (15 per cent), Norway (11 per cent), Chile (8 per cent) and Russia (6 per cent). Although North America and Europe account for 63 per cent of certified seafood destined for retail markets, Latin America represents an important source of certified seafood overall. Asia, which accounts for 69 per cent of global seafood production, only accounts for 11 per cent of certified production.

Data scarcity threatens the viability of continued rapid growth in wild catch certification.

One of the prerequisites to sustainable stock management of wild catch is accurate and timely data on actual stock levels. Based on current estimates, comprehensive assessments exist for between 17 and 25 per cent of the global catch. Further growth will depend on addressing the problem of unassessed stocks. It remains far from clear whether market demand for certified seafood alone will be sufficient to drive the necessary investments in comprehensive stock assessments.

Certified aquaculture will dominate growth in certified seafood for the foreseeable future.

Certified aquaculture is still experiencing early stage growth, with important Asian sources such as Vietnam expected to significantly increase certified supply in the coming years. China also represents a major opportunity for the expansion of certified aquaculture production. Regardless of where certified aquaculture is sourced from, the absence of the stock assessment barriers facing wild catch certification positions aquaculture favourably as a low-cost solution for the supply of certified seafood moving forward.

There is a growing recognition that standards are not simply lists of best practices but represent communities of shared learning and decision making. At their best, voluntary standards do not just ask indifferent economic actors to follow the rules, but rather provide a living forum where diverse stakeholder interests have a voice in determining their future. Our analysis of CARE (coverage, assurance, responsiveness and engagement) measures the criteria and systems used by seafood standards to ensure credibility and effectiveness. The following are some notable points from our analysis:

Coverage

Seafood standards emphasize environmental criteria. Criteria on issues related to biodiversity and ecosystem integrity are most common across both wild catch and aquaculture standards. Synthetic inputs represent an important criteria category for aquaculture, and six of seven aquaculture standards prohibit the use of genetically modified organisms. Criteria on energy reduction and greenhouse gas management are extremely rare among seafood standards. Social criteria in the aquaculture sector display coverage similar to other agriculture sectors but are almost entirely absent from wild catch standards.

Assurance

Traceability and independent conformity assessment are virtually universal hallmarks of seafood certification. All initiatives surveyed apply a model of third-party certification, representing a high level of independence in conformity assessment processes. Eight of the nine initiatives reviewed require both identity preservation and segregation along the supply chain, representing a high degree of traceability. Approximately half of the initiatives offer a separate chain of custody standard.

Responsiveness

Seafood standards, perhaps due to their relatively young age, have focused on setting universal requirements rather than processes for local adaptation, potentially deepening the isolation of specific segments of the supply chain. Most of the standards reviewed do not have significant processes in place to accommodate smallholder or regional interests. The most common strategy for enabling uptake at the local level has been through the implementation of external government-led national strategies for certification.

Engagement

Seafood standards display a mixed level of commitment to multistakeholder decision making and reveal low levels of representation for developing-country stakeholders. Approximately half of the initiatives surveyed include public consultation in their standard review processes, with three initiatives allowing some level of external stakeholder decision making in standard development. Board representation among all of the initiatives surveyed includes some degree of representation of non-traditional stakeholders, such as non-governmental organizations or producers, in the management of their processes. Most of the initiatives include multistakeholder representation. Developing-country representation at the board level is extremely low across the vast majority of initiatives.

While there is plenty of evidence that seafood standards are conceptually aligned with the promotion of a blue economy, there is also considerable evidence that the forces of the market may currently limit the ability of such initiatives to stimulate comprehensive changes in seafood production practices, particularly in poorer regions where such changes are needed most, such as Africa and Asia. Limited market growth along specific species lines combined with underdeveloped infrastructure at production would appear to be the most important barriers to a fully inclusive expansion of supply to, and benefits from, expanding markets for sustainable seafood products.

Any effort to enable broad inclusiveness within more sustainable supply chains, particularly among poorer producers, will almost certainly require significant and targeted investment by policy-makers and others. International restrictions on illegal, unreported and unregulated fishing may represent one of the most compelling policy drivers for such investment in the short term, particularly as a new generation of trade agreements integrate legal sourcing requirements. Seafood sustainability standards offer an invaluable tool for measuring, verifying and “locking in” sustainable and legal practices and, as such, represent an essential complement to policy instruments and related investments aimed at promoting the implementation of sustainable production practices.

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The Initiatives Covered in this Report

This review covers nine key voluntary sustainability standards operating at the global level in the capture fisheries and aquaculture sectors.[3] Different standards may have global applicability due to their having either a global supply or consumer base.[4] The nine initiatives covered certified 20.8 million metric tons, accounting for approximately 95 per cent of the world's certified seafood in 2013.

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3 Although wild catch fisheries and aquaculture contribute to the production of fish meal and fish oil, the initiatives in Table 0.1 were chosen for their primary production in the global seafood industry—from farm/landing to plate. As a result, initiatives focusing on fish meal or other fish by-products, such as the Marine Ingredients Organization, were not included.

4 For example, even though Iceland Responsible Fisheries and ChinaG.A.P. can be considered national standards in their operational scope, the products they certify are principally intended for international markets. Although publicly governed, the ChinaG.A.P. agriculture standards (Fruit and Vegetables/ Combinable Crops) are benchmarked against the GLOBALG.A.P. private standard and therefore benefit from partial equivalency under the GLOBALG.A.P. system. At present, however, it is ChinaG.A.P.'s decision not to benchmark the aquaculture standards against GLOBALG.A.P., although this may change in the future. VietG.A.P. is another publicly governed aquaculture standard and operates in Vietnam. While the initiative acts as an entry standard into international aquaculture certification schemes such as GLOBALG.A.P., ASC and GAA's BAP standards, it is scheduled to operate as part of a mandatory regulatory scheme and therefore does not, itself, fall under the rubric of voluntary standards (for further information see GAA, n.d.). GLOBALG.A.P. has been working with VietG.A.P. in order to publish commonalities, which will be publicly available soon (GLOBALG.A.P., personal communication, 2015).

Table 0.1 The initiatives covered in this report

Name	Year initiative established	Year standards developed	Address	Type of production system	Founding stakeholders	Species scope	Geographic scope	Consumer-facing label
Aquaculture Stewardship Council (ASC)	2010	The SSI assesses four of the seven ASC standards currently available: • Pangasius 2012 • Salmon 2012 • Tilapia 2012 • Shrimp 2014*	Nieuwekade 9 3511 RV Utrecht Netherlands		Civil society	Abalone, bivalves, freshwater trout, pangasius, salmon, shrimp, tilapia	Asia, Australia and Oceania, Central American and Caribbean, Europe, North America, South America	
ChinaG.A.P.	2005	2008	No.9 Madian Donglu Haidian District Beijing 100088, China		Public	All species, with specific control points for eel, crab, croaker, flounder, shrimp, tilapia	China	
Friend of the Sea (FOS)	2008	First edition of both wild catch and aquaculture standards 2013	Corso Buenos Aires, 37 20124 Milano Italy		Civil society	All species of fish, abalone, bivalves, crustaceans	Africa, Asia, Australia and Oceania, Central American and Caribbean, Europe, North America, South America	
Global Aquaculture Alliance Best Aquaculture Practices (GAA BAP)	1997	2004	4111 Telegraph Rd., Suite 302 St. Louis, MO 63129 USA		Civil society, private sector, producers	Barramundi, catfish, golden pompano, jade perch, mussels, pangasius, rainbow trout, salmon, shrimp, tilapia, trout	Asia, Australia and Oceania, Central American and Caribbean, Europe, North America, South America	
The Global Partnership for Good Agricultural Practice (GLOBALG.A.P.)	1997	2004	Spichernstr. 55 50672 Cologne Germany		Private sector (industry, retailers)	35 species of finfish, crustaceans and molluscs (hatchery-based and passive collection of seedlings from the planktonic phase for molluscs)	30 countries from North, Central and South America; Europe; Asia; Australia and Oceania	None (business to business)†
Iceland Responsible Fisheries (IRF)	2008	2010	Borgartún 35 105 Reykjavík Iceland		Private	Cod, haddock, golden redfish, saithe	Iceland	

* Our assessment of the ASC standards was based on four standards in application at the time of writing (pangasius, salmon, tilapia and shrimp). As ASC introduces new standards overall coverage can be expected to change. See ASC (n.d.-b) for the full range of ASC standards.

† Through a collaborative agreement between FOS and GLOBALG.A.P., compliance with a set of voluntary add-on criteria allows the use of the FOS logo and GLOBALG.A.P. number (GGN) on products (the FOS add-on criteria for aquaculture is included in the GLOBALG.A.P. aquaculture standard version 5). Further developments on communication to consumers are expected to be launched soon.

Table 0.1 continued

Name	Year initiative established	Year standards developed	Address	Type of production system	Founding stakeholders	Species scope	Geographic scope	Consumer-facing label
International Federation of Organic Agriculture Movements (IFOAM)	1972	2012	Charles-de-Gaulle-Str. 5 53113 Bonn Germany		Civil society	All species for aquaculture	South America, Asia, Africa, Australia and Oceania, North America, Europe, Central America and Caribbean	No
Marine Stewardship Council (MSC)	1997	1998	Marine House 1 Snow Hill London, England EC1A 2DH		Civil society, private sector	All species for wild catch fisheries	Africa, Asia, Australia and Oceania, Central American and Caribbean, Europe, North America, South America	
Naturland	1982	• Aquaculture 1996 • Wild Catch 2006	Kleinhaderner Weg 1 82166 Gräfelfing Germany		Civil society, private sector, producers	Standard for aquaculture covers carp (plus accompanying species), salmonids, whitefish, mussels, shrimp, tropical freshwater fish, perch-like fish, jack-like and cod-like fish, and macroalgae. Standard for wild catch covers all freshwater and marine species, specifically finfish and invertebrates.	Africa, Asia, Australia and Oceania, Central American and Caribbean, Europe, South America	

* Our assessment of the ASC standards was based on four standards in application at the time of writing (pangasius, salmon, tilapia and shrimp). As ASC introduces new standards overall coverage can be expected to change. See ASC (n.d.-b) for the full range of ASC standards.
† Through a collaborative agreement between FOS and GLOBALG.A.P., compliance with a set of voluntary add-on criteria allows the use of the FOS logo and GLOBALG.A.P. number (GGN) on products (the FOS add-on criteria for aquaculture is included in the GLOBALG.A.P. aquaculture standard version 5). Further developments on communication to consumers are expected to be launched soon.

FreeImages.com/Gregory Hoyl Jr.

1 Building a Blue Economy

Seafood products are one of the most important non-petroleum commodities in terms of value traded globally. In 2014, the value of the seafood economy was estimated at US$140 billion (Rabobank, 2015), with both the primary and secondary seafood sectors supporting an estimated 10 to 12 per cent of the world's population (Food and Agriculture Organization of the United Nations [FAO], 2014b).[5] The two main systems of production for seafood products are wild fish harvesting and aquaculture.[6] Together, these production systems contribute significantly to global prosperity and human well-being.

Seafood production, as with many global commodities, is primarily located across the developing world. The vast majority of people engaged in the primary sector of fishing and fish farming are in Asia, and small fishing vessels and/or small fish farmers dominate seafood production across the developing world more broadly (FAO, 2014).[7] Strategic development of the seafood economy, therefore, represents a major opportunity for securing more sustainable livelihoods. However, a host of pressing infrastructural and environmental challenges currently threaten this opportunity. Processing, storage, stock management and overall ecosystem protection are essential prerequisites for ensuring the longevity of any national seafood economy and yet, in many countries, this infrastructure is underdeveloped.

While the seafood economy shares this basic context with many other primary commodity markets, it remains unique on account of two factors. First, seafood production, to the extent that it is sourced from public and often international ecosystems, is faced with a special dependency on *international cooperation* for its continued existence. This feature, combined with the absence of any realistic means for enforcing international agreements once they are agreed upon, exposes seafood production to a massive freeriding problem. Second, the seafood production base, largely in response to the unpredictability of reliance on public waters for supply, is in rapid transition toward growing reliance on farmed production. And while aquaculture cannot be considered a panacea for all of the challenges facing the sector, it does offer the definitive advantage of enabling more

5 For the purpose of this paper, the term "seafood sector" is used to refer to both wild catch fisheries and aquaculture.

6 Aquaculture is the farming of aquatic organisms, which includes fish, molluscs, crustaceans and aquatic plants. Aquaculture is carried out using a variety of methods including closed system ponds and offshore nets.

7 Even though Asia and Africa account for approximately 94 per cent of fishers and fish farmers globally, they show significantly lower outputs than Europe and North America, which points to the substantially lower degree of industrialization of fishing activities in Asia and Africa.

explicit and strategic management of inputs, outputs and the corresponding environmental burdens associated with seafood production.

The dynamic context of seafood production systems represents an invaluable opportunity to transition to systems that foster and promote social, economic and environmental sustainability over the long term.

Recognizing this opportunity, coastal and island economies of the developing world have called for the development of a "blue economy"[8] emphasizing the importance and special concerns of economies dependent on ocean resources for social and economic well-being (United Nations Environment Programme [UNEP], 2013a). Starting from the acknowledgement that water accounts for 72 per cent of the Earth's surface area and 95 per cent of the planetary biosphere, the blue economy initiative seeks to promote global sustainability by focusing on the planet's single largest resource: the oceans. According to UNEP:

> ***The Blue Economy espouses the same desired outcome as the Rio+20 Green Economy initiative namely: "improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities" and it endorses the same principles of low carbon, resource efficiency and social inclusion, but it is grounded in a developing world context and fashioned to reflect the circumstances and needs of countries whose future resource base is marine (UNEP, 2013a, p. 3).***

The related FAO Blue Growth Initiative (developed in 2013; see FAO, 2013b) "aims to create an enabling environment for people employed in fisheries and aquaculture to act not only as resource users, but also as stewards" (FAO, n.d.-a, p. 1), thereby reconciling tensions between economic growth, food security and marine conservation. Meanwhile, the concepts of "blue growth" and a "green economy in a blue world" align with and support Sustainable Development Goal (SDG) 14 to "Conserve and sustainably use the oceans, seas and marine resources for sustainable development" (United Nations, n.d.).

Voluntary seafood standards, as tools for enabling fisheries and fish farms to measure, report and market sustainable production practices, have the potential to play a key role in promoting a blue economy and SDG 14. At the same time, seafood supply chain initiatives have tended to focus on the impacts of fish production and extraction, thus leaving significant portions of a broader blue economy approach in question. Questions such as poverty reduction, social welfare, coastal tourism, water pollution and regional ecosystem management are examples of issues that, due to their broader social or environmental context, may be more challenging to address through supply chain–specific requirements. Similarly, with new players developing standards on an ongoing basis, the actual value of any individual initiative in meeting the needs of those most in need cannot be taken for granted. This is all the more the case given the historical

8 The concept of the blue economy has also been referred to as "blue green economy" or "blue growth, the new maritime green economy" (European Commission, 2012), "green economy in a blue world" (UNEP, 2012), "blue growth" (FAO, 2013a), and "green growth in fisheries and aquaculture" (Organisation for Economic Co-operation and Development [OECD], 2015). The concept has developed as an emerging paradigm for the sustainable management of natural marine and freshwater resources (Ababouch, 2015).

predominance of developed-country stakeholders in the development and promotion of such initiatives (see Figure 3.11 and Section 3.4.3).

Notwithstanding their developed-country origin, or perhaps because of it, sustainability standards (and sustainable markets more generally) represent a major economic opportunity for developing economies. Markets for sustainable fisheries products were an estimated US$12.9 billion[9] in 2013. Tapping into this opportunity, however, typically requires major investments often out of reach of those targeted by the blue growth strategy. This general context points to the need for ongoing assessment of the major sustainability initiatives operating in the seafood sector, with a view to better understanding their potential to transform this opportunity into meaningful outcomes for developing-country producers.

9 Calculated extrapolating an estimation of MSC retail value from the MSC 2014/15 annual report (MSC, 2014a, p. 11), and an extrapolation of an estimation of Organic retail value in 2009 (FAO, 2010).

Box 1 The importance of fisheries to Africa

It is estimated that the value added by the fisheries sector to Africa's GDP was more than US$24 billion in 2011, or 1.26 per cent of the GDP of all African countries (de Graaf & Garibaldi, 2014). The African seafood sector employs 12.3 million people full-time and part-time in both primary and secondary fishing and fish farming activities. Approximately one-third of all people engaged in fisheries and aquaculture are women. As well as contributing to GDP and providing livelihoods for fishers, farmers and processors, the seafood sector is a source of hard currency from exports and boosts government revenue through fisheries agreements and taxes (FAO, 2014).

Box 2 Fish trade and FAO categories[10]

Fisheries trade is a major economic driver in many developing nations, accounting, in some instances, for more than half of the total value of traded commodities (FAO, 2014). The global fisheries market is also volatile and therefore difficult to predict. Demand and supply factors, along with cost of production and transportation, as well as the value and supply of substitutes like meat and feed all influence fish prices and overall trade values. Fish prices have increased over the past decade (FAO, 1998). The aggregate FAO Fish Price Index reached a record high in October 2013 (FAO, 2014).

Aquaculture is contributing to a growing share of international trade in fishery commodities for high-value species such as salmon, sea bass, sea bream, shrimp and prawns, and bivalves and other molluscs, as well as low-value species such as tilapia, catfish (including pangasius) and carp (FAO, 2014).[11] Developing countries typically have a fish trade surplus. Approximately 30 per cent of their total fish production is exported to the United States, Japan and the European Union (FAO, 2014) and is mostly made up of high-value species like shrimp and prawns, lobster, and tuna (Pérez-Ramírez, Phillips, Lluch-Belda, & Lluch-Cota, 2012).

Shrimp is one of the largest seafood commodities in value terms, representing approximately US$19 billion or 15 per cent of the total value of internationally traded fishery products in 2012. Primarily produced in developing regions, most shrimp is destined for international markets (FAO, 2014).

Salmon production, which has been growing over the past decade due to the expansion of aquaculture production in northern Europe and North and South America, accounted for US$18 billion, a 14 per cent share of total global trade in 2012 (FAO, 2014; Terazono, 2016), and recently surpassed shrimp in value terms. Norway is the predominant producer and exporter of Atlantic salmon, followed by Chile, with production in the latter country variable due to issues related to feed and high feed costs (FAO, 2014).

Groundfish species such as cod, hake, saithe, pollock, tilapia and pangasius accounted for US$13 billion or 10 per cent of the total value of internationally traded fishery products in 2012. Cod remains the most expensive groundfish species. Pangasius, an important source of low-priced traded fish, is relatively new on the international market and is produced mainly in Vietnam for international markets. The main suppliers of tilapia are Asian and Central American countries, and supply is mostly destined for U.S. markets. Tilapia production is expanding in Asia, South America and Africa (FAO, 2014).

Tuna accounted for US$10 billion or 8 per cent of total fish export value in 2012 (FAO, 2014). Tuna markets have shown volatility over the past three years owing to fluctuations in catch levels, sustainability issues and the introduction of eco-labels. Japan is the predominant importer of sashimi-grade tuna, and canned tuna is destined primarily for American, European and, increasingly, Asian markets.

Fish meal (usually made from small pelagic fish) accounted for US$4 billion or 3 per cent of world fish trade in 2012 (FAO, 2014). Peru is the world's largest producer of fish meal, having rights to the largest fishery producing the highest-yielding species in the world, the Peruvian anchoveta. Peruvian fish meal export to China is one of the largest trades in seafood and accounts for approximately US$500 billion a year (Rabobank, 2015), serving largely to support the Chinese aquaculture industry.

Per capita fish consumption in developing regions is increasing, although developed regions still have higher levels of consumption.[12] Despite this, however, the share of developing countries' animal protein intake contributed by fish remains significantly higher than that of their more developed counterparts.

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10 Wild catch and aquaculture aquatic species.

11 According to the FAO it is difficult to determine the extent of aquaculture trade and sustainable practice in seafood because the international classification used to record trade statistics for fish makes no distinction between wild catch and farmed products in international trade.

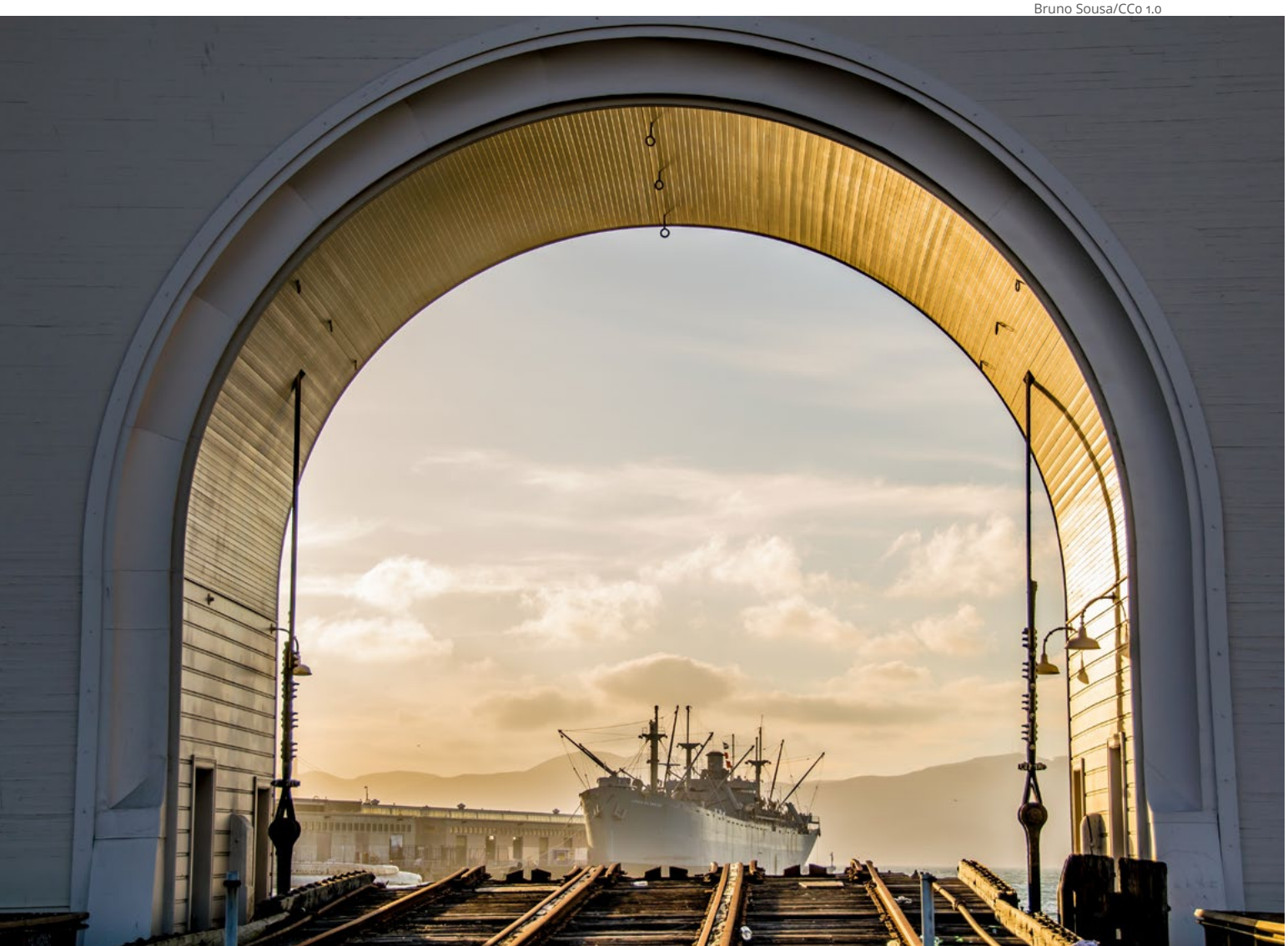
12 Consumption in developing regions may be higher in light of unreliable data of subsistence and small-scale fisheries (FAO, 2014).

1.1 The Rise of Voluntary Standards in the Seafood Sector

It has long been recognized that the stability and overall health of national ocean and seafood economies depend in large part on effective management of fishing practices at the international level. International agreements on the protection of ocean resources, such as the *United Nations Convention on Fishing and the Conservation of the Living Resources of the High Seas* (1966) and the *United Nations Convention on the Law of the Sea* (UNCLOS) (1982) represent some of the earliest global environmental treaties, arguably paving the way for the broader concept of sustainable development itself. The Brundtland Commission, in making its call for international action on sustainable development, was motivated in part by its finding that 95 per cent of the world's fish catch was overexploited (United Nations, 1987).

In many ways, the world has responded to the Brundtland Commission's call to action. Since the release of its report in 1987, a number of global treaties related to the management

Bruno Sousa/CC0 1.0



of international fisheries have been ratified.[13] Through these agreements, the international community has formally recognized the need for global limits on ocean resource extraction and the importance of sustainable harvesting practices as a means to alleviate the pressures on existing stocks and ecosystem biodiversity.

The process of managing resources extracted from the high seas, however, has proven to be a difficult task to master, especially given the diverse levels of economic development and implementation capacity among different countries involved in the seafood sector. Many countries lack the resources or capacity to effectively enforce the obligations stipulated under such agreements (FAO, 2014). As a result, consistent enforcement and management across multiple jurisdictions has presented itself as one of the most persistent challenges to sustainable fisheries management at the global level.

One of the earliest, and certainly the most infamous of such efforts, was the *Marine Mammal Protection Act* promulgated by the United States in 1972. The *Marine Mammal Protection Act*, which prohibited the importation of tuna and tuna products from countries unable to demonstrate compliance with (United States–approved) "dolphin-friendly" fishing practices, was eventually challenged under the General Agreement on Tariffs and Trade (GATT) as being trade discriminatory in nature (Potts, 2008). Although the tuna-dolphin rulings, as they came to be known, were never formally adopted by the GATT membership, the entire debacle placed a stigma on the use of national regulations for the extraterritorial management of sustainable production practices both within fisheries and elsewhere.[14]

Since individual consumer decisions were not under the purview of the GATT, dolphin-friendly tuna labelling arose as an immediate response to the special trade hurdles facing extraterritorial national legislation.[15] Voluntary labelling offered itself as an attractive "GATT-compliant" means for implementing national sustainability objectives and became a go-to option for policy-makers and the public at large.

In 1996, through a partnership between WWF and Unilever, under the auspices of the Marine Stewardship Council (MSC), a private voluntary standard was applied as a solution

13 Inter alia 1966: the *United Nations Convention on Fishing and the Conservation of the Living Resources of the High Seas*; 1982: the *United Nations Convention on the Law of the Sea* (UNCLOS); 1992: *Agenda 21 of the Rio Declaration*; 1995: *United Nations Fish Stocks Agreement*; 1995: *FAO Code of Conduct for Responsible Fisheries* (the Code); 2001: *Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem*; 2005: *Mauritius Strategy for the Further Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States*; 2005 (2009 rev): *FAO Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries*; 2010*: FAO Guidelines for the Ecolabelling of Fish and Fishery Products from Inland Wild Catch Fisheries*; 2011: *FAO International Guidelines on Bycatch Management and Reduction of Discards*.

14 The GATT challenge, brought by Mexico and other countries, resulted in a GATT panel finding the *Marine Mammal Protection Act* was prohibited under the agreement. One of the reasons given for the panel's conclusion was that tuna products were considered "like products," regardless of the manner in which they were caught, and therefore subject to the non-discrimination rules of the GATT. While the basis for this decision has largely been overturned through subsequent decisions by the Appellate Body of the World Trade Organization, the effect of the GATT tuna-dolphin decisions remains non-negligible to this day (see Potts, 2008).

15 Subsequent to the launch of the U.S. Dolphin Safe label in 1990, the 1991 U.S. Dolphin Protection Consumer Information Act (DPCIA) enabled producers to self-declare their tuna as dolphin safe in line with an established set of criteria outlining the manner in which tuna must be caught. On a voluntary basis, companies were permitted to label their tuna as dolphin safe. However, dolphin-friendly labels are not considered to be in compliance with FAO guidelines in terms of ecosystem impacts as well as their procedural and institutional processes, and therefore remain controversial (UNEP, 2009).

for managing sustainable fisheries production at the *global* level. This bold move was followed by the establishment of similar standards for the aquaculture sector under Naturland (1996), the Global Aquaculture Alliance (GAA; 2004) and the Global Partnership for Good Agricultural Practice (GLOBALG.A.P.; 2004). The MSC's development into an independent multistakeholder organization in 1997 marked a further symbolic step forward in the development of mainstream markets for sustainable seafood products. On the one hand, the move toward independence allowed a wide spectrum of would-be competitors to affiliate themselves with a single initiative. On the other hand, the establishment of a multistakeholder governance model offered the promise of enhanced participatory governance in seafood supply chains.

Overall, the ability of voluntary standards to set consistent rules across multiple jurisdictions by leveraging *supply chain relationships* rather than public institutions for the implementation of sustainable practices represented a major innovation and offered a novel modality for promoting sustainable development in the global seafood economy.[16]

While the emergence of private standards can largely be traced to recognition of capacity gaps in public governance systems, private standards have also become tools for differentiating retailers and their products in an increasingly competitive global market. Retailers like Sainsbury's, IKEA, Whole Foods, Woolworths[17] and Walmart[18] have made commitments of 100 per cent sustainable seafood sourcing by 2020.

Following the establishment of the MSC, both non-governmental organizations (NGOs) and retailers have recognized eco-labelling and certification schemes as important tools for more sustainable seafood supply chains. The past decade, reflecting the growth of aquaculture's global importance more generally, has given rise to a rapid expansion in the number and size of certified aquaculture markets. It is estimated that there are now more than 50 fisheries sustainability labels in operation around the world (see Appendix III for a non-exhaustive list of different public and private fishing and aquaculture standards and their coverage).

The growth in the number of voluntary initiatives and their uptake in mainstream supply chains have significantly increased the potential for impact at the global level. However, at the same time, the growth in the number of sustainability claims on the market by competing interests also raises the potential for confusion among consumers, policy-makers and producers. Developing-country producers face the additional challenge of having to adopt a multiplicity of practices in order to maintain access to different markets carved out by individual voluntary standards. Moreover, while voluntary standards have largely come into play as a means for filling regulatory gaps, compliance with such standards often requires a minimum degree of public infrastructure.[19] To the extent that this is the case,

16 The trend toward private food safety standards designed to leverage supply chain management structures for ensuring compliance with national food safety requirements has offered important momentum in the development of global standards. The hazard analysis and critical control points food safety system, which identifies and control hazards along the value chain of the food production process in accordance with globally accepted food safety standards, provides a framework for integrating management for sustainable practices as well. The alignment of needs between food safety and sustainability standards provided the basis for the development of the GLOBALG.A.P. standards.

17 Woolworths has committed to sourcing all farmed seafood from ASC by 2020. J Sainsbury's, Whole Foods and IKEA have committed to sourcing from the MSC (ASC, 2014, J Sainsbury plc, n.d.; MSC, 2014).

18 Walmart requires all fresh and frozen farmed and wild caught certified seafood to be certified by BAP, the MSC or equivalent third-party certification (Seafood International, n.d.).

19 For example, many fisheries standards require the existence of a fisheries management plan—but such plans are often only possible when basic data on stocks are gathered by public institutions.

the growth of regional fisheries management organizations provides critical support for the effective implementation of voluntary standards.

As a response to the growing burden and potential inefficiencies caused by the multiplicity of voluntary systems, the FAO developed its *Guidelines for the Ecolabelling of Fish and Fishery Products*[20] as well as its *Technical Guidelines on Aquaculture Certification* (2011). One of the objectives of the *FAO Guidelines for the Ecolabelling of Fish and Fishery Products From Inland Capture Fisheries* (FAO Guidelines) is to ensure a degree of consistency between voluntary standards and major international agreements such as UNCLOS and the *United Nations Fish Stock Agreement* (UNFSA).[21] A second objective of the FAO Guidelines is to stimulate a degree of harmonization across standards by providing a minimum set of substantive criteria for the development, implementation and organization of credible schemes (FAO, 2012a). Although they are not obligatory, within the context of the highly diverse supply coming from less-developed countries, the FAO guidelines offer a critical roadmap for reducing the transaction costs associated with, and enabling access to, sustainable markets (Figure 1.1 shows the timelines of these FAO guidelines in relation to the implementation of the certification schemes assessed in this review. See Table 0.1 for the dates the standard documents were first implemented.)

More recently, a number of other systems and initiatives have played a proactive role in facilitating coordination and collaboration across individual seafood initiatives, including the International Social and Environmental Accreditation and Labelling Alliance (ISEAL),[22] the International Organization for Standardization (ISO),[23] the International Trade Centre (ITC) Standards Map[24] and the Global Sustainable Seafood Initiative (GSSI).[25]

Under the right circumstances, notably by placing an emphasis on transparency, accountability and coordination with public regulatory agencies, voluntary standards have the potential to offer a direct contribution to the implementation of a blue economy. Bringing this potential to reality, however, will depend on the strategic development of the voluntary sector. On the next page is a listing of some of the several ways in which voluntary standards have particular potential in supporting a blue economy.

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20 2005 for marine wild catch fisheries; 2011 for inland wild catch fisheries and aquaculture products.

21 See FAO (2009). The FAO Guidelines for the eco-labelling of fish and fishery products for *inland* wild catch fisheries also includes references to the *Convention on Biological Diversity* and the *Ramsar Convention on Wetlands* (see FAO, 2011a).

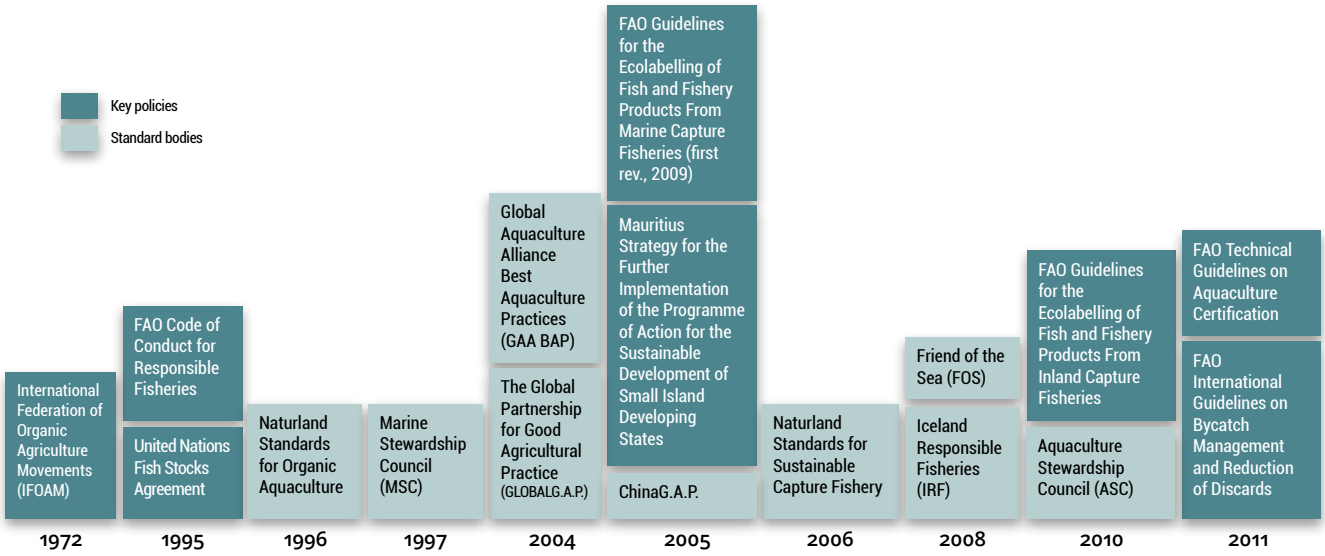
22 ISEAL, in particular, plays a leadership role in defining common terms of best practice for voluntary sustainability standards through its series of codes related to different aspects of the implementation of credible voluntary standards (see ISEAL, n.d.-b).

23 ISO has long played a leading role in establishing international standards related to good practice and food safety in the seafood sector. For a listing of related standards see ISO (n.d.).

24 The ITC's Standards Map manages the world's largest repository of data related to the characteristics of voluntary sustainability standards (see ITC, 2015).

25 The GSSI represents a multistakeholder initiative of private companies, NGOs, and government and intergovernmental organizations aimed at benchmarking diverse seafood initiatives against each other in an effort to ensure a minimum level of quality assurance (GSSI, n.d.).

Figure 1.1 Timeline for initiative and key policy implementation



Defining targets: Every voluntary standard begins with a process dedicated to establishing standards for sustainable practice. These efforts have the potential to push the boundaries of accepted practice while developing new technologies and support systems for their implementation. To the extent that a given standard's processes are participatory, representative and based on scientific evidence, they have the potential to offer meaningful input into the actual definition of the blue economy. Within the context of politically motivated international negotiations, the brass tacks approach of private-sector initiatives may offer a more efficient means of coming to agreement.

Ocean health: One of the key features of the blue economy initiative is its focus on ocean health as the foundation of broader ecosystem and economic health. The notion of sustainable fish production is closely related to the management of a sustainable fish habitat and/or ecosystem. As a result, most voluntary sustainability standards in the seafood sector have integral elements that are designed to promote overall ocean health. However, depending on the priorities of the specific initiative or the sectors within which it works, ocean health per se may be of more or less relevance.

Good governance: Definitions of the blue economy to date have placed emphasis on building a vision for sustainability from the perspective of ocean-dependent nations. Small island states view the blue economy approach as a way of enabling a more participatory role in global sustainability planning. Voluntary standards often include multistakeholder governance models as a means for ensuring buy-in from different groups along the supply chain. Depending on the way a standard is governed, more marginalized players, such as those targeted in the blue economy, may find it easier to participate in its development through multistakeholder voluntary initiatives than through larger multilateral negotiations on seafood sustainability.

Economic growth and poverty reduction: Voluntary standards can also present a host of economic benefits. The most direct benefit may come in the form of higher prices associated with differentiated markets for sustainable products. Certification can facilitate access to international markets, as certification programs set minimum sustainability practices as a price of market entry. Certification, through its reliance

on more integrated supply chain management, can also lead to more stable supply chain relationships and reduced income volatility (Potts, 2007). Quality management may be improved through requirements for transparency in practice, lessening the likelihood of costly rejections and recalls and subsequent negative publicity. Moreover, a farm's profile is likely to be raised through certification (Parkes et al., 2010), which could lead to stronger negotiating positions with buyers, governments and other stakeholders (Pérez-Ramírez et al., 2012).

Investment and public policy: By generating market demand for sustainable practices, sustainable markets can create additional incentives for investment in improved fishing and aquaculture practices. Commitments by major retailers to buy from sustainable sources offer significant signals to the market and, in some cases, may generate direct revenues to invest in sustainable practices. Governments, in coordination with fishery improvement projects (FIPs), may be more inclined to align public investment with certified sustainable production. Meanwhile, voluntary standards may offer a tool for facilitating alignment between SDGs and trade policy by creating a stream of trade that provides assurances in the application of sustainable practices.

The actual ability of seafood sustainability standards to promote a blue economy and their role in the process, however, depends on a variety of factors related to the characteristics of the individual initiatives themselves, the behaviour of the international seafood market and the distribution of existing infrastructure for sustainable production practices globally. In the following sections we offer a survey of the high-level performance characteristics of leading seafood certification initiatives and their markets with a view to providing a current snapshot of the potential relationship between voluntary standards and the promotion of a blue economy.

2 Seafood Sustainability Standards: Market Trends

Eco-labelling in the seafood sector has evolved considerably from its humble roots of single-issue tuna labels in the 1970s. With the growth in consumer awareness of sustainability issues, retailers and manufacturers serving developed-country markets have increasingly recognized value in affiliation with one or another sustainability standard. While early adopters may have been motivated by an interest in demonstrating environmental leadership and possibly seeking product differentiation through certification, the transition of eco-labelling into mainstream markets has arguably changed the primary value of voluntary standards from providing brand enhancement to providing reputational risk management. Certification is increasingly becoming the cost of doing business in many developed-country markets rather than a basis for product differentiation.

Responding to this context, standard-compliant seafood production has grown consistently and dramatically as a percentage of global seafood production over the past decade. By 2015, certified production had reached 23 million metric tons, accounting for 14 per cent of global seafood production, up from 0.5 million metric tons (or 0.5 per cent of global) in 2003. From 2008 to 2015, certified seafood production grew at an annual rate of 30 per cent, over 10 times faster than total seafood production. Eighty per cent of certified seafood comes from certified wild catch production, reflecting the longer history of certification in wild catch markets but also the primacy of sustainability challenges in wild catch production due to issues related to stock management, which, to date, has been the primary driver behind seafood certification.[26]

Two initiatives, FOS and the MSC, dominate certification for wild catch markets, each accounting for 10 per cent of total wild catch seafood. As a consequence, these two initiatives also lead as a portion of global seafood production (including aquaculture) with FOS accounting for 6.2 per cent and the MSC accounting for 5.7 per cent of total seafood production (although of all the standards covered, only FOS and Naturland operate in both wild catch and aquaculture). GLOBALG.A.P., the leading aquaculture certification scheme, by contrast, accounted for 3.0 per cent of the global aquaculture market and 1.3 per cent of the global seafood market (2015).

While the combined growth of wild catch and aquaculture production is impressive and easily suggestive of an unstoppable global trend toward certification, the actual history and market dynamics of the specific initiatives, sectors and species groups suggests a more nuanced interpretation. The global market for certified seafood reflects the complexities and distinctive features that define the aquaculture and wild catch fishery markets.

26 Seafood certification to date has been almost entirely driven by global recognition of the need to preserve finite stocks of wild species, hence the domination of wild catch production in certified seafood markets.

Box 3 Methodological note

Year of analysis: In all data we have used the most recent data available. For the majority of the standards initiatives, the latest market data refers to 2015 production levels. For global totals on seafood production and trade, however, the latest year, depending on the data point, is 2013 or 2014. Given the early growth stage of seafood standards, we adopted the practice of comparing 2015 standard data with the most recent year of corresponding data for global totals. Given the smaller growth of global seafood production (estimated at around 3 per cent per annum), we believe that this approach offers the most accurate representation of the current state of certified fishing. In order to avoid confusing the reader, we refer only to the latest date of standards data in figure titles. Source listings provide detailed references to the data years of specific sources of data.

Multiple certification: Under normal circumstances, certification under one initiative does not preclude certification under another initiative. As a result, the calculation of global aggregates based on a simple addition of the production volumes of individual initiatives can result in double counting and overestimation of certified totals. Gathering accurate data on rates of multiple certification is notoriously difficult. Based on our analysis of the distribution of certified production across regions and species, we believe that multiple certification rates remain negligible within the seafood sector at present. As a result, the aggregate seafood data contained in this report make no adjustments for multiple certification. For maximum transparency, we note the few cases where multiple certification may be an issue. For a complete description of the methodology applied in our market analysis, please see Appendix II.

Table 2.1 Key statistics: Global wild catch and aquaculture production, 2013

Global production	162.8 million mt (82% from developing countries)
Top 5 producers and proportion of total	China (36%), Indonesia (6%), India (6%), Vietnam (4%), Peru (4%) Total combined proportion: 55%
Top 5 species groups produced and proportion of total	Carp (17%), anchoveta (5%), shrimp/prawns (5%), clams (4%), tuna (3%) Total combined proportion: 34%
Proportion of global production destined for non-food uses (e.g., fish meal and fish oil)	13%

Table 2.2 Key statistics: Global wild catch and aquaculture trade, 2014

Global trade value	US$140 billion (represents a doubling over the last 5 years)
Seafood exports as a proportion of global production	37%*
Proportion of seafood exports that come from developed countries	40%
Proportion of seafood exports that come from developing countries	60%
Top 5 exporters and proportion of global exports	China (14%), Norway (7%), Thailand (6%), Vietnam (5%), United States (4%) Total combined proportion: 36%
Top 5 importers and proportion of global imports	Japan (14%), United States (14%), China (6%), Spain (5%), France (5%) Total combined proportion: 44%
Top 5 global species groups for export and proportion of global exports	Shrimp (15%), salmon (14%), groundfish (e.g., hake, cod, haddock, Alaska pollock) (10%), tuna (9%), fish meal (3%) Total combined proportion: 51%

* This represents 10 per cent of total agricultural exports.

Table 2.3 Key statistics: Certified wild catch and aquaculture production (years for data listed in source note)

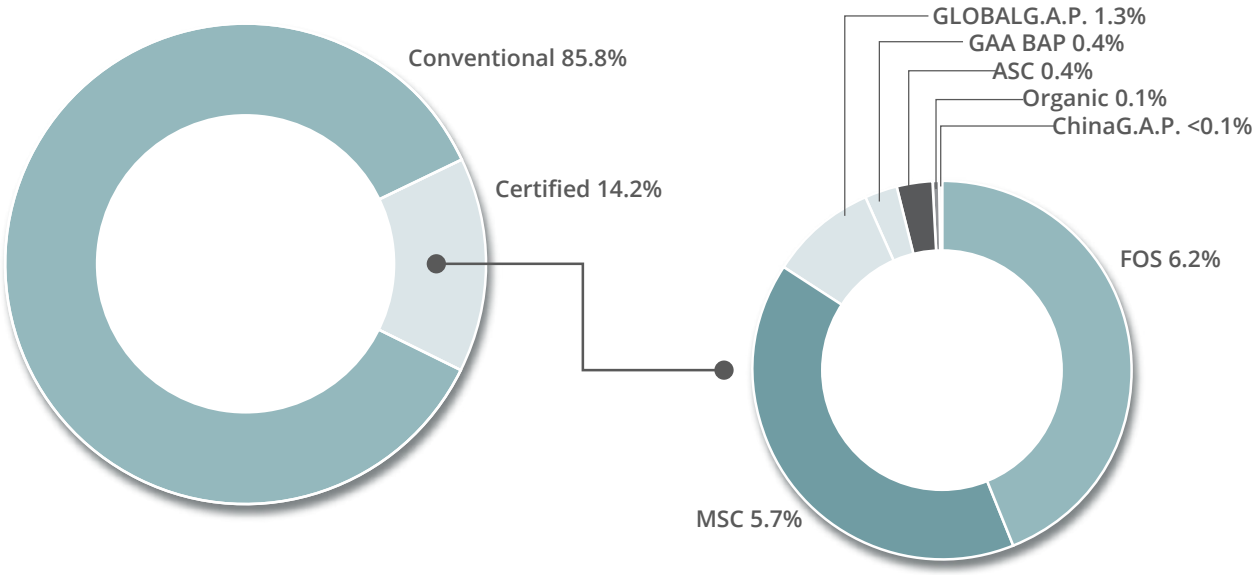
Major international standards	ASC, GAA BAP, ChinaG.A.P., FOS, GLOBALG.A.P., MSC, Organic
Standard-compliant production	23 million mt (14% of global production, 58% from developing countries)
Top 5 standard-compliant producers and proportion of total	Peru (25%), United States (15%), Norway (11%), Chile (8%), Russia (6%) Total combined proportion: 65%
Top 5 standard-compliant species groups and proportion of total	Anchoveta (29%), cod (16%, including Alaska pollock), salmon (15%), tuna (8%), mackerel (4%) Total combined proportion = 72%

All proportions shown represent volumes rather than values.

Sources: Global production, top 5 producers and top 5 species groups produced: FAO Fishstat, 2015 (2013 data). Proportion of production destined for non-food uses (e.g., fish meal and fish oil): FAO, 2014. Trade value: Rabobank, 2015 (2014 data). Seafood exports as a proportion of production: FAO Fishstat, 2015 (2012 data). Top 5 exporters/importers, top global species groups for export: FAO, 2014 (2012 data). Standard-compliant data obtained from personal communication with the standards; data used is the latest available: ASC, 2013 (country-level data), 2015 (species-level and aggregate data); BAP, 2013; ChinaG.A.P., 2013; Conventional, 2013; FOS, 2014 (species- and country-level data), 2015 (aggregate data); GLOBALG.A.P., 2015; MSC, 2015; Organic, 2013.

Figure 2.1 Certified vs. conventional seafood production (years for data listed in source note)

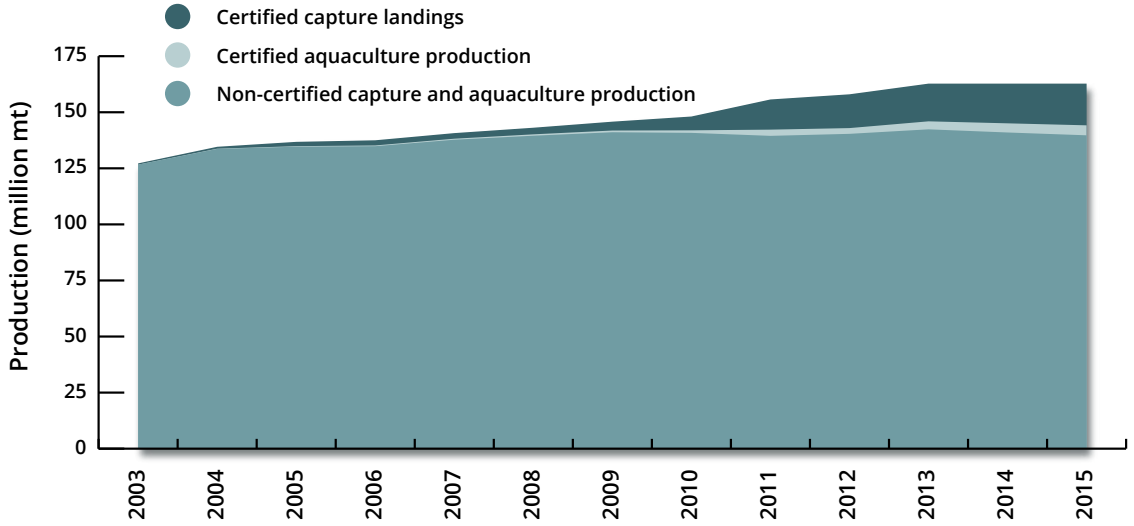
As of 2015, certified seafood made up more than 14 per cent of global seafood production. MSC- and FOS-certified production accounted for virtually all certified wild catch and for 80 per cent of global certified seafood. Six aquaculture certifications accounted for 20 per cent of certified seafood in 2015.



Data years: ASC, 2015; BAP, 2013; ChinaG.A.P., 2013; Conventional, 2013; FOS, 2014; GLOBALG.A.P., 2015; MSC, 2015; Organic, 2013.
Sources: FAO Fishstat, 2015; ASC, BAP, MSC, FOS, Naturland, GLOBALG.A.P., FiBL, ChinaG.A.P., personal communication, 2015.

Figure 2.2 Certified and non-certified wild catch landings and aquaculture production, 2003–2015

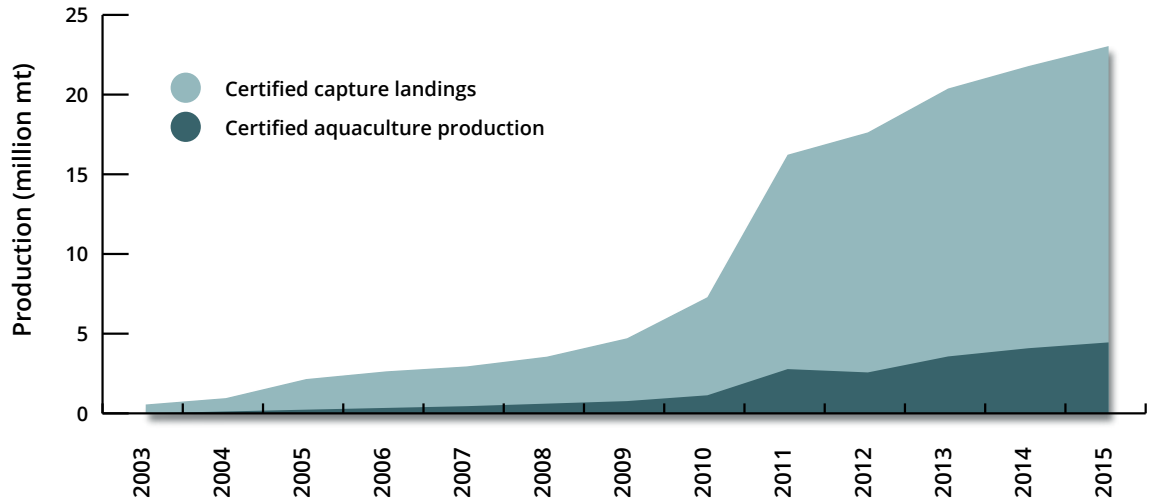
Certified seafood has been available for almost 20 years, but the last 5 years have seen the most significant growth in both certified wild catch and certified aquaculture.



Sources: FAO Fishstat, 2015; ASC, BAP, ChinaG.A.P., FiBL, FOS, GLOBALG.A.P., MSC, Naturland, personal communication, 2015.

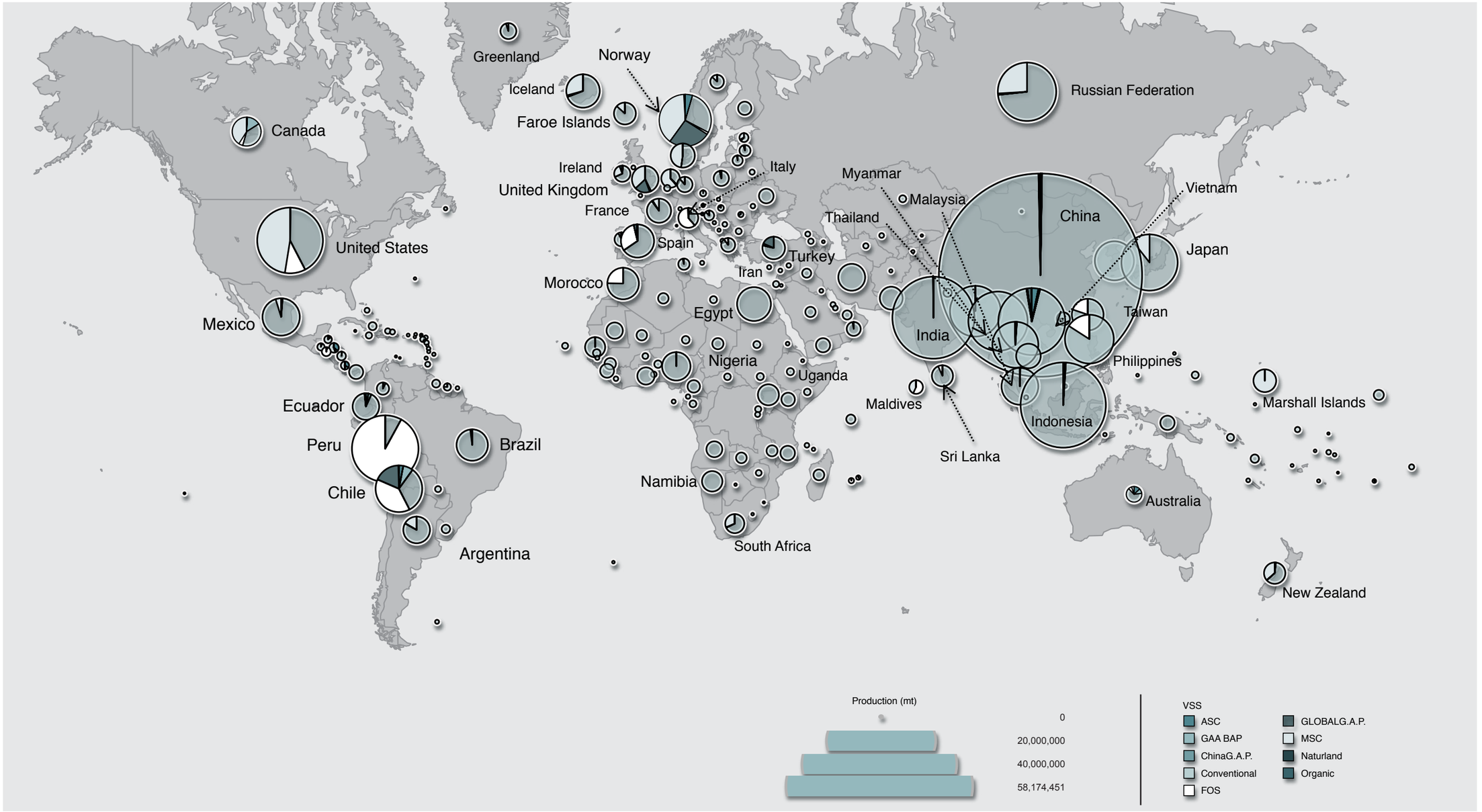
Figure 2.3 Certified wild catch landings and aquaculture production, 2003–2015

Certified wild catch experienced the greatest growth between 2009 and 2011 due in part to the certification of Peruvian anchoveta in 2010–2011. Although certified wild catch has grown the most in absolute terms over the past decade, aquaculture has consistently grown at a faster rate per annum. Between 2014 and 2015, certified aquaculture grew 50 per cent faster than certified wild catch.



No 2015 data were available for ChinaG.A.P., BAP or organic aquaculture, so 2014 and 2015 volumes were set equal to 2013 volumes for these initiatives.
Sources: FAO Fishstat, 2015; ASC, BAP, ChinaG.A.P., FiBL, FOS, GLOBALG.A.P., Naturland, MSC, personal communication, 2015.

Figure 2.4 Certified and conventional seafood production (years for data listed in source note)



Data years: ASC, 2015; BAP, 2013; ChinaG.A.P., 2013; Conventional, 2013; FOS, 2014; GLOBALG.A.P., 2015; MSC, 2015; Organic, 2013.
Sources: FAO Fishstat, 2015; MSC, FOS, personal communication, 2015.

2.1 Wild Catch

Historically, wild catch fisheries have provided the vast majority of seafood products available on global markets. At the international level, two certification systems, FOS and the MSC, compete for global market share, with each initiative accounting for roughly 50 per cent of total certified wild catch, respectively, by 2015. These two initiatives alone certified 18.6 million metric tons of wild catch seafood, accounting for 20 per cent of total wild catch production and 80 per cent of the total certified seafood market. Total certified wild catch production has been growing at an annual rate of 36 per cent (2003–2015), significantly outpacing the relative stagnant growth across global wild catch markets over the same period.

Although wild catch fisheries are present in most countries and 57 countries had some level of production certified under a sustainability standard in 2015, 70 per cent of certified wild catch production was sourced from 5 countries, with Peru and the United States accounting for 50 per cent of total certified wild catch. China, on the other hand, which accounts for 17 per cent of the global wild catch supply, is notably absent from the list of suppliers of certified wild catch production, with the exception of 60,000 metric tons of MSC-certified yesso scallops, certified in 2015.

Certified wild catch production is therefore considerably more concentrated than conventional production (five leading countries accounting for 41 per cent of total production), reflecting differences in the accessibility of certification in different regions but also differences in the business models underlying the MSC and FOS.

Whereas MSC certification is primarily focused on serving retail consumer markets in developed countries (with five retail-oriented species groups accounting for 64 per cent of MSC-certified production), FOS is primarily focused on serving industrial markets for a more diversified industrial base. The distinct business models underlying the two initiatives has led to very different distributions of supply, with the majority of MSC-certified production being sourced from developed countries and the majority of FOS-certified production being sourced from developing countries. While these differences point to different challenges for the respective initiatives, the significant concentration of certified wild catch seafood production in a small number of countries overall raises concerns about the accessibility of certification to less-developed producers more generally (see Section 2.3).

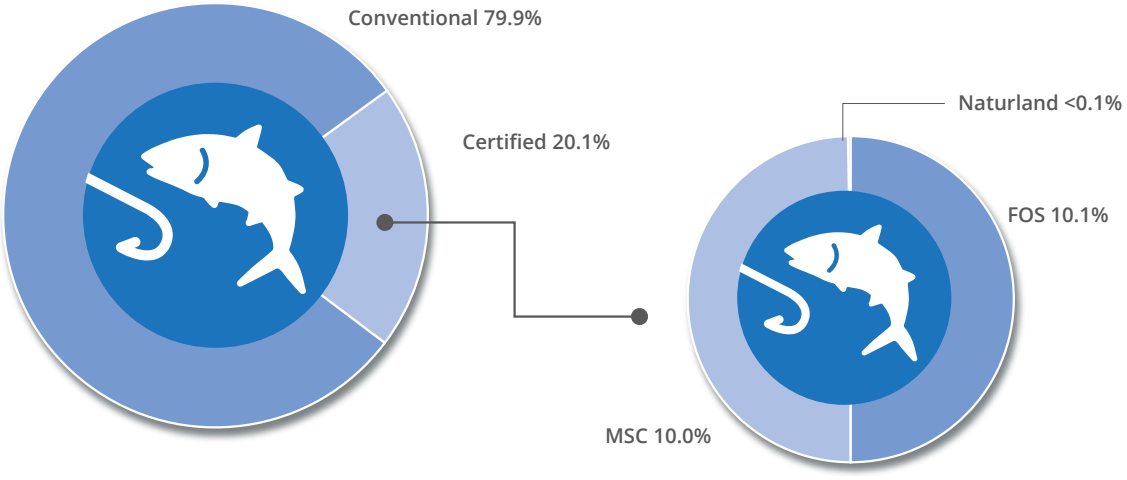
Table 2.4 Key statistics: Wild catch production (years for data listed in source note)

Global production	92.6 million mt
Top 5 producers and proportion of total	China (17%), Indonesia (7%), Peru (6%), United States (6%), India (5%) Total combined proportion: 41%
Top 5 species groups produced and proportion of total	Anchoveta (9%), tuna (6%), cod (6%, 3% of which is Alaska pollock), sardines (4%), shrimp/prawns (4%) Total combined proportion: 29%
Major international standards	Friend of the Sea, Marine Stewardship Council
Standard-compliant production	18.6 million mt (20% of global production)
Top 5 standard-compliant producers	Peru (31%), United States (19%), Norway (8%), Russia (6%), Chile (6%) Total combined proportion: 70%
Top 5 standard-compliant species groups	Anchoveta (36%), cod (19%, 12% of which is Alaska pollock), tuna (10%), mackerel (5%), salmon (4%) Total combined proportion: 74%
Retail value of compliant production	US$7.9 billion

Sources: Global production, top 5 producers, top 5 species groups produced, FAO Fishstat, 2015 (2013 data); standard-compliant data obtained from personal communication with the standards (data used is the latest available); Conventional, 2013; FOS, 2014 (species- and country-level data), 2015 (aggregate data); MSC, 2015; retail value of compliant production is calculated from an extrapolation of an estimation of MSC retail value in MSC, 2014, p. 11.

Figure 2.5 Certified catch as portion of total wild catch (years for data listed in source note)

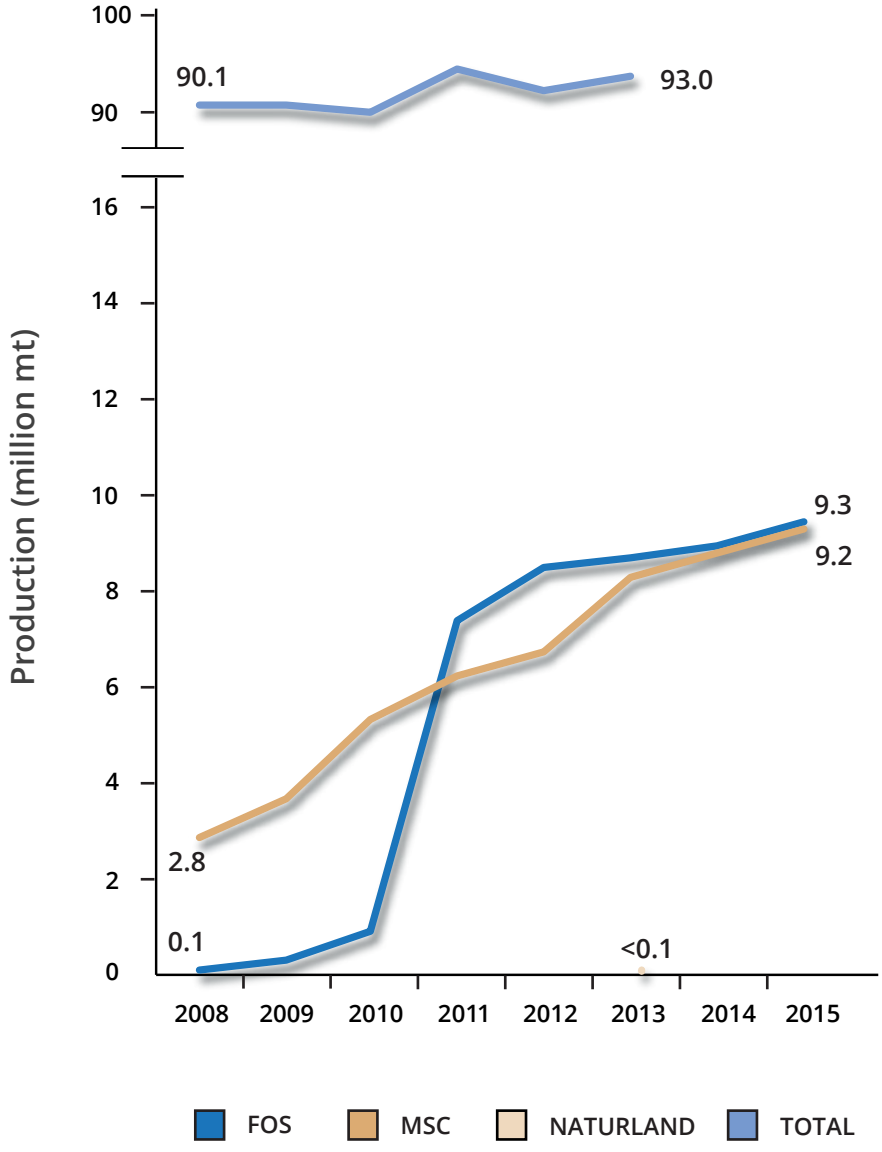
Certified wild catch accounted for 20 per cent of global wild catch in 2015, with FOS and MSC certifying nearly equal portions of total certified production.



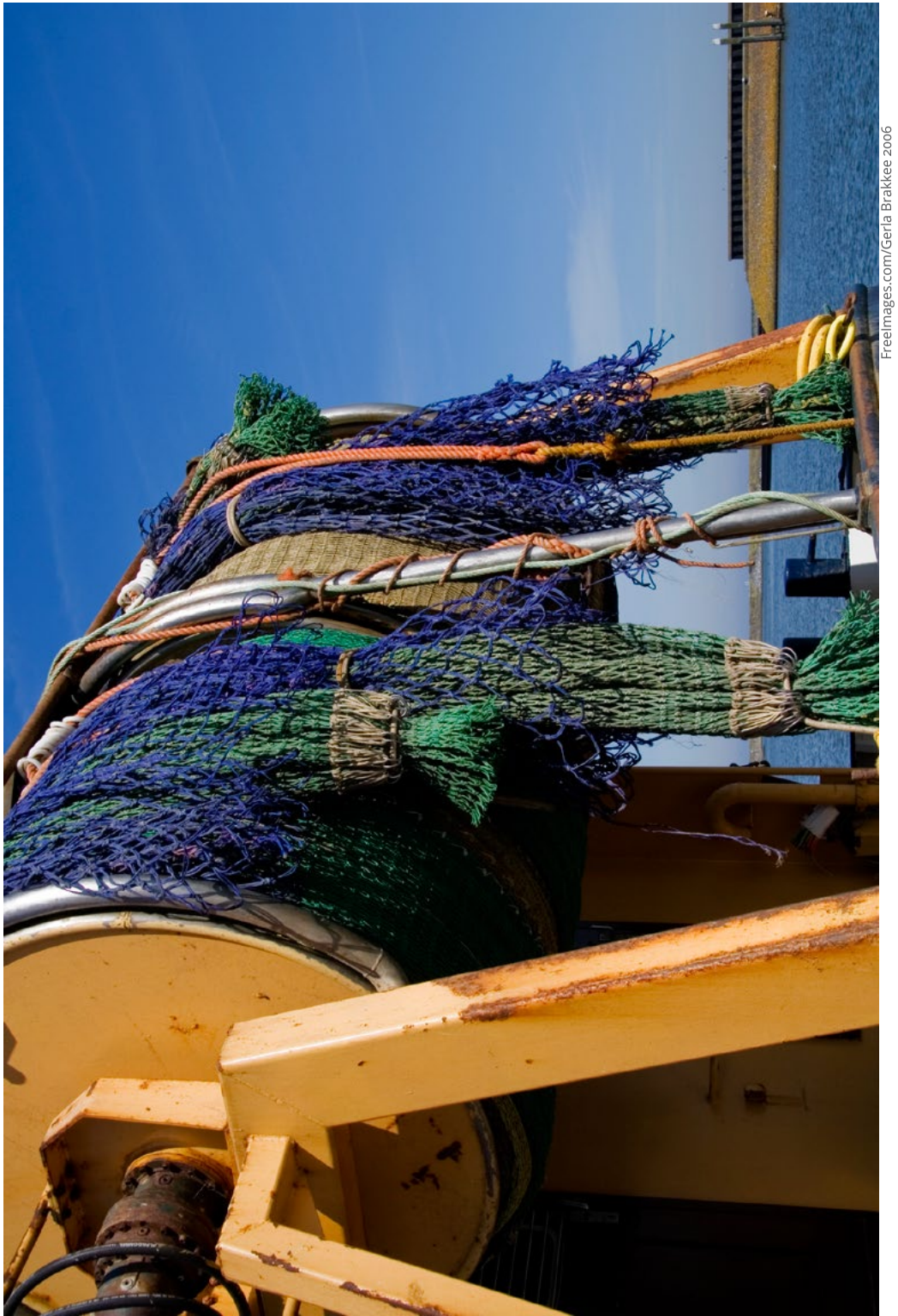
Data years: Global total, 2013; FOS, 2015; MSC, 2015
Sources: FAO Fishstat, 2015; MSC, FOS, personal communication, 2015.

Figure 2.6 Wild catch production growth, global total and by initiative, 2008–2015

Certified wild catch is growing substantially faster than conventional wild catch production. FOS has grown five times as fast as MSC over the last seven years. By 2015 the total production volumes of the two initiatives converged at just over 9 million metric tons, growing at a rate of around 6 per cent per annum (2014–2015).

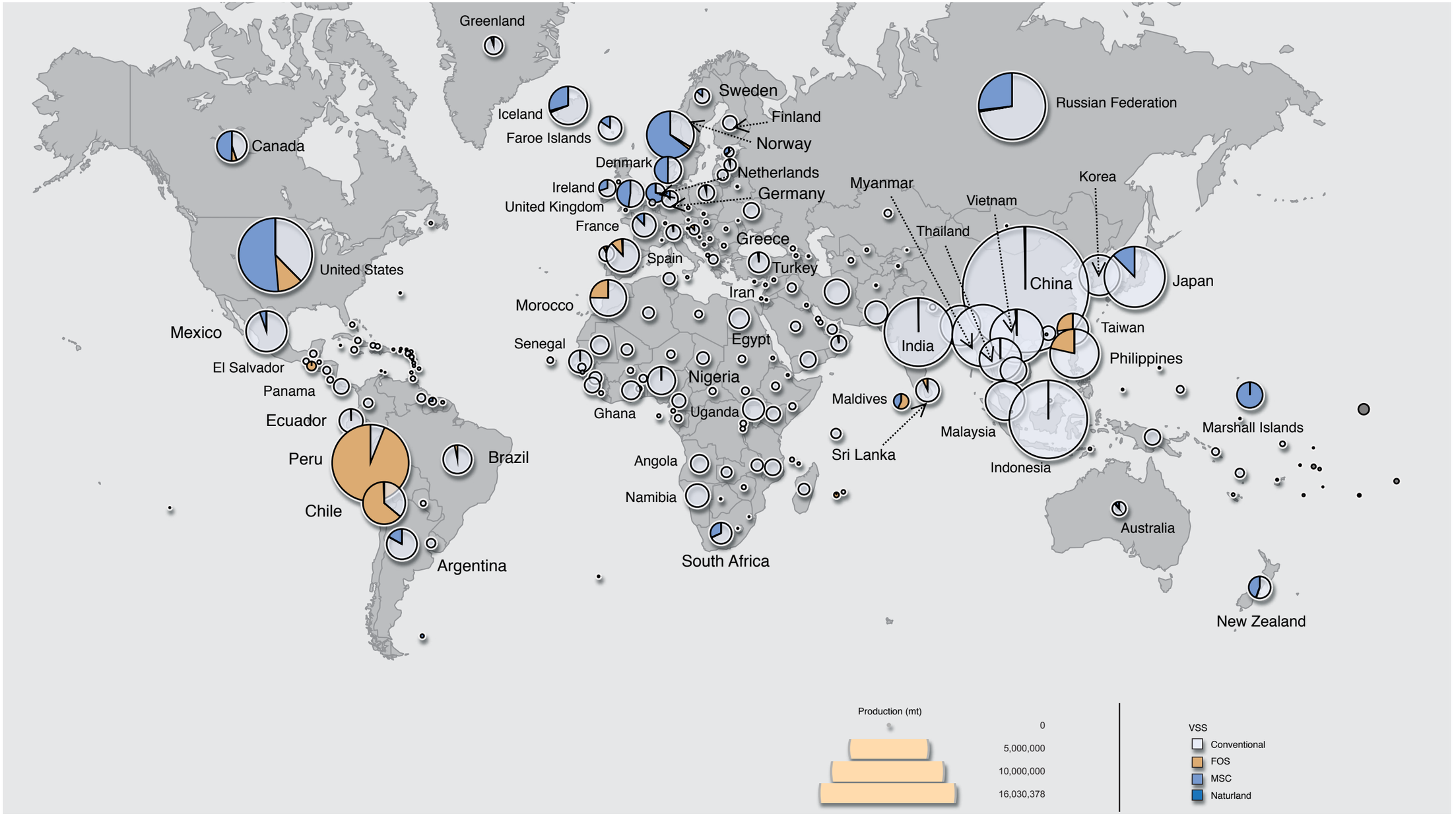


Compound annual growth rates (2008–2015): FOS: 91 per cent; MSC: 18 per cent; Total: 1 per cent.
Source: FAO Fishstat, 2015; FOS, MSC, personal communication, 2015.



FreeImages.com/Gerla Brakkee 2006

Figure 2.7 Global distribution of certified wild catch as a portion of total, 2015



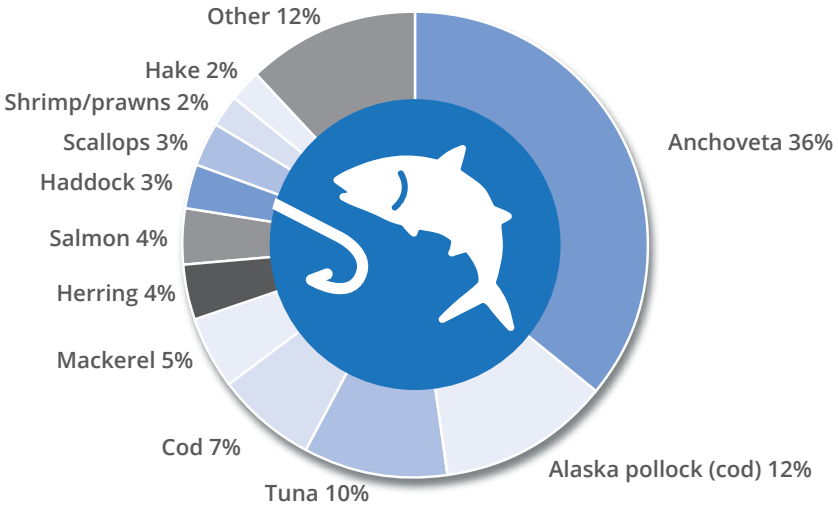
Source: FAO Fishstat, 2015; MSC, FOS, personal communication, 2015.

Figure 2.8 Percentage of total by wild catch key species groups, certified vs. global

The largest single source of certified wild catch is anchoveta, primarily destined for fish meal markets. Cod, tuna and salmon are the main certified wild catch species destined for retail markets. Overall certified wild catch production is concentrated in fewer species than global production as a whole, with the top five species groups accounting for 74 per cent of total certified wild catch.[27]

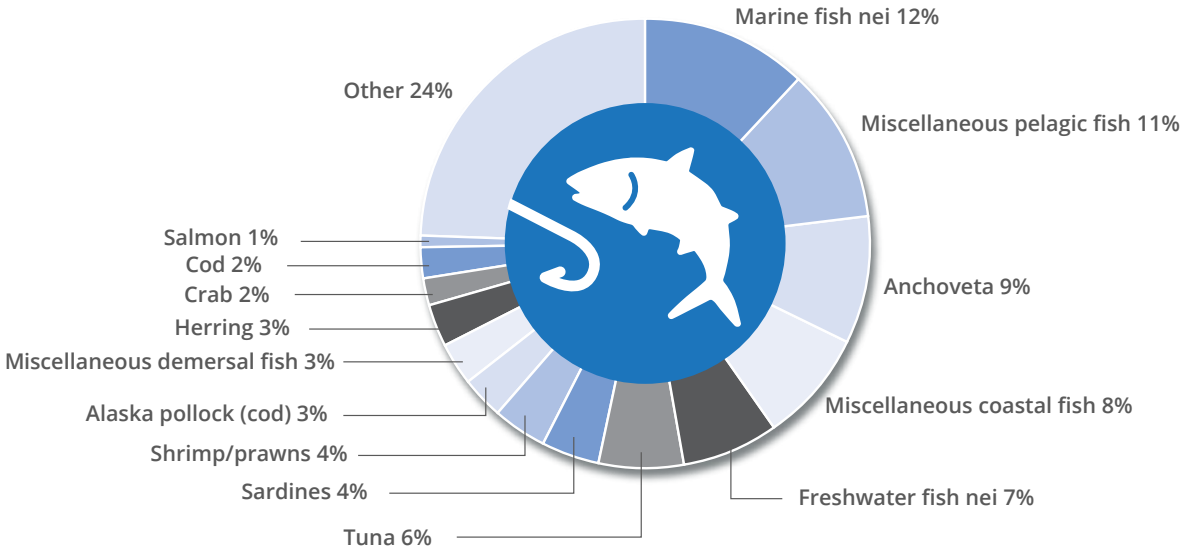
27 With "Alaska pollock (cod)" and "cod" counting as one species group.

Certified (2015)



Sources: ASC, BAP, ChinaG.A.P., FiBL, FOS, GLOBALG.A.P., MSC, Naturland, personal communication, 2015.

Global (2013)



Source: FAO Fishstat, 2015.

2.1.1 Marine Stewardship Council (MSC)

Table 2.5 MSC principles

Principle 1: Sustainable fish stocks	The fishing activity must be at a level that ensures it can continue indefinitely.
Principle 2: Minimizing environmental impact	Fishing operations must be managed to maintain the structure, productivity, function and diversity of the ecosystem.
Principle 3: Effective management	The fishery must comply with relevant laws and have a management system that is responsive to changing circumstances.

Source: MSC, n.d.-c.

The MSC is the oldest standard offering labelling of multiple wild catch species at the global level. Founded in 1997 as a partnership between Unilever and WWF, the MSC was launched as an independent global standard in 1998. In 2015, the MSC certified just over 9 million metric tons. The MSC has experienced rapid and consistent growth over the past seven years, with an annual average growth rate of 18 per cent and a reported retail value of US$4.5 billion in 2015 (MSC, 2014).

The MSC standard development and implementation process is guided by three principles: sustainability of fish stock levels, minimization of environmental impact and effective fishery management (see Table 2.5).

Since implementation of the first two principles is largely dependent on the third principle, implementation of the MSC standard has mainly been limited to larger fisheries and/or fisheries operating in contexts where overall fisheries management is significantly supported by a robust national management infrastructure.

The reliance of MSC certification on national management infrastructure, combined with the attribution of certification to several of the world's largest fisheries, has resulted in a highly concentrated distribution of production volume. Although the MSC boasts the most diverse supply base of any single labelling initiative (35 source countries in 2015; see Table 2.7), 10 developed countries accounted for over 89 per cent of global MSC supply in 2015. The striking concentration of MSC-certified production in developed-country markets points toward an important challenge facing MSC's production growth strategy.

MSC certification is also concentrated in a relatively small number of species, with three species groups (cod, herring and tuna) accounting for more than half of global MSC-certified production ("MSC 45% of global whitefish," 2015; see Table 2.6). Walleye pollock (also known as Alaska pollock, in fact a kind of cod), one of the kinds of fish used in MSC-certified Filet-O-Fish sandwiches at McDonald's throughout Europe and North America, is by far the most significant source of MSC-certified production (2.2 million metric tons or 24 per cent of total).

Notwithstanding the relative concentration in certified production, the MSC has the potential for significant diversification, reporting certification of 117 unique species in 2013. A critical question moving forward is whether the MSC's consumer base will be willing or able to support a more diversified supply base.

All major MSC species are visible retail brands, which speaks to the organization's reliance on retail consumption as a driver of growth. To date, however, consumer recognition of the MSC brand has remained relatively low (reported at 33 per cent across major consumer countries

in 2014).[28] Low consumer recognition has been overcome largely through significant corporate commitments to sourcing MSC-certified production, including the following examples:

- In 2009, Loblaws made a commitment to source all of its seafood from certified sustainable sources by 2013. By 2014, 93 per cent of all seafood in "core categories" (fresh, frozen, canned and frozen grocery) was sourced from MSC- or ASC-certified sources, and continued effort is being made to achieve the 100 per cent goal (WWF, 2015b).
- By 2014, all fish in Filet-O-Fish sandwiches (Alaska pollock) sold at McDonald's in the United States, Canada and Europe was MSC-certified (MSC, 2013a; 2014d).
- In September 2015, Aeon committed to increasing total MSC- and ASC-certified seafood sales in Japan to 10 per cent, up from its current level of 3 per cent ("Japan's largest retailer," 2015).
- In October 2015, Aramark committed to sourcing 2.5 million pounds of MSC-certified skipjack tuna by April 2016 ("U.S. foodservice giant Aramark," 2015d).
- In October 2015, IKEA committed to sourcing 100 per cent of its seafood from MSC- or ASC-certified sources ("IKEA Commits to ASC, MSC," 2015)
- As of 2016:
  - 100 per cent of Iglo Group's wild catch fish is from MSC-certified sources (Gwynn, 2014).
  - More than 90 per cent of Walmart U.S., Sam's Club and Asda's (U.K.) fresh and frozen farmed and wild seafood are either MSC or BAP certified, or engaged in a FIP (Walmart, n.d.).
  - The 2016 Olympic Games in Rio will serve MSC-certified seafood (MSC, 2013b).
  - By 2017, Waitrose supermarkets expects that 100 per cent of its fish products will be independently certified as responsibly sourced.[29]

The MSC's successful positioning of its products within mainstream retail markets at the corporate level signals the power of the MSC's brand and marketing strategy. However, even corporate commitments appear to have certain limitations within the current marketplace. For example, of the more than 3,000 MSC-certified products on the market, more than 75 per cent are sold in 12 countries across Europe and North America. While the MSC's strength within the corporate world suggests that there is still room for growth across the developed-country retail base, it would appear that the maintenance of its growth strategy over the medium term will depend heavily on the attraction of new buyers in less developed countries. However, the availability of production may prove to be an even more important limit on growth in the absence of a concerted effort to bring on more developing-country production into the MSC certification stream.

28 Based on a survey commissioned by the MSC of 9,019 respondents across 15 countries: Australia, Canada, Denmark, France, Finland, Germany, Japan, the Netherlands, Poland, Singapore, Spain, Sweden, Switzerland, the United Kingdom and the United States (MSC, 2014e).

29 Waitrose recognizes a number of independent third-party standards for wild caught fish, including the MSC and the FAO-based Responsible Fisheries Management (Waitrose, n.d.).

Table 2.6 MSC-certified wild catch, key species groups, 2015

Family	Production volume (mt)	Proportion of total	Species	Production volume by species (mt)
Alaska pollock (cod)	2,153,477	23%	Walleye pollock	2,153,477
Cod	1,234,170	13%	Atlantic cod	1,004,258
			Pacific cod	229,912
Herring	751,621	8%	Herring	751,621
Tuna	723,136	8%	Albacore tuna	23,247
			Skipjack tuna	688,993
			Yellowfin tuna	10,896
Scallops	583,381	6%	Atlantic scallop	33,079
			Patagonian scallop	32,892
			Queen scallop	8,479
			Yesso scallop	508,931
Haddock	532,606	6%	Haddock	532,606
Hake	427,792	5%	Cape hake	129,810
			European hake	3,215
			North pacific hake	282,223
			Southern hake	12,544
Salmon	402,760	4%	Chinook salmon	73,492
			Chum salmon	81,652
			Coho ("silver") salmon	73,632
			Pink salmon	81,645
			Sockeye ("red") salmon	92,339
Mackerel	382,271	4%	Mackerel	379,669
			Mackerel icefish	2,602
Shrimp/prawns	310,200	3%	Aesop shrimp	5,050
			Banana prawn	2,670
			Blue endeavor prawn	487
			Brown tiger prawn	2,215
			Greasyback shrimp	487
			Green tiger prawn	2,215
			Indian white prawn	380
			Northern prawn	261,529
			Pandalus shrimp nei	23,468
			Seabob shrimp	10,000
			Western king prawn	1,699
Pollock	267,078	3%	Saithe	267,078
Grenadier	232,015	3%	Blue grenadier	121,748
			Patagonian grenadier	110,267

Table 2.6 MSC-certified wild catch, key species groups, 2015, continued

Family	Production volume (mt)	Proportion of total	Species	Production volume by species (mt)
Mussels	152,831	2%	Blue mussel	141,825
			Chilean mussel	10,000
			Mediterranean mussel	200
			Other mussel	806
Lobster	116,678	1%	American lobster	112,288
			Caribbean spiny lobster	1,200
			European lobster	645
			Juan Fernández rock lobster	83
			Red rock lobster	1,899
			Rock lobster	128
			Tristan da Cunha rock lobster	435
Crab	112,881	1%	Blue crab	18,400
			Brown crab	210
			Dungeness crab	8,255
			Snow crab	85,700
			Velvet swimcrab	316
Sardines	105,313	1%	Sardine	22,313
			South American pilchard	83,000
Clams	44,033	<0.5%	Arctic surfclam	24,692
			Atlantic jackknife (Atlantic razor clam)	3,728
			Hard clam nei	4,380
			Razor clam, knife clam nei	55
			Short-neck clam nei	11,174
			Venus clam nei	4
Halibut	17,627	<0.5%	Atlantic halibut	1,760
			Halibut	15,867
Toothfish (i.e., Chilean sea bass)	13,169	<0.5%	Antarctic toothfish	2,153
			Patagonian toothfish	11,016
Anchoveta	8,719	<0.5%	Argentine anchovy	1,719
			European anchovy	7,000
Oysters	5,372	<0.5%	European flat oyster	5,322
			Pacific cupped oyster	50
Swordfish	4,885	<0.5%	Swordfish	4,885

Table 2.6 MSC-certified wild catch, key species groups, 2015, continued

Family	Production volume (mt)	Proportion of total	Species	Production volume by species (mt)
Other	654,528	7%	Alaska plaice	21,571
			Antarctic krill	117,000
			Arrowtooth flounder	53,818
			Chilipepper rockfish	1
			Cockle	7,761
			Dover sole	11,156
			English sole	340
			European plaice	29,887
			Flathead sole	20,083
			Flounder	220
			Golden redfish	44,400
			Grooved carpet shell	4
			Japanese carpet shell	4
			Ling	17,946
			Longnosed skate	715
			Longspine thornyhead	1,050
			Lumpfish (lumpsucker)	3,860
			Nephrops	4,052
			Northern pike	22
			Petrale sole	1,679
			Pikeperch	180
			Rex sole	2,874
			Rock sole	1,986
			Sablefish	11,060
			Sea bass	168
			Shortspine thornyhead	1,190
			Smelt nei	13,693
			Sole	1,016
			Sole nei	61,759
			Southern blue whiting	38,107
			Spiny dogfish	2,239
			Splitnose rockfish	55
			Spotted spiny dogfish	799
			Vendace	1,746
			Widow rockfish	143
			Yellowfin sole	164,944
			Yellowtail flounder	17,000
Total	**9,236,543**	**100%**		**9,236,543**

Source: MSC, personal communication, 2015.

Table 2.7 MSC-certified wild catch, key countries, 2015

Country	Production value (mt)	Proportion of total
United States	2,766,637	30%
Norway	1,402,861	15%
Russian Federation	1,186,497	13%
Marshall Islands	616,410	7%
Japan	449,151	5%
Canada	422,734	5%
Iceland	414,948	4%
Denmark	334,077	4%
United Kingdom	320,426	3%
Netherlands	236,842	3%
New Zealand	195,225	2%
Argentina	144,878	2%
South Africa	130,245	1%
Mexico	86,099	1%
Maldives	83,479	1%
Faroe Islands	76,406	1%
Ireland	75,388	1%
France	61,908	1%
China	60,000	1%
Germany	29,095	<0.5%
Sweden	25,088	<0.5%
Estonia	23,000	<0.5%
Greenland	14,306	<0.5%
Australia	13,280	<0.5%
India	11,174	<0.5%
Chile	10,083	<0.5%
Suriname	10,000	<0.5%
Poland	8,934	<0.5%
Spain	8,182	<0.5%
Falkland Islands (Malvinas)	5,500	<0.5%
Latvia	5,500	<0.5%
Vietnam	4,380	<0.5%
Cook Islands	2,302	<0.5%
Fiji	1,308	<0.5%
Portugal	200	<0.5%
Total	**9,236,543**	**100%**

Source: MSC, personal communication, 2015.

2.1.2 Friend of the Sea (FOS)

FOS was founded in 2008 by the NGO Earth Island Institute, drawing upon its experience in the management of the dolphin-safe project for the elimination of dolphin encirclement in tuna fishing. Although the origins of the FOS program are traced to the protection of dolphins in tuna fishing fleets, FOS now operates as one of the most diversified seafood labelling initiatives certifying both aquaculture and wild catch fisheries. FOS production has grown at a rate of 91 per cent per annum between 2008 and 2015, reaching 9.3 million metric tons of FOS-certified wild catch seafood in 2015 (5.7 per cent of global; 10.1 per cent of total wild catch) and making it the single largest source of certified wild catch on the global market.

The development of FOS has followed a strikingly different business model than the MSC. On the one hand, FOS certification appears to focus much less on the processes that might lead to sustainable fisheries and much more on the actual state of fisheries seeking certification. Following this approach, the basic and arguably driving requirement for FOS certification is that the target stock not be overexploited according to FAO guidelines. Following this basic principle, the certification process for FOS products would appear to be considerably less involved and potentially less costly for producers seeking certification than might be the case with other more management system–focused fisheries.[30]

Perhaps as a result of lower certification costs, FOS wild catch certification has made significant inroads in the certification of non-retail species destined for fish meal or fish feed, and has also grown a developing-country supply base. These markets are generally untouched or under-represented by other global schemes. Notably, the FOS system's lower costs structure and apparently streamlined approach to certification suggests lower barriers to entry for more marginalized producers and lower-value species (see Table 2.8 and Table 2.9). Although concentration of production remains an issue for FOS, with just three countries accounting for 82 per cent of the standard's wild catch certification, the fact that the three leaders of FOS supply are developing countries (Peru, Chile and the Philippines) and that over 90 per cent of all FOS supply comes from developing countries points toward greater overall access and/or a more concerted strategy by FOS toward the certification of developing-country sources.

Notwithstanding FOS's strong growth over the past five years, its heavy reliance on industrial purchases as inputs for other products along the food chain (as feed) may point toward limited space for demand-driven market growth in a context where potential buyers of such inputs (e.g., producers of other sustainable products requiring sustainable fish inputs for their own production processes) currently only represent a small share of the total feed market. Although FOS has some influence on at least one potential buyer—namely FOS-certified aquaculture production (which is required to use FOS-certified fish feed)—this potential market is still relatively small and apparently not substantial enough at present to drive growing demand for FOS products.

FOS has certified the entire production of Peruvian and Chilean anchovies, which at a combined total of about 6 million metric tons of production per year accounts for about half of the world's fish meal production (Eurofish, 2012). As a result, Peruvian fish meal exported to China, which at half a million metric tons per year (Rabobank, 2015) represents one of the largest trade flows in the entire seafood industry, is now almost entirely FOS certified.

30 FOS reports an average audit cost of €5,000 for wild catch fisheries. See FOS (n.d.-a) and Section 3.3.

Table 2.8 FOS-certified wild catch, key species groups, 2014*

Species group	Production volume (mt)	Proportion of total	Species	Production volume by species (mt)
Anchoveta	6,440,300	72%	Argentine anchovy	3,000
			European anchovy	337,300
			Peruvian anchovy	6,100,000
Tuna	1,112,387	13%	Albacore tuna	8,833
			Bigeye tuna	51,833
			Skipjack tuna	556,273
			Yellowfin tuna	495,448
Mackerel	509,000	6%	Chilean jack mackerel	509,000
Salmon	405,000	5%	Chinook salmon	126,000
			Chum salmon	9,000
			Coho salmon	126,000
			Pink salmon	9,000
			Sockeye salmon	135,000
Shrimp/prawns	40,319	<0.5%	Aristeus shrimp nei	275
			Banana prawn	5,769
			Giant red shrimp	275
			Giant tiger prawn	4,000
			Northern prawn	30,000
Cod	21,000	<0.5%	Atlantic cod	19,500
			Blue cod	1,500
Clams	17,000	<0.5%	Manila clam	5,000
			Venus clam nei	12,000
Haddock	15,000	<0.5%	Haddock	15,000
Scallops	9,000	<0.5%	Scallop	9,000
Swordfish	4,350	<0.5%	Swordfish	4,350
Sea bream	3,000	<0.5%	Sea bream	3,000
Lobster	2,700	<0.5%	Norway lobster	2,000
			Southern rock lobster	700

* Latest year for country-specific data at time of writing.

Table 2.8 FOS-certified wild catch, key species groups, 2014, continued

Species group	Production volume (mt)	Proportion of total	Species	Production volume by species (mt)
Other	312,700	4%	Antarctic krill	15,000
			Atlantic menhaden	174,000
			Cuttlefish	10,000
			Cuttlefish, bobtail squid nei	5,000
			European perch	1,750
			Gulf menhaden	87,000
			Jumbo flying squid	1,200
			Pharaoh cuttlefish	5,000
			Pike perch	1,750
			Sole	2,000
			Various squids nei	10,000
Total	**8,891,756**	**100%**		**8,891,756**

Source: FOS, personal communication, 2015.

Table 2.9 FOS-certified wild catch, key countries, 2014*

Country	Production volume (mt)	Proportion of total
Peru	5,500,000	62%
Chile	1,101,200	12%
United States	591,000	7%
Philippines	500,000	6%
Morocco	310,000	3%
Taiwan	250,000	3%
Spain	115,000	1%
Maldives	110,480	1%
El Salvador	65,000	1%
Canada	48,000	1%
Norway	42,000	<0.5%
Russian Federation	36,000	<0.5%
Sri Lanka	35,250	<0.5%
Brazil	25,000	<0.5%
Iceland	22,500	<0.5%
Vietnam	20,000	<0.5%
Antarctic Ocean	15,000	<0.5%
La Réunion	15,000	<0.5%
Portugal	14,000	<0.5%
Croatia	10,000	<0.5%
Oman	7,407	<0.5%
Turkey	7,300	<0.5%
Thailand	7,000	<0.5%
Australia	5,769	<0.5%
Italy	5,000	<0.5%
Nigeria	4,000	<0.5%
Estonia	3,500	<0.5%
Ecuador	3,100	<0.5%
Argentina	3,000	<0.5%
New Zealand	2,200	<0.5%
Netherlands	2,000	<0.5%
Senegal	2,000	<0.5%
South Africa	1,500	<0.5%
Indonesia	500	<0.5%
Eastern Mediterranean	50	<0.5%
Other (not specified)	10,000	<0.5%
Total	**8,891,756**	**100%**

* Latest year for species-specific data at time of writing.

Source: FOS, personal communication, 2015.

2.1.3 Naturland

Currently, no globally recognized standard for organic wild catch seafood exists.[31] However, Naturland, one of many national organic aquaculture standards, has developed a standard for "sustainable capture fishery." While not technically organic (although most Naturland products are organic, including its certified aquaculture), this standard stipulates conditions on fish stocks and fishing equipment used, as well as social and economic norms. Naturland has one pilot project for a Nile perch capture fishery in Lake Victoria, Tanzania, as well as an inland crayfish fishery and a Baltic Sea fishery certified in Germany. The Lake Victoria project represents one of the only small-scale fishery certification projects in sub-Saharan Africa. Landings from the Lake Victoria certified fishery are estimated at just under 10,000 metric tons, and while landings figures for the other two fisheries could not be shared for confidentiality reasons, their landed volumes are likely to be modest.

31 IFOAM, the international body that oversees organic certification at the global level, does not officially recognize or outline requirements for organic wild catch fisheries. The concept of organic wild catch fisheries has long stirred debate. On one hand, wild fish are by definition free of intentionally introduced synthetic antibiotics or hormones and fulfill any reasonable definition of the "free range" requirement typically required of terrestrial organic animals. On the other hand, wild catch seafood is not "cultivated" and allows for none of the special husbandry that normally allows for other animals to be certified organic. Wild fish cannot be fed organic feed, for example, and their health cannot be managed in most circumstances.

2.2 Aquaculture

Conventional aquaculture production has been growing at an annual average rate of 6.1 per cent over the past two decades and accounted for 43.1 per cent of global seafood production in 2013, up from 30.6 per cent in 1993. Aquaculture production is highly concentrated in the Asia–Pacific region, which accounts for an estimated 90 per cent of global production (Jonell, Phillips, Rönnbäck, & Troell, 2013). China alone accounted for 62 per cent of the world's aquaculture production in 2013.

In the face of stagnating production volumes in wild catch, aquaculture has almost single-handedly been responsible for meeting the global increase in seafood demand over the past decade. Following a similar path, certified aquaculture production has grown exponentially, at an average rate of 76 per cent per year from 2003 to 2015, significantly outpacing the growth of conventional aquaculture.

Six certification initiatives dominate global supply for certified aquaculture, supplying 4.5 million metric tons and accounting for 6 per cent of global aquaculture supply in 2015. Of these, two initiatives, GLOBALG.A.P. (3 per cent of global aquaculture) and the ASC (1 per cent of global aquaculture) account for two-thirds of total sustainable aquaculture production. While the portion of global aquaculture production that is certified is relatively low, this is largely due to China's dominance in conventional production but relative absence in certified production. Certified aquaculture accounts for over 16 per cent of all non-Chinese global production.[32]

Certified aquaculture is highly concentrated across a small number of countries, with Norway, Chile and Spain accounting for over half of the global total. Norway leads the global supply of certified aquaculture with a total production of nearly 1 million metric tons, accounting for one-quarter of global certified supply.

32 Excluding Chinese-certified aquaculture.

Table 2.10 Key statistics: Aquaculture production (years for data listed in source note)

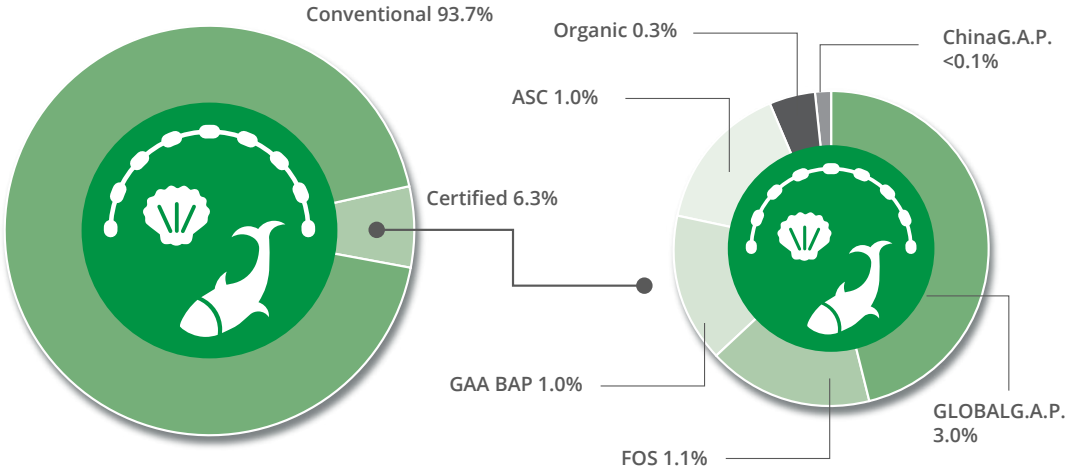
Global production	70.2 million mt
Top 5 producers and proportion of total	China (60%), India (6%), Indonesia (5%), Vietnam (5%), Bangladesh (3%) Total combined proportion: 79%
Top 5 global species groups and proportion of total	Carp (39%), clams (8%), tilapia (7%), oysters (7%), shrimp/prawns (6%) Total combined proportion: 67%
Major international standards	ASC, GAA BAP, FOS, GLOBALG.A.P., Organic
Standard-compliant production	4.5 million mt (6% of total)
Top 5 standard-compliant producers	Norway (25%), Chile (19%), Spain (9%), Vietnam (8%), Italy (7%) Total combined proportion: 68%
Top 5 standard-compliant species groups	Salmon (56%), pangasius (10%), mussels (8%), tilapia (8%), shrimp/prawns (6%) Total combined proportion: 88%
Retail value of compliant production	US$3.6 billion

Sources: Global production, top 5 producers, top 5 species groups produced, FAO Fishstat, 2015 (2013 data); standard-compliant data obtained from personal communication with the standards; data used is the latest available; ASC, 2015; BAP, 2013; ChinaG.A.P., 2013; Conventional, 2013; FOS, 2014 (species- and country-level data), 2015 (aggregate data); GLOBALG.A.P., 2015; FiBL, 2013;[33] retail value of compliant production is calculated from an extrapolation of an estimation of MSC retail value (MSC, 2014a, p. 11).

33 Organic data were provided by FiBL. Data are based on national data sources and Eurostat.

Figure 2.9 Certified vs. conventional aquaculture seafood production (years for data listed in source note)

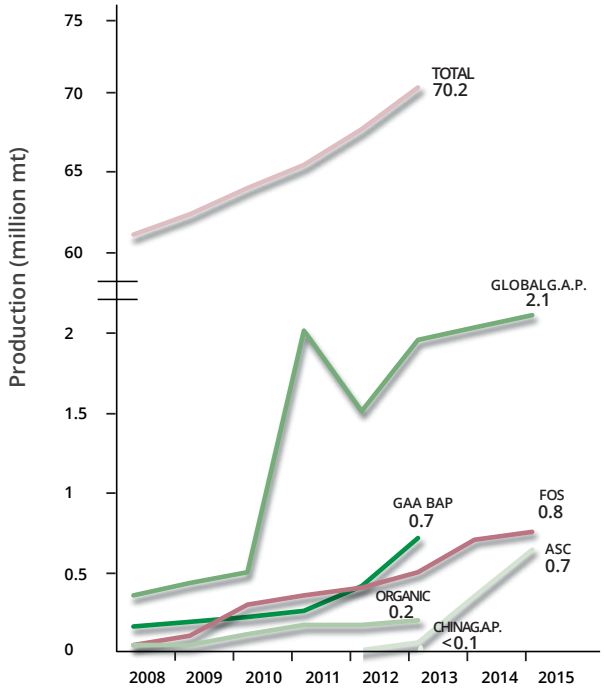
Certified aquaculture accounted for just over 6 per cent of total aquaculture production in 2015. GLOBALG.A.P. accounted for almost half of all certified aquaculture production, while BAP, ASC and FOS shared near-equal portions of the remainder.



Data years: ASC, 2015; BAP, 2013; ChinaG.A.P., 2013; Conventional, 2013; FOS, 2014; GLOBALG.A.P., 2015; Organic, 2013. Sources: FAO Fishstat, 2015; ASC, BAP, ChinaG.A.P., FOS, GLOBALG.A.P., Organic, personal communication, 2015.

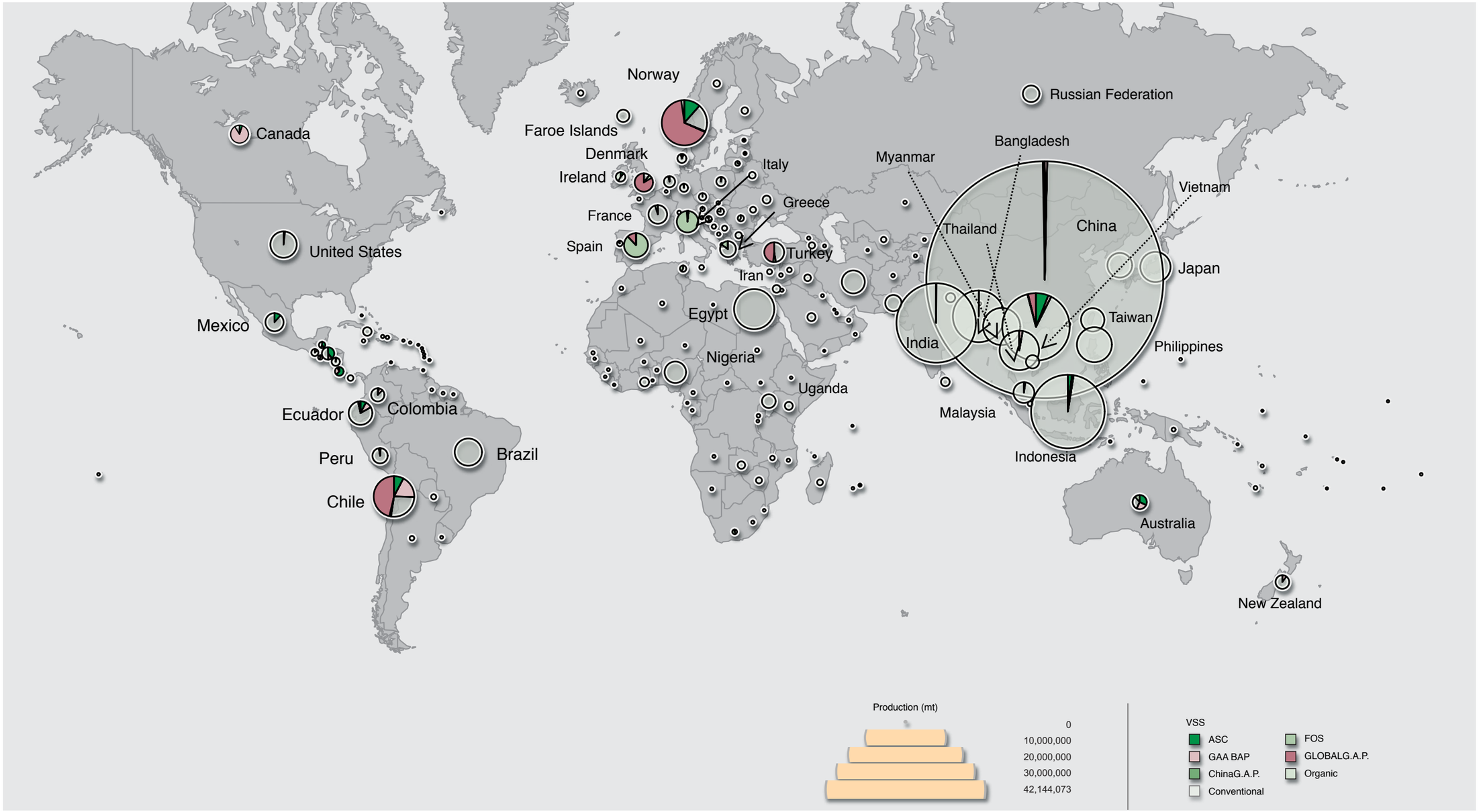
Figure 2.10 Aquaculture production growth, global total and by initiative, 2008–2015

The most significant growth in certified aquaculture occurred between 2009 and 2010, with GLOBALG.A.P. growing by 400 per cent in that year. ASC led per annum growth between 2014 and 2015 at a rate of 52 per cent.



Compound annual growth rates (2008–2015): ASC: 98 per cent; BAP: 35 per cent; FOS: 47 per cent; GLOBALG.A.P.: 29 per cent; Organic: 35 per cent; Total: 6 per cent. Sources: FAO Fishstat, 2015; ASC, BAP, ChinaG.A.P., FiBL, FOS, GLOBALG.A.P., MSC, Naturland, personal communication, 2015.

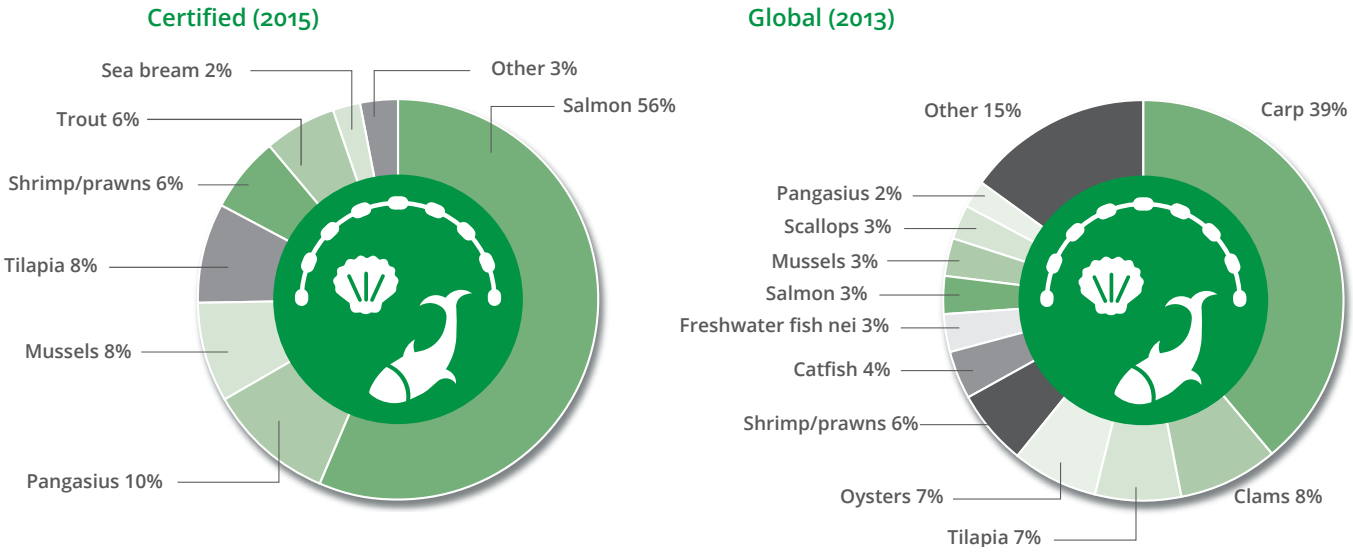
Figure 2.11 Global distribution of certified aquaculture as a portion of total (years for data listed in source note)



Data years: ASC, 2013; BAP, 2013; ChinaG.A.P., 2013; Conventional, 2013; FOS, 2014; GLOBALG.A.P., 2015; Organic, 2013.
Sources: FAO Fishstat, 2015; ASC, BAP, ChinaG.A.P., FiBL, FOS, GLOBALG.A.P., personal communication, 2015.

Figure 2.12 Percentage of total aquaculture production by key species groups, certified vs. global

Certified aquaculture is primarily aimed at a limited number of species with high commercial value. The largest single source of certified aquaculture in 2015 was salmon, accounting for 56 per cent of the global total. With only seven species groups accounting for more than 97 per cent of the global total, certified aquaculture production is significantly more concentrated than global aquaculture production as a whole. Certified aquaculture displays a focus on a more limited number of species groups than wild catch certified production.



Data years: ASC, 2015; BAP, 2013; ChinaG.A.P., 2013; Conventional, 2013; FOS, 2014, GLOBALG.A.P., 2015; Organic, 2013.
Certified sources: ASC, BAP, ChinaG.A.P., FiBL, FOS, GLOBALG.A.P., MSC, Naturland, personal communication, 2015.
Global source: FAO Fishstat, 2015.

Seven species groups (salmon, pangasius, mussels, tilapia, shrimp/prawns, trout and sea bream) account for 97 per cent of certified aquaculture production, with salmon alone accounting for over half of total certified production. Initiatives serving the aquaculture sector tend to focus on the certification of a few species. The six leading certified species groups account for 23 per cent of conventional production, pointing to the particularities of the certified market. Notably, as the most widely produced aquaculture species, accounting for 39 per cent of global production, carp has no significant certified volumes. These statistics point toward the very specific and potentially limited nature of the overall market for certified products as a result of retail-driven demand in Europe and North America.

2.2.1 Aquaculture Stewardship Council (ASC)

The ASC was founded in 2010 by the WWF and the Sustainable Trade Initiative (IDH) as an outcome of the WWF-led Aquaculture Dialogues.[34] To date, the ASC has developed seven species-specific aquaculture standards.[35] The first reported ASC-certified production volumes date from 2012. Between 2012 and 2015, ASC-certified production grew from 88,096 metric tons to 688,138 metric tons, making it the fastest-growing initiative in recent years, with a growth rate of 98 per cent per annum (2012–2015). ASC production to date has primarily focused on three species groups (salmon, tilapia and pangasius), which alone accounted for over 90 per cent of ASC-certified production in 2015 (see Table 2.11).

Of ASC production in 2015, approximately 70 per cent was produced across the developing world (see Table 2.12). Although the majority of ASC production comes from Asia (39 per cent of total), a significant portion also comes from Latin America (25 per cent). Notably, the ASC has very little certified production North America, with none in the United States. African production was also negligible in 2015, with only 298 metric tons being produced in South Africa.

The actual distribution of ASC products is, for the most part, concentrated in Europe, with over 77 per cent of the more than 3,600 ASC-certified products being sold in Europe alone in 2015 (ASC, 2015). Due to the relatively new status of the ASC, it is difficult to predict planned or eventual growth of the initiative moving forward, though there would appear to be obvious opportunities for the expansion of production in North America, Asia and Africa.

34 The Aquaculture Dialogues were launched in 2004 and continue to this day.

35 Abalone (2012), bivalves (2012), pangasius (2012), salmon (2012), tilapia (2012), freshwater trout (2013), shrimp (2014).

Table 2.11 ASC-certified aquaculture, key species groups, 2015

Species group	Production volume (mt)	Proportion of total	Species	Production volume by species (mt)
Salmon	341,161	50%	Salmon	341,161
Tilapia	147,919	21%	Tilapia	147,919
Pangasius	144,555	21%	Pangasius	144,555
Shrimp/prawns	41,092	6%	Shrimp	41,092
Trout	6,735	1%	Trout	6,735
Other	6,676	1%	Abalone	1
			Bivalves	6,675
Total	**688,138**	**100%**		**688,138**

Source: ASC, personal communication, 2015.

Table 2.12 ASC-certified aquaculture, key countries, 2015

Country	Production volume (mt)	Proportion of total
Vietnam	191,720	28%
Norway	161,448	24%
Chile	85,455	13%
Indonesia	67,320	10%
Australia	33,839	5%
Honduras	29,791	4%
Ecuador	26,325	4%
Mexico	21,864	3%
Costa Rica	18,575	3%
Canada	9,215	1%
Belize	5,052	1%
Italy	4,528	1%
Ireland	4,369	1%
Malaysia	3,605	1%
Scotland	2,979	<0.5%
Colombia	2,222	<0.5%
Denmark	2,160	<0.5%
China	1,828	<0.5%
Peru	1,589	<0.5%
Poland	1,291	<0.5%
England	750	<0.5%
South Africa	298	<0.5%
Total	**688,139**	**100%**

Source: ASC, personal communication, 2015.

Data for this table was received at a later than the data in the species table, with an aggregate that was 1 per cent larger than the aggregate in the species table. Data in this table was thus adjusted downward by 1 per cent so as to maintain consistency with the species data.

ChinaG.A.P.

Founded in 2005, ChinaG.A.P. is a government-led initiative, developed, supervised and governed by the Certification and Accreditation Administration of the People's Republic of China (ITC, 2015). ChinaG.A.P. has certified Chinese aquaculture production since 2008. Although ChinaG.A.P.'s agriculture standards are benchmarked against GLOBALG.A.P., at the time of writing, the ChinaG.A.P. aquaculture standards had not followed suit. This could be due in part to the diversity of Chinese aquaculture systems as well as the administrative burden involved in the benchmarking process. It is uncertain whether ChinaG.A.P. aquaculture standards will be benchmarked against the GLOBALG.A.P. standard in the future.

Total ChinaG.A.P.-certified production in 2013 was estimated at 3,090 metric tons or 0.1 per cent of globally certified sustainable aquaculture. Although ChinaG.A.P.'s market represents only a fraction of global certified production at present, the overall importance

of Chinese aquaculture production in the global market makes ChinaG.A.P. a potentially important player.[36] Although the standard body provided no data on species distribution, based on production data provided by certification bodies, it is believed that tilapia, crab and shrimp are the main species certified by ChinaG.A.P. (Wit Assessment Co., Ltd., personal communication, March 19, 2015). All ChinaG.A.P.-certified production, as the name suggests, is produced in China.

The administration of the ChinaG.A.P. standard makes it extremely difficult to acquire market data and/or gain a foothold on the organization's strategic direction. Although the standard is supported by state processes (China Quality Certification Centre, n.d.), there is virtually no data available with respect to volumes of certified production, let alone sustainability or marketing strategies. The lack of access to data and related information on ChinaG.A.P. threatens to feed confusion and reduce overall transparency in Chinese seafood chains.[37]

2.2.2 Friend of the Sea (FOS)

FOS, with about 700,000 metric tons certified in 2014 and 750,000 metric tons certified in 2015, represents the second-largest source of certified aquaculture as well as the second-fastest-growing aquaculture initiative, with an average annual growth rate of 47 per cent between 2008 (its founding year) and 2015. As the only non-organic global standard certifying both wild catch and aquaculture, FOS has a unique opportunity to oversee sector transformation by managing the distribution of supply between wild catch and aquaculture. Moreover, it also has the potential to develop its own internal market, supplying certified wild catch product to certified aquaculture production in the form of fish meal. Notwithstanding these notable assets, it would appear that there is much work to do before FOS is able to realize these synergies in an effective manner. At present, aquaculture constitutes less than 10 per cent of total FOS-certified production.

The overwhelming majority (47 per cent) of FOS aquaculture production in 2014 was mussels. Trout and Arctic char account for another 35 per cent of FOS aquaculture production (see Table 2.13). In stark contrast to its wild catch certification, FOS-certified aquaculture production is almost entirely located in the developed world, with Spain and Italy accounting for 84 per cent (584,975 metric tons) of global production (see Table 2.14).

Although FOS reported having products on sale in 14 countries in 2014, including Canada, Hong Kong, Singapore, the United Kingdom and the United States (FOS, 2015), its retail market remains highly concentrated in Italy, Spain and Switzerland. Indeed, it would appear, notwithstanding the global potential of a combined strategy for wild catch and aquaculture certification, that FOS has focused its growth strategy on the development of a limited number of European markets. If FOS is to maintain its role as a relevant player at the global level, it may have to invest more heavily in the development of global demand for its products.

36 From the limited information available on the standard, it appears the producers consist of moderately sized units with relatively stable annual production and incomes, with few (if any) of the producers consisting of publicly traded companies (Wit Assessment Co., Ltd., personal communication, March 19, 2015).

37 In addition to failing to provide time series or species-related market data, access to the actual criteria covered by ChinaG.A.P. can only be had by paying a fee. Overall, it would appear that the general operation and management of the scheme runs contrary to the basic role that standards are meant to fill, namely providing better information on supply chain sustainability.

Table 2.13 FOS-certified aquaculture, key species groups, 2014

Species group	Production volume (mt)	Proportion of total	Species	Production volume by species (mt)
Mussels	329,815	47%	Blue mussel	9,938
			Chilean mussel	14,908
			Mediterranean mussel	304,969
Trout	166,468	24%	Brook trout	79,507
			Rainbow trout	86,961
Salmon	89,446	13%	Arctic char	79,507
			Atlantic salmon	9,938
Sea bream	29,815	4%	Gilthead sea bream	24,846
			Sea bream	4,969
Pangasius	7,454	1%	Pangasius	7,454
Shrimp/prawns	5,687	1%	Black tiger prawn	3,102
			Whiteleg shrimp	2,585
Oysters	4,969	1%	Flat oysters nei	2,485
			Pacific cupped oyster	2,485
Cod	2,500	<0.5%	Atlantic cod	2,500
Clams	2,485	<0.5%	Venus clams nei	2,485
Scallops	2,485	<0.5%	Peruvian calico scallop	2,485
Other	58,877	8%	Adriatic sturgeon	125
			Beluga sturgeon	42
			Danube sturgeon (osetr)	83
			European sea bass	32,300
			Meagre	9,938
			Abalone (perlemoen)	2,485
			Red drum	2,485
			Senegalese sole	800
			Siberian sturgeon	125
			Stellate sturgeon	42
			Sterlet sturgeon	42
			Striped bass	2,485
			Turbot	5,400
			White sturgeon	42
			Yellowtail amberjack	2,485
Total	**700,000**	**100%**		**700,000**

Source: FOS, personal communication, 2015.

Table 2.14 FOS-certified aquaculture, key countries, 2014

Country	Production volume (mt)	Proportion of total
Spain	313,737	45%
Italy	271,238	39%
Greece	19,877	3%
Chile	14,908	2%
United Kingdom	12,423	2%
Australia	12,423	2%
Vietnam	10,139	1%
France	9,938	1%
Turkey	9,938	1%
Norway	7,469	1%
Mauritius	4,969	1%
Tunisia	4,969	1%
Netherlands	2,485	<0.5%
Peru	2,485	<0.5%
South Africa	2,485	<0.5%
India	517	<0.5%
Total	**700,000**	**100%**

Source: FOS, personal communication, 2015.

2.2.3 Best Aquaculture Practices (BAP)

The BAP standards were developed by the GAA in 2004. The GAA is an industry-led trade organization seeking to promote coordinated strategies in marketing and policy developments related to the aquaculture sector. The BAP standards were developed with the specific support of 12 companies primarily supplying the U.S. market.[38] Among its suite of standards, BAP has three species-specific standards (finfish and crustaceans, salmon, and mussels) as well several other standards pertaining to specific segments of the supply chain (e.g., hatcheries and processing plants). BAP's development of segment-specific standards is a reflection of GAA and BAP's preoccupation with and integration of hazard analysis and critical control points food safety standards as a major driver of adoption. In some ways, BAP represents a North American–born response to EUREPGAP (subsequently GLOBALG.A.P.), bearing some of the same advantages and disadvantages of promoting a fully integrated health, safety and sustainability standard system.

BAP's strong industry buy-in has permitted rapid growth. The most recent data show BAP growing at an annual rate of 35 per cent, from 159,316 metric tons in 2008 to 711,827 metric tons in 2013. Three species groups—salmon, tilapia and shrimp/prawns—accounted for more than 90 per cent of BAP-certified production in 2013, with salmon accounting for the vast majority (396,662 metric tons or 56 per cent). The extremely high concentration of production

38 BAP founding partners are H&N Foods International, Chicken of the Sea Frozen Foods, H.E. Butt Grocery Co., Red Chamber Co., Rubicon Resources, Eastern Fish Co., Pacific Supreme Co., SeaPack Shrimp Co., Darden Restaurants, High Liner Foods USA Inc., Seajoy, and Scientific Associates, LLC.

across specific species groups clearly reflects the corporate base behind the standard (see Table 2.15). Comparatively speaking, BAP production is more evenly distributed than most of the other aquaculture certifications, with compliant seafood production across 20 countries and 8 countries producing "non-negligible" amounts (>10,000 metric tons). Nevertheless, 68 per cent of BAP production is supplied by three countries spanning three continents: Chile, Canada and China. Notably, BAP is the only major international supplier of certified aquaculture from China and Canada, suggesting potential early-mover advantage in these markets. BAP's Chilean production, on the other hand, at 198,572 metric tons, is only slightly less than GLOBALG.A.P. production in the same country (see Table 2.16). The relative prominence of both GLOBALG.A.P. and BAP in Chile represents one of the few markets where substantial levels of double certification may exist—although no estimates of overlaps in certification were provided by either standard.[39]

BAP products are sold through a reported 34 registered buyers, all of whom are located in either the United States or Canada (BAP, 2015). Although undoubtedly there is considerable room for growth, BAP's focus on supplying the North American market would appear to be a significant limitation to longer-term growth. The long-term viability of a North American–focused program, within the context of the need for a global supply base and infrastructure *and* GLOBALG.A.P.'s growing reach and dominance, is, at best, questionable. Given the potential for overlapping supply (and duplication of costs) in places like Chile and the relative pioneer status of BAP in other places like China, there may be a unique opportunity for closer coordination between BAP and the GLOBALG.A.P. program in the expansion of their respective production bases (either through mutual recognition or shared technical assistance efforts).

39 A cursory scan of certified producers across both BAP and GLOBALG.A.P. in Chile shows that some degree of overlap does exist, though available data does not permit a calculation of the level of overlap.

Table 2.15 GAA BAP–certified aquaculture, key species groups, 2013

Species group	Production volume (mt)	Proportion of total	Species
Salmon	396,662	56%	Salmon
Tilapia	139,567	20%	Tilapia
Shrimp/prawns	134,529	19%	Shrimp
Pangasius	38,732	5%	Pangasius
Catfish	2,337	<0.5%	Catfish
Total	**711,827**	**100%**	

Source: BAP, personal communication, 2015.

Table 2.16 GAA BAP–certified aquaculture, key countries, 2013

Country	Production volume (mt)	Proportion of total
Chile	198,572	28%
Canada	155,898	22%
China	130,330	18%
Vietnam	48,710	7%
Ecuador	31,909	4%
Indonesia	30,943	4%
Thailand	29,208	4%
Australia	26,650	4%
New Zealand	9,646	1%
Colombia	9,174	1%
Costa Rica	9,154	1%
United States	8,233	1%
Honduras	7,986	1%
India	3,484	<0.5%
Malaysia	2,914	<0.5%
Guatemala	2,431	<0.5%
Bangladesh	1,873	<0.5%
Belize	1,812	<0.5%
El Salvador	1,800	<0.5%
Nicaragua	1,100	<0.5%
Total	**711,827**	**100%**

Source: BAP, personal communication, 2015.

2.2.4 GLOBALG.A.P.

GLOBALG.A.P. began as EUREPGAP in 1997 as an initiative of the Euro-Retailer Produce Group (EUREP). Major retailers in the European marketplace seeking to ensure that their supply chain base would comply with increasingly stringent food safety requirements developed the EUREPGAP standards. In 2007, EUREPGAP was rebranded as the Global Partnership for Good Agricultural Practice (GLOBALG.A.P.) in light of the growing global importance of the standard. Consistent with its history as a business-led initiative, GLOBALG.A.P. has adopted a business-to-business approach in the promotion and uptake of its standard and has no on-package label associated with its standard. From the beginning, GLOBALG.A.P. has focused on promoting good agriculture practices as a basis for ensuring both food safety and sustainability. GLOBALG.A.P. aquaculture standards were first launched at the global level in 2004.

GLOBALG.A.P. is by far the world leader in terms of volume of aquaculture certified. In 2015 the standard reported an estimated 2.1 million metric tons of reported compliant production, accounting for approximately 3 per cent of global aquaculture production. Between 2008 and 2015 GLOBALG.A.P. also reported significant growth at 29 per cent per annum. The standard did experience a pointed retraction with compliant production decreasing by about 500,000 metric tons between 2011 and 2012 due to the implementation of more stringent standards during that year; however, by 2013 GLOBALG.A.P. had more

or less made up for this loss.[40] GLOBALG.A.P.'s growth would be impressive for any certification initiative but is particularly so in light of the overall production figures for GLOBALG.A.P.

GLOBALG.A.P.'s dominance and rapid rise in the market is likely due to several features. Given the rigorous nature of health and safety regulations related to seafood, retailers secure a double advantage of strengthening health, safety and sustainability goals through a single compliance effort. GLOBALG.A.P.'s relatively mature status and close relationship with retailers have also been important factors in GLOBALG.A.P. growth.[41]

Based on GLOBALG.A.P.'s wide distribution of production, its breadth of species coverage and its consistently strong growth rate over the past several years, it would appear that the initiative is well positioned for further growth (see Table 2.17 and Table 2.18).

40 The decline in GLOBALG.A.P. production in 2011 has been traced to the launch of version 4 of the GLOBALG.A.P. aquaculture standard, which mandated stricter standards including mandatory certification across the entire production chain for a producer to become certified (e.g., broodstock, seedlings, farm, feed and CoC). (GLOBALG.A.P., personal communication, July 9, 2015).

41 GLOBALG.A.P.'s rapid production growth between 2010 and 2011 was also facilitated by an expansion in the number of certifiable species groups during the same year (GLOBALG.A.P., personal communication, July 9, 2015).

Table 2.17 GLOBALG.A.P.-certified aquaculture, key species groups, 2015

Species group	Production volume (mt)	Proportion of total	Species	Production volume by species (mt)
Salmon	1,655,250	79%	Atlantic salmon	1,655,250
Pangasius	102,700	5%	Pangasius	102,700
Shrimp/prawns	94,504	4%	Whiteleg shrimp	94,504
Trout	90,943	4%	Rainbow trout	90,943
Sea bream	57,776	3%	Gilthead sea bream	57,776
Other	100,194	5%	European sea bass	74,723
			Meagre	4,764
			Others	20,707
Total	**2,101,367**	**100%**		**2,101,367**

Source: GLOBALG.A.P., personal communication, 2015.

Table 2.18 GLOBALG.A.P.-certified aquaculture, key countries, 2015

Country	Production volume (mt)	Proportion of total
Norway	930,952	44%
Chile	518,380	25%
United Kingdom	162,506	8%
Vietnam	120,045	6%
Turkey	112,917	5%
Spain	42,511	2%
Ecuador	9,809	<0.5%
Other	204,247	10%
Total	**2,101,367**	**100%**

Source: GLOBALG.A.P., personal communication, 2015.

2.2.5 Organic

Voluntary sustainability standards in the aquaculture sector began with organic certification. German-based Naturland first certified carp in Germany in 1995. The International Federation of Organic Aquaculture Movements (IFOAM) approved the final version of its aquaculture standard in 2005 (Auld, 2014). China's national organic standard was developed the same year, and the country has since become the world leader in organic aquaculture production (FAO, 2010). Organic aquaculture standards differ from organic livestock and poultry certification most conspicuously in that organic aquaculture animals need not be fed a strictly organic diet, but rather can be fed fish meal produced with wild-caught fish certified under other sustainable standards such as the MSC or FOS.[42] Given that the virtual entirety of the Peruvian anchoveta population is certified by FOS, and that fish meal exported from Peru to China represents one of the most traded seafoods, it is likely that fish meal produced from the FOS-certified anchoveta fisheries off the coasts of Peru and Chile is an important source of feed for the Chinese organic aquaculture market, and will continue to be into the foreseeable future.

Image caption

42 Because fish meal typically comes from wild-caught small pelagic fish, which cannot be certified organic, to demand that organic aquaculture be fed a completely organic diet would be a non-starter.

Because of the decentralized nature of organic certification, data and information on market developments is difficult to collect, but FiBL reports that there were at least 200,000 metric tons of organic aquaculture products produced in 2013 (note that data on organic aquaculture are not available for all producing countries). This is up from estimates of 50,000 metric tons in 2008 (Centre for the Promotion of Imports from Developing Countries, 2015), representing an annual growth rate of 35 per cent over this time period. The market value of organic aquaculture was valued at US$300 million in 2008 (FAO, 2010), which, following a linear extrapolation based on production volume, would be worth more than US$1.2 billion in 2013. Although the majority of countries supplying organic aquaculture are developed countries, the vast majority of organic aquaculture production is sourced from China, which makes it one of the few initiatives with significant Chinese production (see Table 2.20).

It remains unclear what the exact species breakdown of organic aquaculture is, given the difficulty in collecting data from the multiplicity of national and private standards bodies, but it is likely that organic certification remains concentrated in high-value species groups. By 2013 almost 90 per cent of seafood certified under Naturland, still one of the leading certifiers of organic aquaculture, was salmon and shrimp, while rainbow trout, mussels, sea bream and sea bass are also important species groups certified under the standard (see Table 2.19).

Table 2.19 Organic aquaculture, key species groups, 2013

Species group	Production volume (mt)	Proportion of total	Species	Production volume by species (mt)
Salmon	16,317	8%	Salmon	16,317
Shrimp/prawns	8,779	4%	Shrimp	8,779
Mussels	5,514	3%	Mussels	5,514
Carp	4,339	2%	Carp	4,339
Trout	1,454	1%	Rainbow trout	735
			Trout	719
Oysters	6	<0.5%	Oysters	6
Other	160,743	82%	Sea bass	1,184
			No details	159,560
Total	**197,153**	**100%**		**197,153**

Source: FiBL, personal communication, 2015.

Table 2.20 Organic aquaculture, key source countries, 2013

Country	Production volume (mt)	% of total
China	116,000	59%
Norway	32,000	16%
Ireland	16,314	8%
Romania	4,566	2%
Italy	3,673	2%
Hungary	3,487	2%
Vietnam	3,292	2%
Lithuania	2,998	2%
Indonesia	1,929	1%
Denmark	1,870	1%
Ecuador	1,779	1%
Thailand	1,512	1%
Croatia	1,376	1%
Spain	1,183	1%
Greece	1,104	1%
Portugal	1,100	1%
Germany	955	<0.5%
Costa Rica	593	<0.5%
Honduras	593	<0.5%
Peru	593	<0.5%
Estonia	156	<0.5%
Poland	56	<0.5%
Latvia	12	<0.5%
Austria	9	<0.5%
Czech Republic	3	<0.5%
Total	**197,153**	**100%**

Source: FiBL, personal communication, 2015.

2.3 Challenges and Opportunities in the Supply and Demand of Certified Seafood

The rapid growth of seafood certification over the past two decades points toward the importance of the economic and environmental opportunities associated with verifiably sustainable production practices. With a combined estimated retail value of US$11.5 billion, supply from more than 50 countries and growing consumer awareness, the possibility that certified supply chains could have substantial global influence and impact on the sustainability of seafood production practices is no longer merely hypothetical. The fact that the use of certification has reached mainstream status and has seen its most significant growth through the choice-editing practices of large manufacturers and retailers suggests that certification may even be becoming a prerequisite to market entry in some markets.

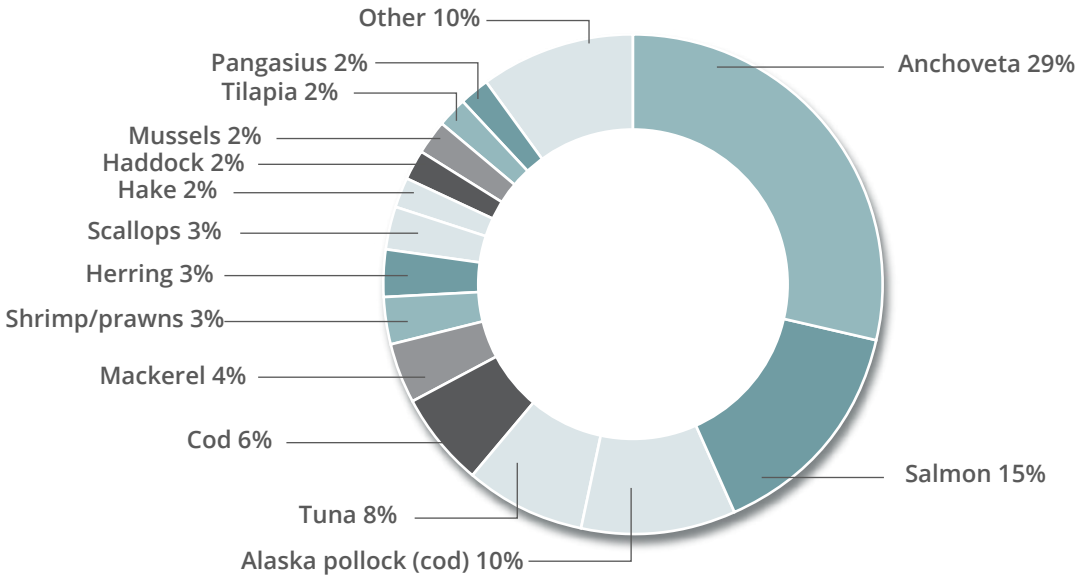
Notwithstanding the impressive and growing phenomenon of seafood certification as a portion of global production, certification growth has for the most part been restricted to limited segments of the market—primarily to fisheries with strong management capacity and species groups with high visibility in developed-country markets. Commitments by major retailers and food service providers across the United States and Europe are driving the demand for certified production and seeking stable supply of a limited number of species groups with high commercial value.[43]

43 The major exception to this general rule, the Peruvian anchovy fishery certified under FOS, which largely services the fish meal market, is arguably a feature of the other major drivers in the distribution of certification (fishery size and capacity).

Figure 2.13 Percentage of total by key species groups, certified vs. global

Five species groups, anchoveta, cod (including Alaska pollock), salmon, tuna and mackerel, account for 72 per cent of total certified seafood. These same species groups account for only 15 per cent of global seafood production.

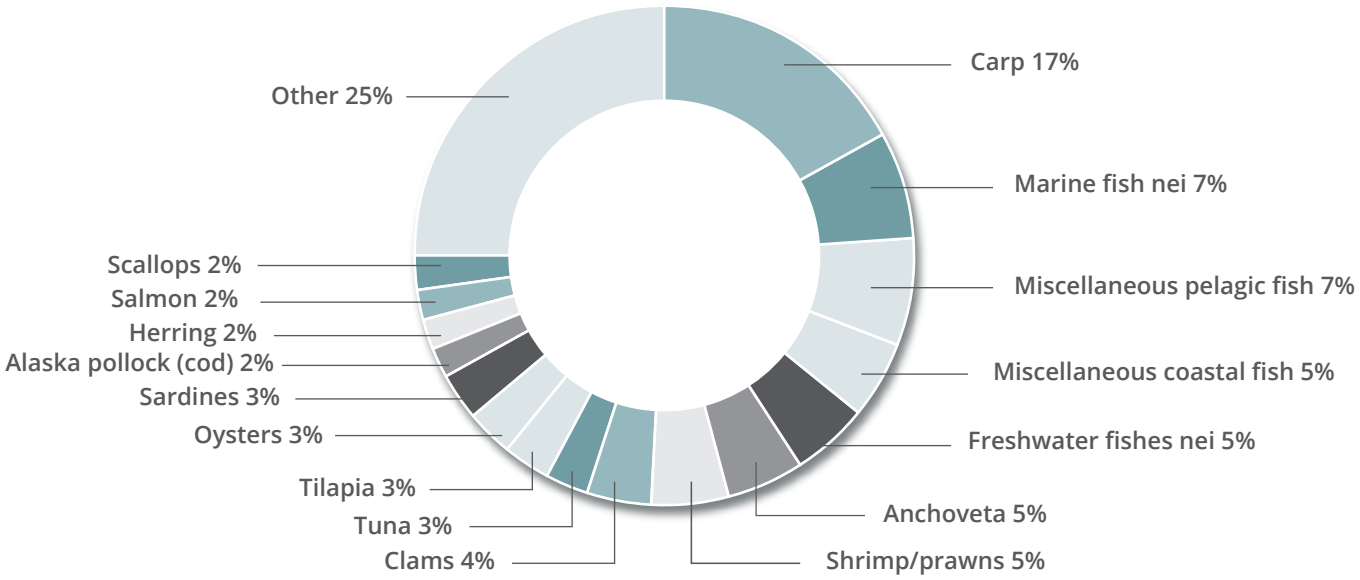
Certified (2015)



Sources: ASC, BAP, ChinaG.A.P., FiBL, FOS, GLOBALG.A.P., MSC, Naturland, 2015.

Remarkably, more than half of all certified seafood is sourced from developing countries. Extracting the significant contribution of certified anchoveta production sourced from South America (FOS certified), however, reveals a significant concentration of certified production (primarily MSC certified) from more developed countries.

Global (2013)



Source: FAO Fishstat, 2015.

Certification along specific species lines is largely determined by retail demand in developed-country markets. With the exception of anchoveta production (which appears to be largely supply driven), species with the highest commercial value, such as salmon, cod and tuna, tend to dominate the market for certified production. The concentration of certified production in a limited number of species also reflects a prioritization of need among wild catch fisheries. Of the five leading species groups for wild catch certification, at least two include some high-risk species and thus represent logical focal points for certification efforts.[44]

Of the more than 50 voluntary seafood standards currently in operation around the world, the vast majority are tailored to specific supply chains and/or regions. Although there is no indication that the few international standards in the sector have been designed to favour specific regions or production systems, it is clear that access to international markets for certified seafood does provide special advantage for some countries on a de facto basis (see Figure 2.15). Most notably, Asia, which accounts for 69 per cent of global seafood production, only accounts for 11 per cent of global certified seafood production. By contrast, Europe and North America, which account for approximately 15 per cent of global seafood production, nevertheless account for 45 per cent of global certified seafood production.

The concentration of production can be traced to a combination of factors principally related to the distribution of seafood certification across a few larger wild catch fisheries. Although more than 1,000 fisheries are reported as certified by a major voluntary standard across the aquaculture and capture sectors globally, the certification of some of the largest wild catch fisheries in the world (notably Peruvian anchovy fisheries by FOS and U.S. pollock fisheries by the MSC) has resulted in a relatively high concentration of certified production from these countries. Fishery size is an important factor in determining global market access to certification, due to the high fixed costs often associated with the certification process.

A related factor in determining the distribution of certified production appears to be the pre-certification management practices and capacities. Most major certification schemes require the implementation of specific management structures and plans as well as significant auditing procedures to obtain certification. Clearly, fisheries that already have such plans in place are more likely to seek and receive certification than those that do not. One of the critical questions facing the seafood certification industry is whether certification is *only* or *principally* available to those with an existing management capacity to demonstrate sustainability and/or how certification might be used a vehicle for actually facilitating the transition to such management systems.[45]

44 Tuna and salmon being the clear examples.

45 FIPs represent an important vehicle for building capacity to become certified among fisheries. Several examples exist of public and private institutions working through FIPs to enable certification.

Box 4 Standards and sustainable fisheries management

Although it can be argued that private sustainability standards in the seafood sector have largely arisen as a response to the failure of public institutions to adequately monitor and manage seafood sustainability, it would be erroneous to conclude that seafood standards can replace or even operate independently of public institutions. The public nature of the resources used in seafood production suggests that public regulation is an essential component of *any* sustainable management of seafood production.

States have a legal responsibility to control and manage access to coastal marine fisheries, which also includes the establishment of management and data collection frameworks associated with stock assessments. Since stock assessments are usually the foundation for determining stock sustainability, certification itself is largely dependent on the existence of an effective regulatory infrastructure.

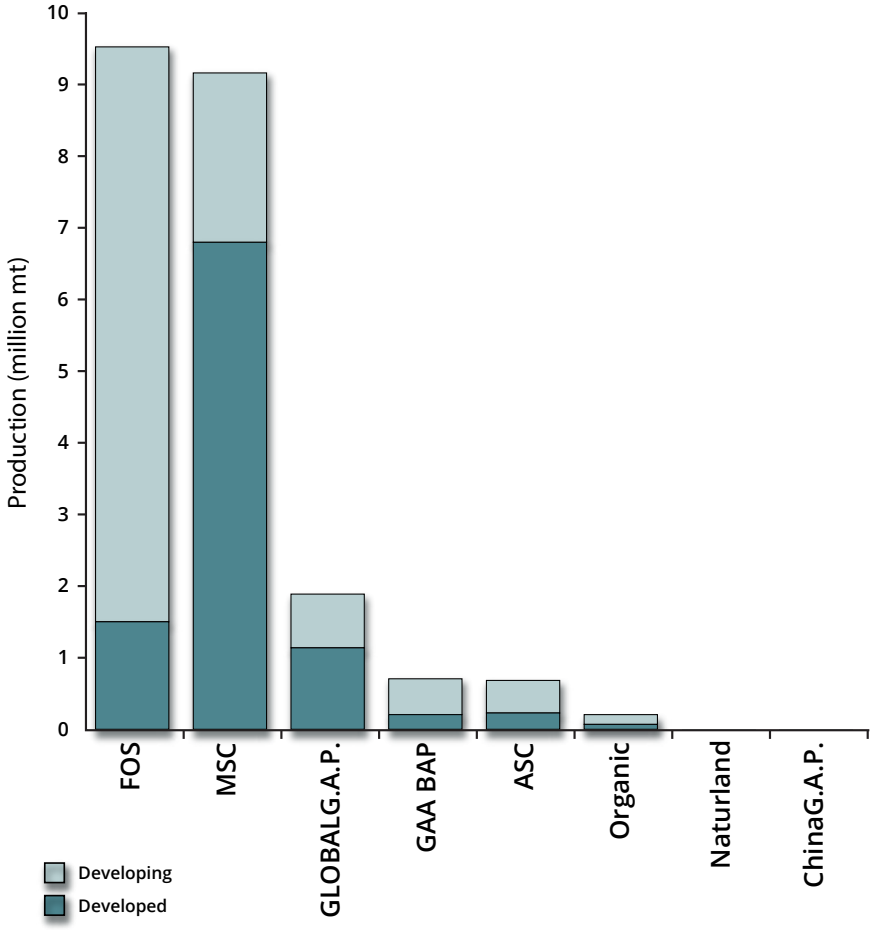
But if voluntary standards are dependent on the existence of an operational public data and management system for their success, it may also be the case that the reverse is true as well. Increasingly, there has been a recognition of the need to move beyond simple stock management to broader fisheries management, including the various stakeholders and stocks that are implicated in commercial exploitation within a given region (FAO, 2014).

As market-based organizations, voluntary standards have historically built themselves on governance models aimed at generating international consensus among multiple stakeholder groups while maintaining responsiveness to market interests. International standards effectively bring a "momentum of consensus" that can facilitate the inclusion of, and agreement among, different stakeholders operating within a given fishery. Within this context, the implementation of a process toward certification at the level of the fishery has the potential to bring with it an additional layer of stakeholder participation, leading to a more inclusive and effective fisheries management process itself.

Moreover, since the commercial development of national seafood export industries is in the best interest of governments, government management bodies may see value in referencing international standards in the development of ongoing policy for best practices. In this light, there may be no clear distinction between state and market and private and public within the realm of fisheries certification. At a minimum, it is clear that voluntary sustainability standards have the potential to strengthen national fisheries management regimes and facilitate effective state action.

Recognizing the potential for mutually supportive roles, regional fisheries management organizations and national governments have both repeatedly found value in linking their own strategic efforts to securing compliance with a given certification initiative (Foley, 2013).

Figure 2.14 Certified production by initiative and stage of country development, 2015



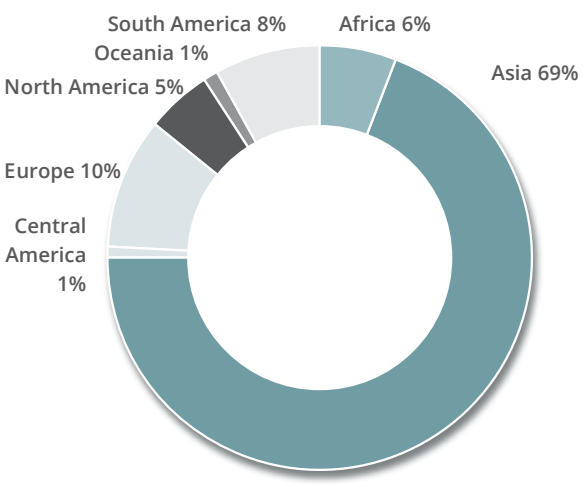
Sources: ASC, BAP, ChinaG.A.P., FiBL, FOS, GLOBALG.A.P., MSC, Naturland, 2015.


2
92.5

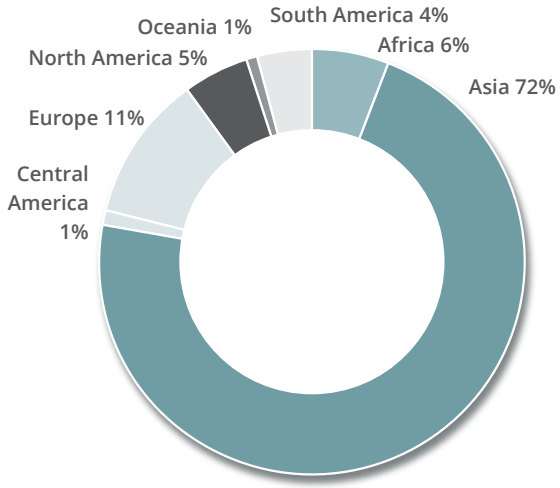
Figure 2.15 Certified production vs. global production, and global exports by region

More than 75 per cent of certified seafood comes from South America, Europe and North America, with South America accounting for nearly half of global certified production. The remarkable South American leadership in certified seafood is largely due to the certification of the Peruvian anchoveta fishery. A parallel analysis of seafood destined primarily for retail markets (e.g., excluding Peruvian anchoveta) reveals a clear leadership of North America and Europe. The concentration of certified production in North America and Europe can largely be explained by the concentration of consumption in these countries as well as their generally more advanced production systems. South America nevertheless stands out even in these markets, accounting for 15 per cent of global production, more than three times its proportionate contribution to global seafood production, and disproportionately more than either Asia or Africa.

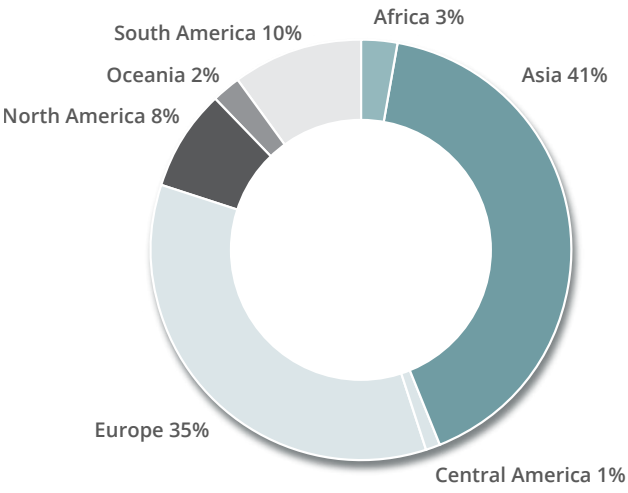
Total seafood production, 2013



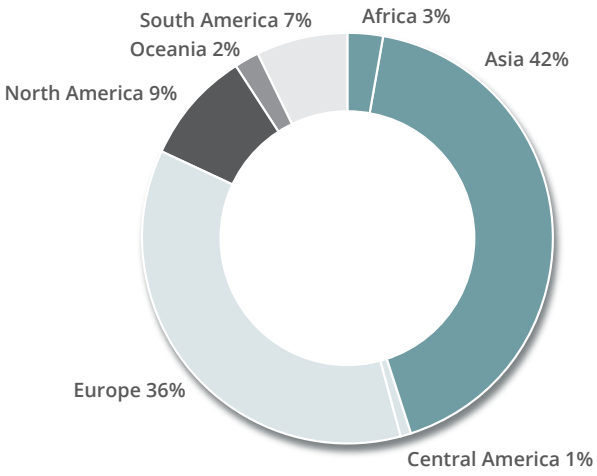
Total seafood production excluding Peruvian anchoveta, 2013



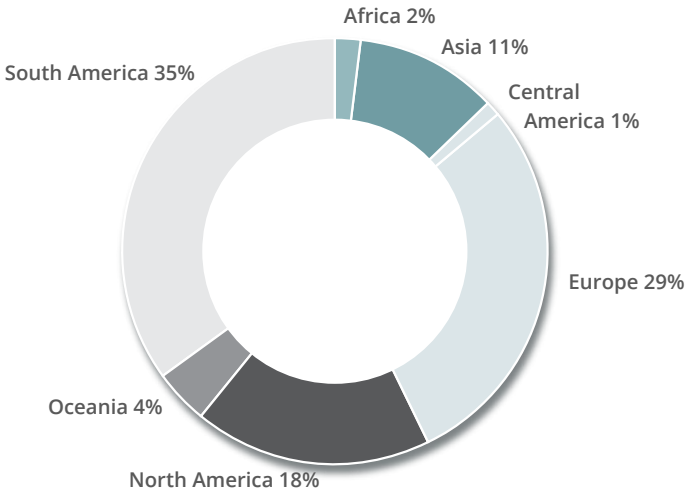
Total seafood exports, 2012



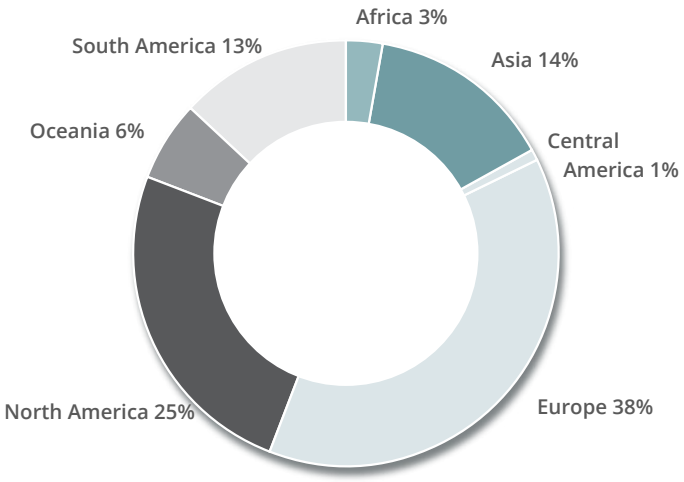
Total seafood exports excluding Peruvian anchoveta, 2012



Total certified seafood production, 2015

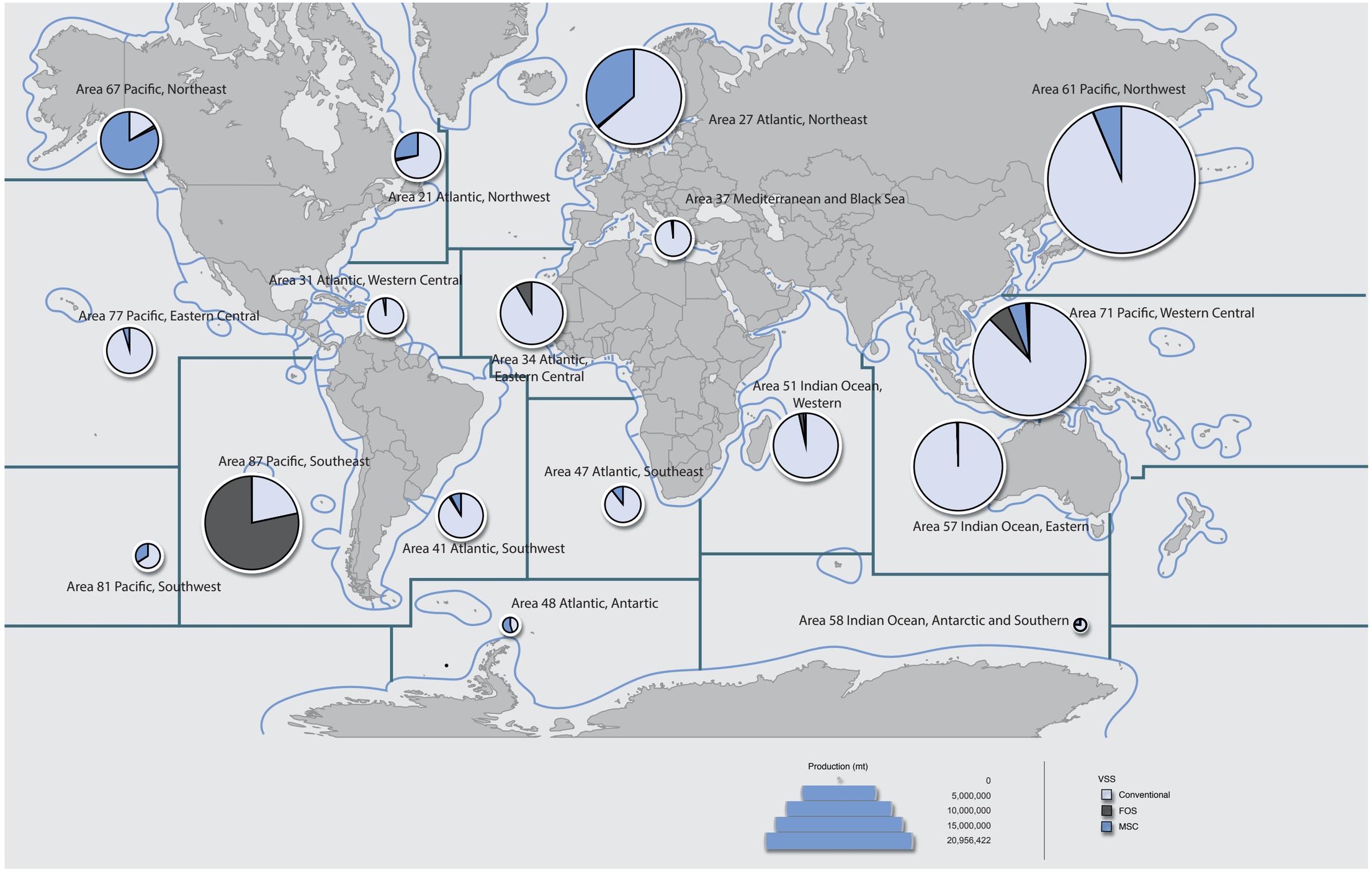


Total certified seafood production excluding Peruvian anchoveta, 2015



Sources: FAO Fishstat, 2015; ASC, BAP, ChinaG.A.P., FiBL, FOS, GLOBALG.A.P., MSC, Naturland, personal communications, 2015.

Figure 2.16 Certified wild catch as a proportion of total wild catch, by fishing zone



Area 61, Northwest Pacific: 6 per cent of the catches from this area are certified, over 90 per cent of which are MSC-certified walleye pollock (also known as Alaska pollock, a kind of cod) and yesso scallops. Walleye pollock are considered to be fully exploited in this area and are among its most important species landed, second only to "Marine fishes not identified." Area 61 is the FAO fishing area with the highest production levels, at over 21 million metric tons landed in 2013.

Area 77, Eastern Central Pacific: 5 per cent of the fish caught in this area are certified, over three-quarters of which are MSC-certified South American pilchard (sardines). Over one-third of the overall landed catches in this area come from sardines, whose stocks the FAO considers to be fully exploited. Albacore tuna, Dungeness crab and red rock lobster were also certified in this area, but their overall landings relative to other species are minor. Both squid and octopus represent relatively important amounts of landings in this area but typically are not certified.

Area 87, Southeast Pacific: 78 per cent of the fish caught in this area are certified, with over 90 per cent FOS-certified Peruvian anchoveta (landed in both Peru and Chile), and most of the remainder FOS-certified Chilean jack mackerel (landed in Peru). Overall, Peruvian anchoveta accounts for about two-thirds of landings in this fishery, with the FAO considering stocks fully exploited. Chilean jack mackerel stocks from this region were considered overexploited by FAO in 2011 and are currently FOS certified.[46]

Area 27, Northeast Atlantic: 30 per cent of the catches in this area are certified, with MSC-certified cod, herring and mackerel accounting for about two-thirds of all certified catch. The FAO considers all three of these species (cod, herring and mackerel) fully exploited, although there are recovery measures in place for cod. Herring is the most productive species in this area (about a quarter of the total), followed by cod and mackerel.

Area 34, Eastern Central Atlantic: 11 per cent of catches in this area are certified, and are almost all FOS-certified anchovies and tuna. The most important fish landed in this area, the sardine, has stocks that the FAO considers to be underexploited, although none of its landings are certified by a voluntary sustainability initiative. Anchovy stocks in this area were fully exploited, and tuna stocks aren't calculated on a fishing area basis because of their migratory nature, although the species certified in this area, skipjack, yellowfin and bigeye, are considered to be fully exploited in the Atlantic ocean, while non-certified Atlantic albacore and bluefin stocks are considered to be overexploited. Generally, the FAO considers that 52 per cent of stocks in this area are fished within biologically sustainable limits.

Area 41, Southwest Atlantic: 9 per cent of catches in this area are certified, while the FAO considers that 45 per cent of stocks are within biologically sustainable limits. About two-thirds of 2013 certified catch in this area was Patagonian grenadier certified by MSC, which the FAO considers underexploited. The most important fish landed in this area, the Argentine hake, is considered overexploited, and none of these stocks were certified.

Area 67, Northeast Pacific: 87 per cent of catches in this area are certified, while the FAO considers 88 per cent of stocks to be within biologically sustainable limits. It follows that almost all of the major producing stocks are certified: walleye pollock (also known as Alaska pollock, which is a kind of cod) accounted for 51 per cent of certified catch versus 37 per cent of total, pacific hake accounted for 10 per cent of certified catch versus 8 per cent of total, and pacific cod accounted for 8 per cent of certified catch versus 10 per cent of total. This the fishing area with by far the most comprehensive certification profile.

Area 21, Northwest Atlantic: 30 per cent of the catches in this area are certified, with MSC- and FOS-certified northern prawn accounting for nearly half of this, and MSC-certified snow crab and American lobster accounting for about a third. Indeed, the FAO considers invertebrates in this area to be at near-record levels of abundance. Of the species in this area

46 Note that overexploited stocks don't imply current overfishing if catches are low enough to provide maximum sustainable yield.

that have ostensibly shown signs of recovery in the last decade, Greenland halibut, yellowtail flounder, Atlantic halibut, haddock, spiny dogfish, and only small amounts of haddock and halibut have been certified, all by the MSC.

Area 47, Southeast Atlantic: 11 per cent of the catches in this area are certified, with MSC-certified cape hake accounting for the near entirety of certification. This is notable considering that the FAO considers the important hake stocks to be fully or overfished, but that the cape hake stocks, the most important landed fish in the area, are showing signs of recovery due to management measures put into place since 2006. The third and fourth most important landings in this area, the Southern African anchovy and the Southern African pilchard (a pilchard is a sardine), have shown notably improving and declining stocks, respectively, although neither of them have been certified.

Area 37, Mediterranean and Black Sea: 2 per cent of the catches in this area are certified, and are all FOS-certified anchovies and clams landed in Croatia, Italy and Turkey. The anchovy and the sardine are the most landed catch from this area, together accounting for over one-third of the total, and both of which the FAO considers to be fully fished, with the exception of anchovies in the Black Sea, which it says are overfished albeit with recovering stocks. FAO-certified anchovies in Turkey, therefore, may represent an important conservation measure rather than the certification of a historically underfished species. The FAO considers 48 per cent of fish stocks to be at sustainable levels in this area, and 52 per cent at unsustainable levels.

Area 71, Western Central Pacific: 12 per cent of the catches in this area are certified, most FOS-certified tuna. The FAO is concerned generally with stocks in the western South China Sea, although high catch figures have been reported. The FAO suggests that this may be due to double counting because of shipments across areas, although others have commented that Chinese data may be systemically adjusted upward in order to hit output quotas (World Ocean Review, 2012). To be sure, practices may recently have begun to change, but this, like in Area 61 above, speaks to a larger difficulty in collecting accurate fish stock data, especially in the global South.

Area 57, Eastern Indian Ocean: Less than 1 per cent of landed fish are certified in this fishing area. The FAO notes that 42 per cent of fish landed in this area are designated "marine fishes not identified." This lack of data on fish stocks in this area likely operates as a barrier to certification.

Area 51, Western Indian Ocean: 4 per cent of fish landed from this area were certified, most MSC-certified tuna, although in 2014 FOS certified relatively small amounts of tuna and sea bream from this area, landed in La Réunion and Oman. The FAO maintains that catch data in this area is not detailed enough for stock assessments, although Indian oil sardines, the most important landed species from this area (excluding marine fishes not identified), the FAO presumes to be underexploited.

Sources: FAO, 2011c; FOS, personal communication; MSC, 2015.

The clear concentration of certification in species that are sold in European and North American markets is to be expected in light of demand for sustainable products being concentrated in these markets. Commitments by North American and European retailers to source sustainably harvested seafood are major drivers behind growing demand for certified seafood globally and, although significant in size, have reportedly run into barriers in actually meeting their supply needs.[47] As these commitments continue to roll out, one can expect the size of the certified seafood market to grow in coming years. However, the barriers to growing certified supply of wild catch seafood are significant in light of the relatively poor status of global stock assessments and currently represent a long-term concern for the expansion of certification in the wild catch sector.

47 For example, Walmart had originally committed to sourcing only from MSC-certified sources by 2011 but had still not fulfilled this commitment by 2015, allegedly due to a lack of sufficient certified supply (see Palmer, 2015).

But even within a context of improved data collection and fisheries management capacity, growing consumer demand for seafood products at the global level threatens to continue to outpace the ability of wild catch sources to offer sustainable supply. Recent polls suggest that upward of 60 per cent of developed-country consumers believe that it is important or very important that retailers sell sustainable seafood.[48] While the growth of seafood certification has been led to date by the certification of wild catch operations, it seems likely that this dynamic may change in the coming years as aquaculture accounts for an increasingly important share of global production. Salmon and shrimp/prawns are important sources of certified production in both wild catch and aquaculture production, signalling the potential for cross management of supply and demand of sustainable products from these species lines and/or the possibility of transitioning from wild catch to certified aquaculture as a long-term sustainability strategy for these species. Indeed, one of the "solutions" to dwindling wild catch resources and production could turn on placing a greater reliance on production from controlled (and sustainable) aquaculture production.[49]

FOS certification of major wild catch fisheries destined primarily for fish meal markets represents a distinct but nevertheless important market for wild catch certification. Although the vast majority of FOS-certified fish meal is used to service conventional fish meal markets at present, it offers a strong supply base for feeding the growing demand for sustainable aquaculture,[50] potentially positioning certified aquaculture for massive growth in the coming years. Regardless, it is clear that aquaculture certification will play a much more prominent role in the supply of certified seafood moving forward.[51]

With developing countries accounting for roughly 80 per cent of global seafood consumption, long-term growth in the demand for certified seafood will depend on the ability of certifiers to find ways to tap into these markets, particularly across Asia. While it remains unclear whether developing-country consumers (or retailers) will be willing or able to make the transition to certified sources, a growing trend toward linking trade obligations to the prevention of illegal, unreported and unregulated (IUU) fishing may provide a new stimulus toward growing certification across both developed and developing countries (see analysis in Section 4).

48 One poll estimated that 80 per cent of U.S. consumers regarded sustainable seafood as important or very important. Meanwhile, a survey commissioned by the MSC in 2014 across 15 of its most important markets found that an average of 65 per cent of those surveyed believed retailers should carry sustainable seafood (MSC, 2014e).

49 As it stands, most seafood certification initiatives focus on certifying aquaculture *or* wild catch fisheries, making it somewhat challenging for individual initiatives to manage cross-sectoral strategies. In this regard, FOS certification, with both active aquaculture and capture fishery certification, offers a special opportunity for promoting sustainable stock management.

50 Sustainable aquaculture certifications typically require the use of certified sustainable feedstocks.

51 Increased aquaculture certification will also be catalyzed by the growing relative value of aquaculture production within the seafood sector. Aquaculture tends to focus on higher-value species, giving it a higher per-volume value than wild catch (Villasante, Rodríguez-González, Antelo, Rivero-Rodríguez, & Lebrancón-Nieto, 2013).

3 Criteria Development, Implementation and Conformity Assessment

The initiatives covered by our analysis are, first and foremost, standard-setting bodies. In order to be included in the SSI Review, the initiative must promulgate a set of measurable and enforceable standards with global relevance. A scheme owner will, however, typically involve a variety of other components such as conformity assessment, dispute resolution, marketing and even technical assistance related to the implementation of the identified standards. While our analysis cannot capture all of the related elements associated with the development and implementation of a certification scheme, a key

attribute of the SSI Review is its consideration of scheme owners as private governance regimes.

Increasingly, standards systems are not simply rules to be followed so much as communities of practice incorporating shared decision-making and enforcement activities. Put in more legalistic terms, voluntary standards play a role analogous to public governments of establishing their own internal "rule of law" by performing executive, legislative and judicial functions. The governance roles of voluntary standards may, in many cases, be more important than the criteria themselves in promoting long-term sustainability. By enabling new means of entry into supply chain decision making, voluntary standards are well poised to augment supply chain inclusiveness. The ability of a standard to actually promote participatory governance, however, largely turns on the degree to which it is able to manifest its governance functions in a complete, transparent and equitable manner.

While these windows of analysis provide one way of understanding the role of voluntary standards, it remains true that voluntary standards systems, unlike governments perhaps, have often been understood as *primarily* instruments for establishing and enforcing rules. In order to capture the diversity of ways that sustainability initiatives can contribute to sustainability, in a manner that speaks to their core competencies of rule development and rule adherence, we have grouped our analysis according to the following categories:[52]

1. **Coverage**: Standards are defined by the requirements they set for their users. Although requirements alone do not determine actual outcomes or impact, they do set the level of ambition of a system, as well as the bar to which systems can be held accountable. Our coverage analysis seeks to measure the degree to which any given initiative sets requirements along key sustainability themes, and it is scored based on the time frame allocated for implementing a named requirement.
2. **Assurance**: The requirements surrounding voluntary sustainability initiatives are typically unverifiable at the point of consumption or elsewhere along the supply chain. The strength of a given system is directly related to the degree of assurance it provides to consumers and other stakeholders that requirements are actually fulfilled. Our assurance analysis assesses the credibility of the claims for compliance that are made by the initiative and whether compliance actually leads to meaningful results.
3. **Responsiveness**: Sustainable development is context and time dependent. Global rules will be of varying relevance to actual sustainability depending on context-specific factors. Our responsiveness analysis seeks to provide a measure of an initiative's ability to respond to local conditions while moving producers toward continuous improvement on an ongoing basis.
4. **Engagement**: Sustainable development is premised on the idea that a minimum level of equity needs to be provided through political and economic processes. Participatory governance is one of the few systemic tools available for ensuring equity across diverse systems and forms the basis for the long-term sustainability of the initiative. Our engagement analysis measures an initiative's inclusiveness, transparency and dispute resolution mechanisms.

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52 In many cases, the activities carried out under a single standards system will be carried out either by distinct bodies within the system or by entirely independent bodies (e.g., accreditation and certification). In such cases, our analysis pertains to the scheme requirements rather than the individual bodies carrying out the work. Content, criteria and governance analyses refer only to the operations of the standards bodies themselves.

Box 5 The economy of CARE

One of the most obvious connections between sustainability standards and a blue economy is the manner in which standards enable a direct link between market transactions and sustainable fishing and aquaculture production practices. But the ability of a system of fixed criteria, no matter how comprehensive and well intentioned, to embody circumstantially meaningful and relevant practice, ultimately depends on how those criteria "live" in the real world. Clearly, a critical element in the life of a standard will be "where" it lives: market uptake and distribution will set boundaries for the direct impacts of an initiative and, as such, represents an important indicator of overall potential impact. But market "success" only represents one piece of the puzzle.

As the voluntary sector has become more populated (and popular), it has also matured. There is a growing recognition that standards are not simply lists of best practices but represent communities of shared learning and decision making. At their best, voluntary standards do not just ask indifferent economic actors to follow the rules, but rather provide a living forum where diverse stakeholder interests have a voice in determining their future.

As such, the greatest contribution of voluntary standards to a blue economy may well rest on their ability to promote an ethos of inclusiveness and empathy as they prescribe practice—that is to say, an ethos of care. Our analysis of CARE (coverage, assurance, responsiveness and engagement) seeks to provide a starting point for understanding how voluntary standards can embody sustainability not simply through the rules they set but by the communities of care that they create.

3.1 Coverage

Although voluntary standards in the seafood sector come in a variety of shapes and sizes, they are all joined by a commitment to elaborating measureable and enforceable rules of practice for eventual adoption along target seafood supply chains.[53] The actual standards established by any given initiative establish the foundation for that system's vision of sustainability within its area of operation and therefore represent a starting point for understanding the different priorities among initiatives as well as across the initiatives reviewed more generally.

As a general rule, all[54] of the standards self-proclaim an interest in promoting "sustainable development." Notwithstanding this general agreement, each system's standards reflect a specific starting point for defining sustainability. Perhaps the most obvious and important point of separation among the various initiatives relates to whether they are applicable to aquaculture or wild catch fisheries or both. The two sectors face distinct sustainability challenges. In light of this, any given standard system will be tailored for one or the other of these production systems. In cases where a single initiative covers both aquaculture and wild catch fisheries, they typically apply distinct standards to address each production system. In accordance with the different needs and challenges facing the two production systems, we have, for the most part, divided our content and criteria analysis in terms of whether the standards are applicable to the aquaculture or wild catch production systems.[55]

The systems covered in this report speak clearly to the distinctiveness of aquaculture and capture fishing by the basic fact that they tend to cover only one or the other of such systems. Of the eight initiatives covered, only two cover both aquaculture and wild catch fisheries (Naturland and FOS). Even those that *do* cover both sectors reveal a significant concentration of volume in one sector over another, further emphasizing the distinctiveness of the two supply chains.

3.1.1 SSI Content Criteria Methodology

The SSI has developed a four-point scale based on the degree of compliance associated with each environmental, social and economic criterion. Each criterion is scored as "not covered," "recommended," "required" or "critical." "Critical" applies to criteria with which compliance is mandatory prior to certification. "Required" applies to criteria that involve a degree of flexibility in the certification decision (for example, on the part of the auditor or certification committee, or with respect to specific project or regional context). See Appendix II for further details on the numerical application assigned to each standard's conformity assessment methodology and the verbiage within the standard document that determines the degree of criticality across each SSI indicator.

Once the degree of criticality is assessed for each criterion, the criterion is then converted

53 The application of a measurable and enforceable set of criteria is one of the prerequisites for inclusion within the SSI analysis. Initiatives that lack such precision or accountability are considered too uncertain to warrant rigorous analysis.

54 Iceland Responsible Fisheries being the notable exception, although fisheries management involves sustainability of Iceland's fisheries sector.

55 Important to note here is that some of the aquaculture standards reviewed provide specific criteria for different species. For example, GAA's BAP provides a separate standard for finfish and crustacean farms, as well as one for salmon farms and one for mussel farms. In light of the scope of this review, we built our analysis across standards covering finfish and crustacean farmed species. For ASC, we therefore selected its pangasius, salmon, shrimp and tilapia standard. In line with ASC, we selected BAP's finfish/crustacean standard and salmon standard (see Appendix II).

into a four-level sustainability number system (see Table 3.1). Results for each indicator are then aggregated accordingly for each index on a scale of 0 to 100 per cent. Two separate analyses are applied to interpret results and overall trends:

- **Index-specific analysis** examines criteria coverage across various indices (each index houses a number of indicators). The primary focus of this analysis is to identify the overall coverage according to the core sustainability issues along the social, environmental and economic dimensions of sustainability.
- **Indicator-specific analysis** examines criteria coverage according to the individual indicators that make up the indices. The primary focus of this analysis is to identify the disparities evident in disaggregated data that may not be fully reflected in an overall aggregate index analysis. This analysis helps provide an understanding of which criteria are most common and which are the least developed across the initiatives and sectors examined (see Appendix IV and Appendix V for specific indicator analysis across the wild catch and aquaculture sectors, respectively).

Table 3.1 Degree of coverage methodology

Degree of coverage	Requirement	Rating
Critical	Full compliance as a condition of certification	3
Required	Degree of flexibility on the part of the auditor or certification decision-makers	2
Recommended	Criterion exists but is not binding	1
Not covered	No requirements	0

Calculations: Based on Table 3.1 if an initiative covers the SSI indicator *energy use management*, for example, as a recommendation (1) and does not address the SSI indicator *energy use reduction* (0), the score for the SSI energy index would be 1+0=1. The highest score achievable for the energy index would be 6 (3+3), which would equal 100 per cent. Therefore, the total for the energy index is averaged across both indicators (in this case divided by 6) to get the final score. In this example, the initiative would score 16.6 per cent (1/6) for the SSI energy index. For SSI indices consisting of three indicators, the total score is averaged by dividing by 9 (3+3+3), for indices with four indicators the total is divided by 12 (3+3+3+3) and so on. This is the process by which the percentages for the coverage of specific criteria across the environmental, social and economic dimensions are determined for this review.

Box 6 Using the SSI analysis

The SSI assessment criteria: The SSI's indicator analysis is a comparison tool for evaluating where standards lie on the continuum of social, environmental, and economic content and criteria coverage. The analysis is not intended to delineate "good" versus "bad" performance. While we recognize that there will be a natural tendency to regard more complete coverage as "better," this may not necessarily be the case.

To the extent that more stringent criteria also represent a higher bar for producers to cross, increased competiveness may decrease the accessibility of sustainable markets to those most in need, thereby restricting the ability of such initiatives to promote poverty reduction objectives among the most marginalized producers. As our review of the market trends reveals (see Section 2), this remains a major concern for initiatives moving forward.

A given standard may deem it desirable (e.g., more efficient/transparent) to focus its efforts along specific sustainability vectors with the understanding that other initiatives may be more effective or efficient for delivery on other vectors. At such a point, the question facing the user will ultimately be whether or not a given standard is "fit for purpose," rather than whether or not it covers all categories to the highest degree.

Different sustainability challenges will therefore be of different priority depending on the sector and/or geographic or thematic area of concern as well as on the priorities of the scheme's stakeholders. With this in mind, our analysis is based on a condensed and non-exhaustive set of environmental, social and economic indicators designed to illuminate key contributing factors in building a blue economy. Given that virtually all of the systems included in our analysis make some general claim of promoting sustainability through criteria compliance, an understanding of the depth and breadth of criteria coverage by initiative represents a non-negligible starting point for understanding their respective levels of ambition and scope. At the same time, our analysis should only be considered a starting point for more in-depth analysis along specific sustainability priorities.

Our broad analysis helps the reader understand whether or not, and to what degree, different standards cover specific sustainability issues in accordance with the criteria they enforce. What a standard requires may have little relationship with its actual impacts, which will depend upon local conditions and the various ways in which standards are actually implemented. Even where criteria do offer a meaningful measure of an initiative's intent, the breadth of coverage across all relevant indicators should not be mistaken as an indication of overall potential for impact. Any interpretation of our criteria analysis needs to take into consideration issues related to geographic relevance, market relevance and immediacy—not to mention the overall governance systems used to develop and implement the criteria.

3.1.2 SSI Environmental Criteria Analysis

Table 3.2 SSI environmental indices, indicators and definitions

Table 3.2 provides a list of the SSI environmental indices and their respective indicators (see Appendix I for a full list of the SSI reference indicators and the indicators that are new for this seafood edition. Figures 3.1 and 3.2 illustrate the total average of each environmental index across the wild catch and aquaculture sectors, respectively, and Tables 3.3 and 3.4 disaggregate the results to illustrate the coverage of criteria by each standard reviewed. The indices are presented by highest degree of coverage to lowest.

Index	Sector applicability	Indicator	Definition
Biodiversity		Habitat set-asides	The standard requires areas not to be used for production or extraction in order to conserve, protect and restore habitat areas for wild plants, aquatic species and animals.
		Monitoring and protection of high-conservation-value areas	The standard prohibits conversion of high-conservation-value areas.
		Escape prevention	The standard requires the certified unit to have systems in place to minimize the unintentional release or escape of farmed species.
		Management of non-target species (bycatch)	The standard requires bycatch management and reduction of discards.
		Use of hatchery-raised seed	The standard includes criteria that promote the use of hatchery-raised seed.
		Prohibition of lethal predator control	The standard favours passive and/or non-lethal methods of predator control.
		Minimization of "ghost fishing"	The standard requires measures be taken to minimize loss of fishing devices and ensure their immediate retrieval in order to avoid "ghost fishing."
Ecosystems		Prohibition of destructive fishing practices	The standard prohibits use of destructive fishing methods such as dynamite and poison.
		Responsible sourcing of aquatic animal feed	The standard requires that marine-based feed ingredients come from sustainable sources.
		Feed regulation and handling	The standard includes criteria related to animal feeding, including type of feeding, ingredients and handling method.
		Disease management	The standard requires establishment and implementation of procedures to prevent the spread of disease.
		Environmental risk and impact assessment	The standard requires assessment of the potential impacts of production and harvesting sites (production land, water, processes, new crops, etc.).
		Stock regulation	The standard promotes the sustainable exploitation of marine resources, including restoration of overfished and depleted stocks.

Table 3.2 SSI environmental indices, indicators and definitions, continued

Index	Sector applicability	Indicator	Definition
Ecosystems		Fishing vessels in legal compliance	The standard requires that the fishing fleet not include illegal, non-declared or non-regulated fishing boats and that the fleet operate in regulated and managed areas.
		Stocking density	The standard requires stocking density of ponds and cages to allow for appropriate movement, resting, feeding, social and reproduction habits of stocked species.
Waste and water management		Waste disposal	The standard addresses proper disposal of waste (including solid waste, non-solid waste and hazardous waste).
		Waste management plan	The standard includes control of the collection and treatment of different wastes.
		Water pollution	The standard includes criteria preventing water contamination.
		Water use management plan	The standard requires a plan that includes planning, developing, distributing and optimal use of water resources under defined management strategies.
		Waste water management	The standard requires appropriate management of waste water.
Greenhouse gas and energy		Greenhouse gas accounting	The standard requires measurement of carbon emissions.
		Greenhouse gas reductions	The standard explicitly requires management of greenhouse gas emissions.
		Energy use management	The standard includes criteria for the application of a set of clean production principles.
		Energy use reduction	The standard includes requirements to reduce energy use.
Synthetic inputs		Prophylactic use of antimicrobials prohibited	The standard prohibits prophylactic use of antimicrobials and may require that antimicrobials are used only in response to a diagnosed disease.
		List of prohibited antibiotics	The standard prohibits the use of antibiotics listed by the World Health Organization that are considered highly or critically important to human health.
		Management plan for application of chemicals and veterinary drugs	The standard requires that the certified unit have in place a management plan for the application of chemicals and veterinary drugs.
		Prohibition of genetically modified organisms	The standard prohibits the use of GMOs.

Box 7 Key environmental sustainability issues in the wild catch sector

The following is a brief listing of key environmental sustainability issues in the wild catch sector and forms a basis for contextualizing the SSI environmental indicator analysis.

A) Ecosystems

Intensive fishing can result in the collapse of fish species and impact the entire biological community. Biological overfishing of stock is a consequence of premature removal of mature breeding stock or of new recruits.[56] Conventional models of stock assessments set the level of fishing necessary to meet specific biological economic and social objectives. The UNCLOS[57] and the UFSA[58] provide maximum sustainable yield as the reference point for maintaining sustainable levels of stocks. According to FAO statistics, the bulk of the stock of the world's top 10 species, accounting for approximately 30 per cent of global marine wild catch fisheries production, are fully exploited (FAO, 2012a).

IUU fishing activities contribute to the current overcapacity and overexploitation of stocks. It is estimated that 90 per cent of global wild caught species is harvested within the Exclusive Economic Zone[59] (EEZ). The EEZ bears a significant proportion of global IUU activities because of the limited technical capacity of developing coastal states to monitor and enforce IUU regulations. Catch documentation schemes and traceability schemes are recommendations put forward to help mitigate IUU (United Nations, 2011). Many flag states[60] fail to comply with conservation and management measures. Volumes and values of IUU catch are difficult to estimate and, increasingly, cooperation is required beyond national boundaries (FAO, 2012a).

Destructive fishing practices such as using dynamite and poison destroy habitat and breeding areas for reef animals, consequently disrupting the ecological food chain. These practices also inhibit the growth of new corals. Habitat destruction leads to fewer fish. Destructive fishing practices also kill non-target species (Sea Shepherd, n.d.).

B) Biodiversity

Biodiversity is the variation in the genetics and life forms of populations, species, communities and ecosystems. The more diverse an ecosystem, the greater the opportunity

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56 Recruitment of overfished stock results from the number of reproducing adults being reduced to the point where frequent below-average production of offspring occurs.

57 Article 2 of the UNCLOS states, "'conservation of the living resources of the high seas' means the aggregate of the measures rendering possible the optimum sustainable yield from those resources so as to secure a maximum supply of food and other marine products" (United Nations, 1958).

58 Article 5 (b) of the UNFSA states, "ensure that such measures are based on the best scientific evidence available and are designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, as qualified by relevant environmental and economic factors, including the special requirements of developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global" (United Nations, 1995).

59 An EEZ is an assumed jurisdiction by a coastal state over the exploration and exploitation of marine resources in its adjacent section of the continental shelf, taken to be a band extending 200 miles from the shore (OECD, 2001).

60 The flag state refers to the authority under which a country exercises regulatory control over a commercial vessel registered under its flag. Rules require that states secure compliance from fishing fleets flying their flags with national laws, treaties and international conservation and management measures (FAO, 2002).

for economic development (providing goods and services such as clean water and nutrient cycling) and adaptive responses to environmental challenges like climate change.

Habitat set-asides are important for the protection and restoration of habitat areas for wild plants, aquatic species and animals, as well as the prohibition of conversion of high conservation-value areas, both of which should be monitored and enforced in the wild catch and aquaculture sectors in order to protect aquatic biodiversity.

Bycatch, the catch of non-target individuals or species, is an inevitable part of all marine fisheries. Oftentimes, bycatch is discarded back to the sea and is unable to survive, which results in substantive under-reporting of actual levels of fish mortality. The mortality of discarded species can be, at times, quite minor, whereas other times it can be as high as 100 per cent (Suuronen, 2005). Although it is difficult for fishers to capture only the desired target species, poorly selective fishing can exacerbate incidental catch that includes ecologically important juveniles and economically viable species. Loss or abandonment of fishing gear (ghost fishing) also contributes to increased levels of unreported mortality.

C) Energy use

Some fishing methods are more energy intensive than others. Trawl is a preferred method of fishing due to its adaptability of use on many different types of areas and grounds, aquatic species, deep and shallow waters, and various-sized fishing vessels. However, the use of trawl is considered to be the marine equivalent of forest clear-cutting, whereby the apparatus drags along the sea bed, unearthing virtually everything in its path and subsequently destroying crucial habitat communities and marine animals. Habitat and ecosystem destruction aside, trawls are one of the most energy-burdensome modes of fishing gear. Although challenges do exist in the transition to less fuel-intensive and lower-impact fishing practices, simple modifications rather than drastic changes in operational techniques and gear design could contribute to reductions in fuel consumption and ecosystem impacts (Suuronen, 2005).

D) Greenhouse gas emissions

Gear type, fishing practice, operational methods, species type, as well as the distance between port and fishing grounds are all factors that contribute to fossil fuel consumption. Moreover, life-cycle assessments reveal that substantial energy consumption and subsequent greenhouse gas emissions result after the catch is boarded, with consumption increasing even more after landing due to processing, cooling, packaging and transport.

Voluntary sustainability standards can contribute to developing stronger consumer demand for fish products with a small carbon footprint, which would promote the use of less fuel-intensive and lower-impact fishing methods and gears.

Figure 3.1 Average coverage of SSI environmental indices, wild catch, from highest to lowest

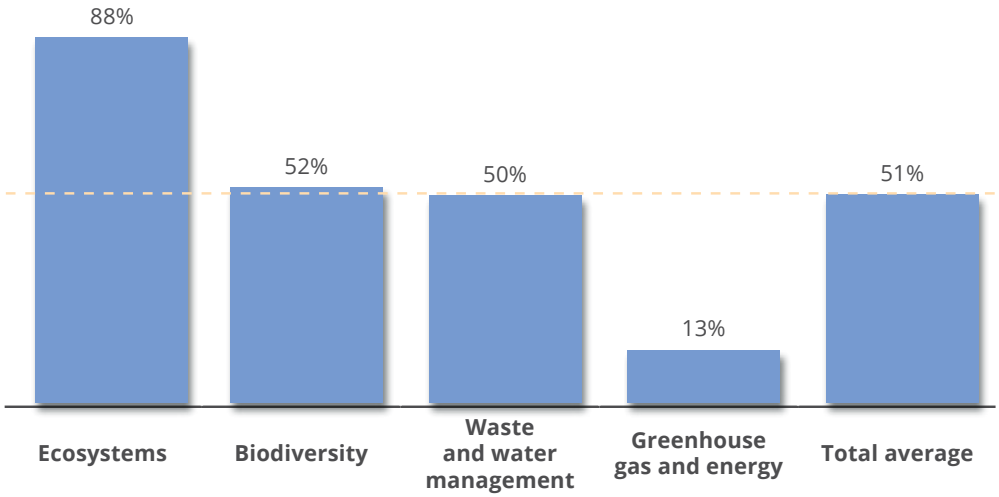

Table 3.3 Average coverage of SSI environmental indices, wild catch, from highest to lowest

	Ecosystems	Biodiversity	Waste and water management	Greenhouse gas and energy	Total average
FOS wild catch	83%	58%	100%	33%	69%
MSC	92%	67%	44%	0%	51%
Naturland wild catch	75%	33%	56%	17%	45%
IRF	100%	50%	0%	0%	38%
Index average	88%	52%	50%	13%	51%

Figure 3.2 Average coverage of SSI environmental indices, aquaculture, from highest to lowest

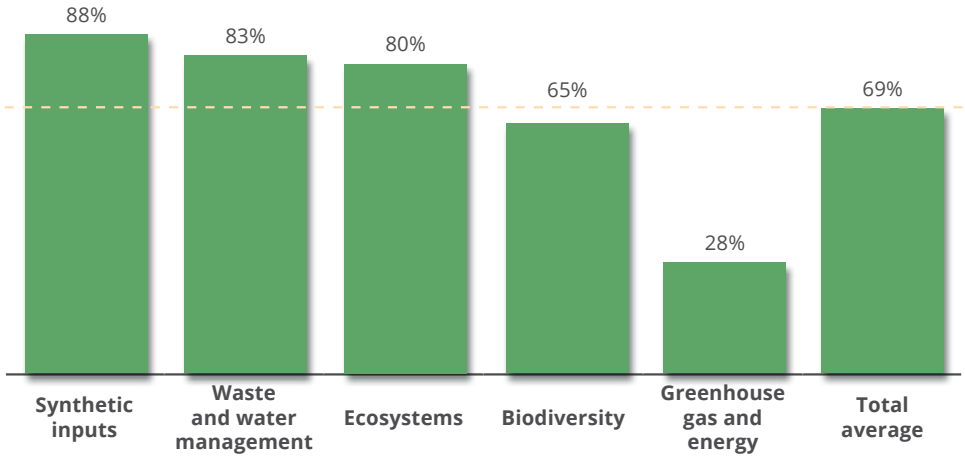

Table 3.4 Average coverage of SSI environmental indices, aquaculture, from highest to lowest

	Synthetic inputs	Waste and water management	Ecosystems	Biodiversity	Greenhouse gas and energy	Total average
GLOBALG.A.P.	100%	100%	100%	93%	42%	87%
IFOAM	100%	100%	80%	73%	33%	77%
Naturland aquaculture	83%	87%	100%	80%	33%	77%
ChinaG.A.P.	92%	87%	100%	60%	17%	71%
ASC	88%	70%	63%	55%	38%	63%
GAA BAP	75%	90%	70%	53%	0%	58%
FOS aquaculture	75%	47%	47%	40%	33%	48%
Index average	88%	83%	80%	65%	28%	69%

Box 8 Key environmental sustainability issues in the aquaculture sector

The following is a brief listing of key environmental issues in the aquaculture sector and forms a basis for contextualizing the SSI environmental indicator analysis.

A) Ecosystems

Aquaculture feed can be sourced from artificial feed (aquafeed), wild sources (phytoplankton or other species) or a combination of both. The use of manufactured or artificial feed contributes to pollution through the increase of farm effluent. Unless quickly consumed, artificial feeds undergo rapid nutrient loss (FAO, 1983). These released nutrients combine with fish excretion to raise nutrient levels, creating an ideal environment for algae. When the algae die, their decomposition depletes the oxygen in the water, resulting in eutrophication. Consequently, the ecosystem becomes unbalanced as sedentary species die from the oxygen-depleted water and mobile species migrate to other areas. Therefore, of concern within aquaculture systems are the appropriate levels of food for aquatic animals. Moreover, chemicals and antibiotics that are oftentimes added to artificial feed can impact aquatic organisms through the release of these drugs when feed decomposes. This also poses a potential risk to human health from high levels of antibiotics and genetically engineered components in the feed (Emerson, 1999). Responsible sourcing of aquatic feed is therefore important to avoid ecosystem degradation.

Another concern with respect to fish feed results from the growing use of soy as an alternative to wild fish-based feed. Aside from the issues related to waste and the lack of evidence guaranteeing fish health and ecological sustainability from the use of soy-based aquaculture feed, the rapid expansion of soy production to feed part of the aquaculture industry has resulted in massive deforestation and land conversion in South America, while fuelling the growing prevalence of genetically modified crops in the United States (Food and Water Watch, 2012).

With respect to shrimp aquaculture specifically, mangrove forests are destroyed for the construction of ponds. In Asia, more than 400,000 hectares of mangroves have been converted into brackish-water shrimp aquaculture (UNEP, 2013a). The destruction of natural habitat for fish farming has resulted in the disappearance of an estimated one-fifth of the world's mangrove forests, with extensive degradation to remaining forests (UNEP, 2013a). Mangrove forests play a pivotal role in erosion prevention, coastal water quality and the reproductive cycles of marine organisms. The destruction of these forests is a long-term loss, as restoration has proven very difficult.

B) Biodiversity

Escapees leading to contamination of wild stocks pose another threat to biodiversity. Farmed fish are usually bred or genetically modified to experience extremely high growth rates. Escapees can also spread disease and pathogens to wild stocks (typical of densely packed ponds). Escapes can be either small losses that are typically unreported or large-scale events. The seriousness of the situation is reflected in the 2010 legislation criminalizing farmed salmon escapees in Chile. This was the first salmon farming reform of its kind that poses heavy fines and prison sentences against violators. The consequences of these escapees on wild stocks have yet to be fully realized. Modifications to operational techniques and farming technology could significantly reduce or completely eliminate the risk of escapes.

The use of wild stock for aquaculture seed, broodstock (mature species used for breeding purposes in aquaculture) and feed can further negatively impact wild stocks and biodiversity. Although hatcheries now supply much of the seed for shellfish and finfish culture, many farms still use wild species for broodstock or for sources of larvae, which can result in the destruction of thousands of other larvae species. Marine capture stocks are also used as feed for aquaculture. Although efforts have been made to use alternative sources of fish feed, it is estimated that 20 per cent of global fish production is used for fish meal and fish oil (FAO, 2012a). Not only does the

use of wild stock for feed contribute to stock decline, but when aquatic species are harvested for fish meal, less food becomes available for economically viable predatory fish as well as for other marine predators like seabirds and seals. This practice is particularly evident in developing countries where manufactured feed can be too expensive for poorer farmers to purchase.

The main predators of farmed aquatic species are birds and aquatic mammals (e.g., seals, dolphins, porpoises), and these predators can be responsible for significant economic losses. However, using lethal technics such as electrocution or shooting adversely impacts biodiversity and infringes on animal welfare and ethical farming practices. Non-lethal predator control methods such as the use of netting or sight and/or sound to discourage wildlife from feeding can be used as alternatives in the protection of biodiversity (Bevan, Chandroo, & Moccia, 2002).

C) Genetically modified organisms (GMOs)

GMOs or transgenics, as defined by the FAO, are organisms that have been inserted, via in vitro techniques, with donor DNA (Beardmore & Porter, 2003). The use of genetic modification in aquaculture aims at improvements in output/input ratios. The economic benefits derived from transgenics for aquaculture have been illustrated primarily through the use of the growth hormone, resulting in growth 3 to 5 times that of non-transgenic salmonids, with some fish reaching 10 to 30 times their species' regular size (Beardmore & Porter, 2003).

Economic benefits aside, there are a number of potential risks from the use of transgenics on human health, biodiversity and animal welfare that need to be considered. The risk to human health comes primarily from the source of the DNA and the nature of the product. Studies have linked transgenics to cancer, and this link is not considered to be trivial (Beardmore & Porter, 2003). Additional consequences to human health are potential allergies and the development of new human pathogens.

The main concern associated with GMOs and biodiversity is the unknown impacts on native populations from the inevitable escapes of transgenic farmed species. Breeding between wild stocks and genetically altered species could hinder the ability of wild species to adapt to local conditions, making it increasingly difficult to survive in nature (FAO 2003, chapter 4).

D) Waste

Tremendous levels of waste are often discarded from aquaculture systems. Manufactured feed containing antibiotics, pesticides and nutrients[61] in combination with the large amounts of feces produced by high densities pollute aquatic environments surrounding farms, threatening ecosystem balance.

E) Greenhouse gas emissions

The aquaculture sector contributes to global greenhouse emissions through energy inputs for refrigeration, transportation and synthetic/feed inputs. A review of life-cycle assessment research on products derived from aquaculture reported feed and on-farm electricity use as the main drivers of greenhouse gas emissions in aquaculture settings, with an estimated 87 per cent of greenhouse gases being attributed to feed alone in the case of Atlantic salmon and trout production.[62]

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61 High levels of nutrients can result in eutrophication, whereby the increase of mineral and organic nutrients in a water body reduces the amount of dissolved oxygen and produces an environment that generally favours plants over animals.

62 Overall, it is estimated that fish production and/or capture accounts for between 60 and 80 per cent of total greenhouse gas emissions from seafood production and consumption. See Parker (2012) and Seafish (2008).

F) Water quality
Poor water quality can impact the health of aquatic species by impeding growth and development, and can also endanger human health through the accumulation of toxic substances in consumed aquatic species. Water quality contributes directly to ocean health, which is a key factor in achieving a blue economy.

G) Synthetic inputs
The use of antibiotics and pesticides in fish farming in order to prevent the common occurrence of disease and parasites in densely packed environments can lead to antibiotic-resistant bacteria, antibiotic residues in non-target aquatic species and harmful effects of pesticides on other aquatic organisms. According to the FAO, drug choices are becoming increasingly limited and expensive for the treatment of common infectious diseases, and in some cases are now unavailable due to the emergence of drug resistance, which is threatening to reverse much of the medical progress achieved over the past 50 years (Hernández Serrano, 2005). Non-biodegradable antibiotics can remain in the aquatic environment for long periods of time.

Environmental sustainability represents the historical cornerstone of eco-labelling and voluntary standards more generally. Seafood standards are no different in this respect, with average coverage across environmental indices being higher than coverage across social and economic indices.

Although our analysis covers a wide spectrum of environmental indicators of relevance to both capture fisheries and aquaculture, it would be inaccurate to consider all areas of possible impact as having equal importance either within or across the different production systems. For example, potential ecosystem and biodiversity impacts stand out as major points of potential impact for both capture fisheries and aquaculture. For fisheries, ecosystem effects include stock management, destructive fishing practices and IUU fishing prohibition, while biodiversity effects include bycatch, ghost fishing and high-conservation areas. For aquaculture, ecosystem effects include stock density, responsible marine animal feed and disease management, while biodiversity effects include escapee prevention, non-lethal predator control and hatchery-raised seed. These effects all largely overshadow the other environmental indicator sets. Within that context, the reader may wish to focus on these or other subsets of the specific indicators in order to gain a more balanced assessment of "relevant coverage" (see Box 9).

Keeping this broader observation in mind, the complete environmental coverage analysis is designed to provide a snapshot of where criteria coverage moves into the extremities of environmental impact. Given the specific preoccupations of individual supply chains, policy -makers or even consumers, a general understanding of how and where different standards relate to different environmental vectors remains an important point of observation but should not be mistaken as a general statement of standard effectiveness with respect to environmental protection.

Wild catch standards display the greatest average coverage across the ecosystem integrity index, at 88 per cent (Table 3.3). Of the top six requirements in the wild catch sector, five fall within the spectrum of ecosystem integrity. The prohibition of destructive fishing practices (100 per cent coverage), management of stock regulation (92 per cent coverage) and requirement of environmental risk assessments (92 per cent coverage), for example, are nearly universally required among the systems reviewed (see Appendix IV). Somewhat surprisingly, however, the well-documented problem of ghost fishing finds only 58 per cent coverage across the wild catch standards.

Although the aquaculture sector also places a high degree of importance on ecosystem preservation, with an average index score of 80 per cent, aquaculture standards place a greater emphasis on the management of inputs (specifically synthetic inputs, with an average coverage of 88 per cent) and outputs (specifically waste and water management, at 83 per cent), reflecting the conception of aquaculture systems as throughput rather than natural resource extraction systems (see Table 3.4). Among the list of universally or nearly universally required practices in the aquaculture sector are a variety of criteria related to the management of inputs and outputs, including criteria specifying management practices for water pollution, antibiotics, escapees, feed sustainability and disease. Aquaculture standards also display a remarkably high rate of prohibition of the use of GMOs (72 per cent coverage)—particularly in light of the political controversy surrounding their use (see Box 8).

While there is a smaller range of relevant inputs and outputs related to wild catch fisheries, those that are relevant—water pollution and waste management—are not as well represented by specific requirements as within the aquaculture sector. Aquaculture standards do, however, pay more stringent attention to the preservation of high-value conservation zones (73 per cent coverage across aquaculture standards versus 0 per cent coverage across wild catch standards).

Both the wild catch and the aquaculture sectors share relatively low coverage of requirements related to greenhouse gas management and energy reduction requirements. Based on the important contribution of seafood production to greenhouse gas emissions related to the seafood supply chain more generally (see Box 8), the absence of greenhouse gas-related requirements across the standards surveyed represents an important opportunity for development moving forward. See Appendix IV and Appendix V for average coverage of each indicator across the initiatives reviewed.

Image: Ann Wilkings

Box 9 Focusing on ocean health

The blue economy is built on recognition of the importance of ocean health as a basis for economic growth and resilience. Our environmental indicators provide a snapshot of how the environmental requirements of major seafood standards map onto the major sustainability issues facing seafood production and extraction. Clearly, different sustainability challenges will be of different priority depending on the sector and/or the geographic or thematic area of concern. From a global ocean health perspective, one could argue that managing overexploitation, bycatch and habitat protection represent some of the most relevant or important impact vectors for the wild catch sector.[63] To the extent that this is the case, our biodiversity and ecosystem indices may offer a better indication of relative attention to what matters for a blue economy than the entire list of indicators. For illustrative purposes, and to emphasize the importance of perspective in interpreting our analysis, we apply our analytic framework to these two indices alone below.

Figure 3.3 Ecosystem and biodiversity coverage, wild catch

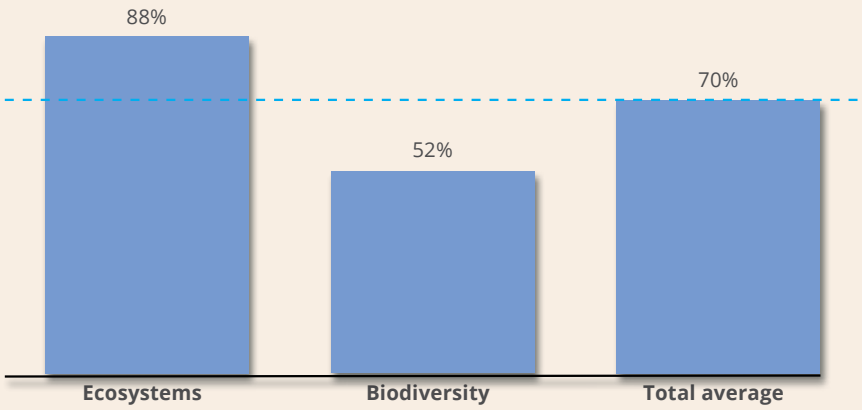

Table 3.5 Ecosystem and biodiversity coverage, wild catch

	Ecosystems	Biodiversity	Total average
MSC	92%	67%	79%
IRF	100%	50%	75%
FOS wild catch	83%	58%	71%
Naturland wild catch	75%	33%	54%
Index average	88%	52%	70%

63 Stock population, bycatch and habitat protection have been the primary drivers behind international fishery conventions and voluntary standards over the years.

Box 10 Voluntary standards and GMOs: Pushing the frontier of consumer choice

While controversy over the health and environmental impacts of GMOs persists, North American and European governments have provided a relatively permissive environment for the production and sale of GMO products. Although EU regulations insist on traceability and labelling of GMOs and products produced from GMOs throughout the entire supply chain, the U.S. Food and Drug Administration (and, by association, the Canadian Food Inspection Agency) has long resisted calls for any GMO labelling or other prohibitions whatsoever (Lynch & Vogel, 2001). For whatever controversy exists among regulators, it would appear that there is near consensus among the aquaculture seafood standards initiatives on GMOs, with all but one prohibiting their use outright. This does not, of course, prove that GMOs are unsustainable, but it does suggest that there is an alignment between consumer perceptions of sustainability and GMO-free production. As voluntary standards become more pervasive, they may lead to a de facto prohibition of GMOs in seafood supply chains.

3.1.3 SSI Social Criteria

Table 3.6 SSI social indices, indicators and definitions, wild catch and aquaculture

Table 3.6 provides a list of the SSI social indices and their respective indicators (see Appendix I for a full list of the SSI reference indicators and the indicators that are new for this seafood edition). Figures 3.4 and 3.5 illustrate the total average of each social index across the wild catch and aquaculture sectors, respectively, and Tables 3.7 and 3.8 disaggregate the results to illustrate the coverage of criteria by each standard reviewed. The indices are presented by highest degree of coverage to lowest.

Index	Indicator	Definition
Animal welfare	Humane methods of slaughter	The standard requires practices that consider the welfare of aquatic animals in slaughter methods.
	Welfare during transport	Includes criteria related to minimizing the effect of transport on the welfare of wild caught and farmed fish.
Labour rights	Freedom of association	The standard includes criteria for freedom of association, as defined by ILO 87.
	Forced labour	The standard prohibits use of forced labour, as defined by ILO 29.
	Minimum age	The standard sets a minimum age for workers, with ILO 138 as the minimum threshold.
	Non-discrimination	The standard prohibits discrimination due to racial, religious, social, cultural, age-related, gender or other factors, as defined by ILO Convention 111
	Worst forms of child labour	The standard prohibits the use of child labour, as defined by ILO Convention 182.
	Collective bargaining	The standard includes criteria for collective bargaining, as defined by ILO 98.
	Equal remuneration	The standard includesrequires equal remuneration, in accordance with ILO 100.
	Women's labour rights	The standard includes explicit criteria to protect female employees' rights (e.g., protection against mandatory pregnancy testing).
Employment conditions and benefits	Treatment of part-time and seasonal workers	The standard requires equal workers' rights and benefits for all types of workers (full time, seasonal, part time and temporary).
	Written contracts for employees	The standard requires written contracts with employees.
	Timely payment of wages	The standard requires wage payment be made without delays.
	Maximum amount of working hours	The standard explicitly sets maximum number of working hours.
	Paid maternity, paternity and sick leave	The standard requires provision of paid maternity, paternity, sick and holiday leave.
	Pension and security benefits	The standard requires provision of pensions and social security benefits.
Human rights	Access to education	The standard requires the promotion and enhancement of education or training for workers and their families.
	Access to medical care	The standard requires access to and provision of medical care to workers' families.
	Access to housing and sanitary facilities	The standard includes criteria related to provision of housing and sanitary facilities where onsite housing is provided.

Table 3.6 SSI social indices, indicators and definitions, wild catch and aquaculture, continued

Index	Indicator	Definition
Workers' health and safety	Safety at work	The standard specifies minimum standards for safety at work.
	Healthy work conditions	The standard requires protection and promotion of health at work.
	Access to safe drinking water at work	The standard requires workers' access to safe drinking water.
	Access to sanitary facilities at work	The standard requires sanitary facilities in the workplace (showers, restrooms, changing rooms, etc.).
	Access to medical assistance at work	The standard requires access to and provision of medical care in the workplace.
	Access to medical insurance at work	The standard requires access to medical insurance in the workplace.
Employment benefits	Paid maternity, paternity and sick leave	The standard addresses requirements for workers' paid maternity, paternity, sick and holiday leave.
	Pension and security benefits	The standard addresses provision of pensions and social security benefits.
Community involvement	Community consultation	The standard requires consultation with the community regarding changes or impacts from business activities on local resources and communities.
	Local hiring	The standard includes criteria promoting preference policies for local hiring and purchasing contributing to the economic development of local communities.
	Access to natural resources	The standard protects access to natural resources for local or indigenous people.

Figure 3.4 Average coverage of SSI social indices, wild catch, from highest to lowest

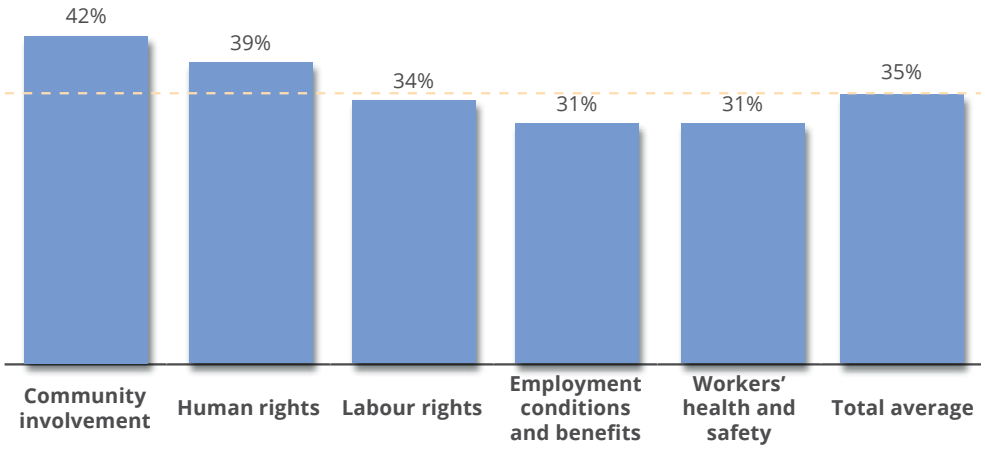

Table 3.7 Average coverage of SSI social indices, wild catch, from highest to lowest

	Community involvement	Human rights	Labour rights	Employment conditions and benefits	Workers' health and safety	Total average
Naturland wild catch	67%	100%	96%	100%	83%	89%
FOS wild catch	22%	56%	42%	22%	39%	36%
MSC	44%	0%	0%	0%	0%	9%
IRF	33%	0%	0%	0%	0%	7%
Index average	42%	39%	34%	31%	31%	35%

Figure 3.5 Total average coverage of SSI social indices, aquaculture, from highest to lowest

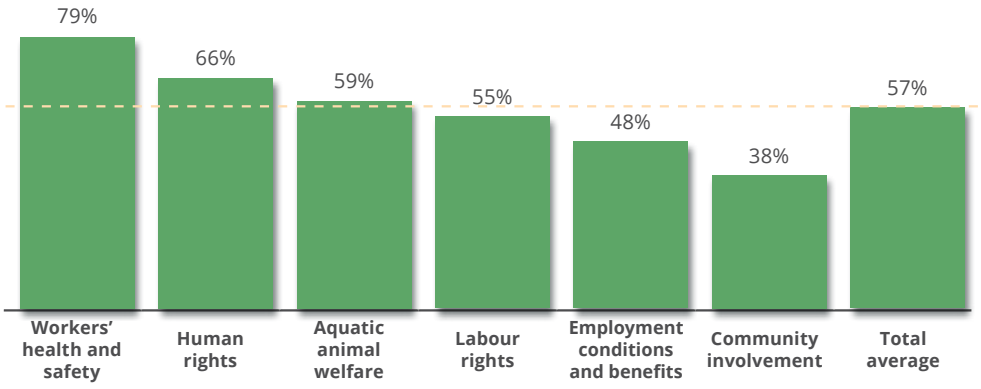

Table 3.8 Average coverage of SSI social indices, aquaculture, from highest to lowest

	Workers' health and safety	Human rights	Aquatic animal welfare	Labour rights	Employment conditions and benefits	Community involvement	Total average
Naturland aquaculture	67%	100%	100%	96%	100%	78%	90%
IFOAM	100%	78%	100%	71%	100%	11%	77%
GAA BAP	92%	83%	100%	63%	42%	67%	74%
ASC	75%	33%	13%	88%	42%	75%	54%
GLOBALG.A.P.	78%	44%	100%	29%	28%	33%	52%
ChinaG.A.P.	100%	67%	0%	0%	0%	0%	28%
FOS aquaculture	39%	56%	0%	42%	22%	0%	26%
Index average	79%	66%	59%	55%	48%	38%	57%

Notwithstanding the prevalence of seafood production from less-developed countries, social issues have, for the most part, not been a significant driver in the development of seafood standards. As with environmental issues, the wild catch and aquaculture sectors treat social issues quite differently. As a general rule, wild catch standards include little to no criteria related to social conditions at production, with an average indicator coverage score of 35 per cent, whereas aquaculture standards contain social criteria at a moderate level, with a coverage score of 57 per cent (on par with certification initiatives in the agriculture sector).[64]

The absence of social criteria in the wild catch sector can be explained, in part, by the history of such standards and their early focus on stock and ecosystem preservation. With major international environmental agreements and, at times, catastrophic ecosystem collapse as major reference points largely inspiring the growth of wild catch voluntary standards, it is understandable why such systems might initially place priority on environmental requirements.[65] Perhaps more surprising is the degree to which the group of wild catch standards has avoided the inclusion of more social criteria over the course of more than two decades of international consensus on the need for an integrated approach to sustainable development and the existence of internationally agreed labour rights under core International Labour Organization (ILO) conventions.[66]

64 In the *SSI Review 2014,* the average coverage of social indicators across 16 initiatives serving the agriculture sector was 51 per cent (see Potts et al., 2014).

65 Seafood standards have historically relied heavily on local fishery management infrastructure for their own operation. To a degree, this reliance may have also limited the overall scope of such systems. To the extent that voluntary standards are regarded as initiatives designed to support local fishery management systems, the boundaries of concern for such voluntary standards may be defined as those defined for fisheries management systems at the national level. Since labour issues typically are *not* the purview of fisheries management authorities, seafood standards following such an approach might not feel the imperative or relevance of addressing labour concerns through their own initiatives. This explanation, however, only goes so far given that voluntary standards are typically regarded as vehicles for pushing companies *beyond* regulatory compliance per se.

66 Notably, the consensus on the need for an integrated approach to sustainable development can be traced to the 1992 Rio Earth Summit, which predates every seafood standard included in this review (see United Nations, 1992). The *ILO Declaration on the Fundamental Principles and Rights at Work* (1998) signals virtually universal acceptance of eight "core" ILO standards—setting an obvious and relatively non-controversial baseline for the inclusion of labour standards within seafood standards more generally (see ILO, 1998). Indeed, the call for the inclusion of social requirements in supply chain sustainability over the past two decades has been so pervasive that many

Given the high rate of trade in capture fishing and the high rate of supply from developing countries with lower capacity levels in the protection of human and labour rights, the absence of requirements along the social spectrum in wild catch standards more generally is particularly noteworthy and points toward an area ripe for further development.[67]

Coverage of social indicators across aquaculture standards is somewhat more robust than within the wild catch sector. The strongest coverage in aquaculture is found in workers' health and safety, followed by the protection of negative rights related to human rights, reflecting the strong global consensus established by major human rights treaties. However, similar to the wild catch sector, labour rights reveal a below-average score of 55 per cent.[68] Animal welfare requirements related to humane methods of transport and slaughter of animals are also relatively low, with only 55 per cent and 45 per cent coverage, respectively, across the aquaculture standards (see Appendix IV and Appendix V).[69]

The provision of positive employee benefits and maternity benefits are, as with wild catch standards, either not included or only recommended across the aquaculture initiatives studied. Given the significance of women in the seafood sector (see Section 1), the absence of greater protections for gender-specific benefits is noteworthy.[70]

Overall, social requirements are poorly represented within the wild catch seafood standards in particular, pointing toward an opportunity for robust review and integration. Labour rights related to the enforcement of core ILO conventions are inconsistently represented across both the wild catch and aquaculture sectors. Meanwhile, positive rights such as employment and maternity benefits remain poorly represented across both the wild catch and aquaculture sectors. Both labour rights and positive employment rights are likely to become increasingly important as certification seeks to provide meaningful benefits for poorer stakeholders along the seafood supply chain.

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organic standards bodies, including Naturland, have actually integrated significant social requirements within their traditionally environmentally focused systems. In our review, Naturland stands out as having reported the most comprehensive social requirements of all the wild catch systems, with an average social coverage score of 89 per cent.

67 In its documentation, FOS makes reference to the SA8000 standard as the relevant standard for certifying social conditions on fisheries. It is unclear whether there is any special relationship between the two standards initiatives, but based on existing documentation, social requirements under the SA8000 are in no way obligatory for FOS certification, effectively rendering demonstration of adequate social conditions as an optional activity. It is also worth noting that in the wake of news on the potential use of slave labour on some fishing vessels, the MSC released a policy on forced labour stipulating that "companies which have been successfully prosecuted for forced labour violations in the last two years will be out of scope of the MSC programme and will be ineligible for MSC certification" (MSC, 2014b). However, this is not reflected in the MSC standard document requirements.

68 ILO core labour rights display uneven coverage across aquaculture standards: prohibition of forced labor (79 per cent), protection of collective bargaining (79 per cent), prohibition of child labour (76 per cent), minimum age requirement (73 per cent), non-discrimination (70 per cent), freedom of association (61 per cent) and equal remuneration (52 per cent). Given the universality of these principles at the international level, the inconsistency across voluntary initiatives is remarkable.

69 It is worth noting that some environmental requirements, such as disease management, could be considered to have animal welfare implications and are not captured by the social welfare analysis per se.

70 The one exception to this rule is Naturland which, as in the case of wild catch, reports the most robust social coverage among the initiatives analyzed.

Box 11 Slave labour on Thai fishing vessels

In June 2014, the *Guardian* reported on human trafficking into slavery on Thai fishing trawlers. The article reported allegations of people "beaten, tortured and sometimes killed—all to catch 'trash fish' to feed the cheap farmed prawns sold in the west" (Hodal & Kelly, 2014).

In February 2015, in a follow-up article, the *Guardian* reported on Thailand's inadequacy in tackling the fishing industry's issue of slavery (Hodal, 2015), with government inspections of fishing vessels failing to identify abuse and its perpetrators despite the fact that the U.S. State Department dropped Thailand to the lowest rank in its *Trafficking in Persons Report* (Hodal, Kelly, & Roberts, 2014). Thailand is not alone. Qatar has also been exposed for conditions of slavery on its fishing vessels and has also been dropped to the lowest rank in the *Trafficking in Persons Report.*

Since then, the MSC has developed a policy on forced labour stipulating that "Companies which have been successfully prosecuted for forced labour violations in the last two years will be out of scope of the MSC programme and will be ineligible for MSC certification" (MSC, 2014b).

MSC's forced labour policy represents an important response to the forced labor issue but also raises the question of whether or not such an ex post approach has the capacity to contribute to the *prevention* of human rights violations in the future.

One conclusion, which does seem fair to draw from such examples, is that neither fishery owners nor scheme owners can credibly assert that social issues are either irrelevant or negligible to the overall sustainability of the seafood sector.

3.1.4 SSI Economic Criteria

Table 3.9 provides a list of the SSI economic indices and their respective indicators (see Appendix I for a full list of the SSI reference indicators and the indicators that are new for this seafood edition). Figures 3.6 and 3.7 illustrate the total average of each economic index across the wild catch and aquaculture sectors, respectively, and Tables 3.10 and 3.11 disaggregate the results to illustrate the coverage of criteria by each standard reviewed. The indices are presented by highest degree of coverage to lowest.

Table 3.9 SSI economic indices and indicators

Index/Indicator	Definition
Minimum wage	The standard requires compliance with minimum wage as defined by local, regional or national law.
Living wage	The standard requires workers to be paid minimum levels of wages that cover basic human needs.
Premiums	The standard requires a premium over the conventional price of a product be paid to the producer.
Written contracts	The standard includes criteria for setting up contracts with traders.
GFSI compliant	The standard is recognized by the Global Food Safety Initiative (GFSI) at the farm level.

Figure 3.6 Average coverage of SSI economic indices, wild catch, from highest to lowest

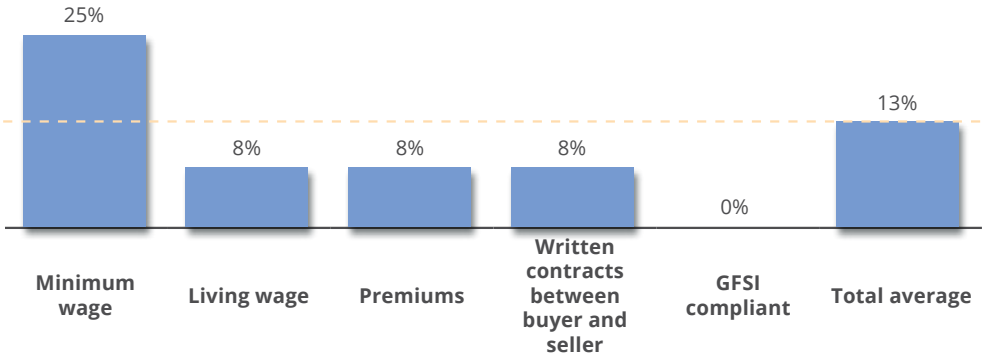

Table 3.10 Average coverage of SSI economic indices, wild catch, from highest to lowest

	Minimum wage	Living wage	Premiums	Written contracts between buyer and seller	GFSI compliant	Total average
FOS wild catch	100%	33%	0%	0%	0%	33%
Naturland wild catch	0%	0%	33%	33%	0%	17%
IRF	0%	0%	0%	0%	0%	0%
MSC	0%	0%	0%	0%	0%	0%
Index average	25%	8%	8%	8%	0%	13%

Figure 3.7 Average coverage of SSI economic indices, aquaculture, from highest to lowest

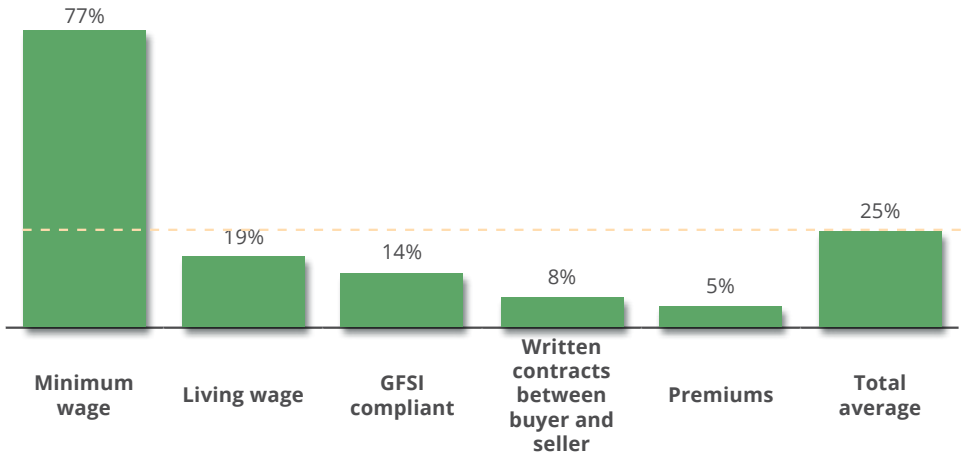

Table 3.11 Average coverage of SSI economic indices, aquaculture, from highest to lowest

	Minimum wage	Living wage	GFSI compliant	Written contracts between buyer and seller	Premiums	Total average
ASC	75%	100%	0%	25%	0%	40%
GLOBALG.A.P.	67%	0%	100%	0%	0%	33%
FOS aquaculture	100%	33%	0%	0%	0%	27%
IFOAM	100%	0%	0%	0%	0%	20%
ChinaG.A.P.	100%	0%	0%	0%	0%	20%
GAA BAP	100%	0%	0%	0%	0%	20%
Naturland aquaculture	0%	0%	0%	33%	33%	13%
Index average	77%	19%	14%	8%	5%	25%

Most of the schemes reviewed offer very few requirements directly related to ensuring the economic sustainability of certified producers. A general explanation for the absence of economic requirements can be traced to the theory of change underlying market-based instruments more generally, whereby economic benefits are expected to come *as a result of compliance,* not *as a precondition to compliance*. Notwithstanding this general logic, any initiative that seeks to identify sustainable production among regions where poverty is a major factor, as is the case in both aquaculture and wild catch production, needs to be attentive to the relationship between certification and sustainable livelihoods.

Three of the initiatives cover food safety (BAP, ChinaG.A.P. and GLOBALG.A.P.), but only GLOBALG.A.P. is compliant with the Global Food Safety Initiative (GFSI) at farm level. Although both sectors show an overall low coverage of the SSI economic indicators, coverage is particularly low across the wild catch standards (see Table 3.10), averaging only 13 per cent, compared to aquaculture's 25 per cent (see Table 3.11). Only one of the four wild catch standards assessed requires the producer to comply with minimum wage laws (Naturland does at the processing level but not at the farm level), and living wage is a recommendation within the FOS standard. In addition to FOS, the ASC is the only other standard that addresses living wage across the aquaculture sector. The aquaculture standards share a general focus on minimum wage with the GFSI at the farm level.

Box 12 When blue turns to green: Using standards as a platform for investment

As one of the few rapidly growing commodities, the seafood sector represents an important opportunity for bringing rural communities across the developing world out of poverty. Ensuring market access for more marginalized producers therefore represents an increasingly important sustainability concern.

More than 80 per cent of aquaculture output occurs in developing countries (FAO, 2012a), home to a considerable number of small-scale fisheries and farms. Small-scale production supports more than 100 million people dependent on aquaculture livelihoods, and these employment opportunities have given rise to an increased number of young people remaining in their communities. This in turn has led to improved economic conditions in these often remote areas. Small-scale production also contributed 46 per cent to global fish catch (FAO 2012c) and employed over 90 per cent of the world's capture fishers in 2010—over half of whom are women (FAO, 2012a). However, long-term decreasing sustainability of the sector poses an eminent threat to poor people living in rural coastal areas, with southern areas more susceptible to the impacts of climate change than northern regions. Increased ocean temperatures, migrating species and severe weather patterns threaten to increase rather than alleviate poverty and displace many people dependent on fishing and fish farming for their survival.

Per capita production volumes shed light on the level of industrialization of a region's fisheries sector as well as small-scale producer presence in that region. Africa and Asia represent more than 94 per cent of fishers and fish farmers globally, yet these regions illustrate the lowest annual average outputs, of approximately 1.8 and 2.0 metric tons per person, respectively. To put these figures into perspective, Europe shows an average annual output of 24.0 metric tons per capita and North America 20.1 metric tons per capita. Latin America and the Caribbean fall between these low and high outputs at 6.4–11.7 metric tons per capita (FAO, 2014). Notwithstanding its generally lower productivity, in recent years, due largely to trade liberalization, the developing-country share of fisheries trade has been on the rise (FAO, 2012a). However, internal capacity gaps and the expansion of technical barriers to trade continue to pose challenges to developing-country market access.

Voluntary standards as external requirements have the potential to lead to further isolation of smaller producers who lack the capacity of financing to reach compliance, as witnessed by the relatively low share of certified production sourced from Africa and Asia (see Section 2). However, standards can also facilitate the delivery of technical assistance and investment from the supply chain where buyers see potential return on investment by improving the stability or quality of supply. Compliance with best management practices associated with standards also has the potential to generate higher yields both within aquaculture and across wild catch fisheries.

There can be little doubt, however, that optimally extracting these long-term benefits from voluntary standards or the seafood sector more generally will be possible only through direct and targeted investment in sustainable fishing practices. Voluntary standards provide a guide for such investment but cannot be expected to bring such results on their own. Our review found little in the way of targeted funds linking investment to the adoption of sustainable practices, suggesting a potential opportunity for development banks, donor agencies and buyers alike.

3.2 Assurance

Building a comprehensive and effective set of rules that define the parameters of sustainable practice (e.g., a system's "coverage" as per above) is a core component of any sustainability standard. However, a set of standards is only meaningful to the degree that claims regarding practices are met by actual application of such practices. The current surge in the popularity of voluntary standards in the seafood sector is largely founded on their use of third-party conformity assessment and traceability systems as a basis for engendering confidence in the market claims they make.

In an effort to facilitate a better understanding of how the major initiatives approach building confidence in the claims they make, we collected information related to the specifics of the conformity assessment and traceability systems applied by the respective systems.

3.2.1 Conformity Assessment

Conformity assessment refers to the set of systems in place to verify compliance with a standard's requirements. Typically, a conformity assessment system will revolve around a series of audits and spot checks. Major quality parameters associated with conformity assessment include the degree of independence associated with the system, the consistency and dependability of the audit process, and the frequency and scope of verification procedures.

3.2.1.1 Independence

Many different degrees of independence exist across voluntary standards systems as a whole. These range from "first party," where conformity assessment processes are managed by the companies producing the products, to "second party," where conformity assessment processes are managed by entities with an interest in the production of the products but not the actual producer of the products (e.g., consumers or suppliers), to "third party," where conformity assessment processes are managed by entities with no interest in the production process (e.g., independent scheme owners). As a general rule, credibility is enhanced through greater independence, though increased independence also implies additional costs related to the outsourcing of multiple activities and may therefore limit market uptake. All of the major systems analyzed apply third-party systems compliant with ISO 17065—which is to say, all existing systems apply a system of third-party certification that represents a high level of independence.[71]

3.2.1.2 Consistency

Although conformity assessment systems applied in the seafood sector exhibit a high degree of independence, a variety of other factors can impede the consistency and dependability of the audit process due to variability in the competencies, interests and/or subjective judgments of individual auditors. All but one of the initiatives surveyed provide some evidence of auditor training, though there is considerably less evidence of specific competency

71 Certification refers to a formal process where an authorized person or entity verifies and attests (in the form of a certificate) that a given product or service is associated with specific characteristics or attributes. ISO 17065 requires both third-party attestations and third-party determinations of scheme compliance. Note that while all of the standards reviewed report as being ISO 17065 compliant, eight of the nine initiatives reviewed use third-party *accredited* certification bodies to fulfill the ISO 17065 requirements. The use of accredited certification bodies provides a still greater degree of quality control and independence in the certification process, representing the gold standard of independence.

Image: Ben Harritt

requirements for auditors.[72] Beyond training and competency requirements per se, the individual systems inevitably allocate a degree of discretionary authority to auditors in interpreting requirements for compliance (see Box 13).

The larger the space for auditor discretion, the greater the potential for variations in actual practices on the ground (see Appendix II). Moreover, auditors (and the standards systems they serve), may face systemic incentives to approve audited fisheries and farms in order to secure certified supply or certification-related revenue (future audits, licence fees). Although it is difficult to quantify the effect of economic pressures on various initiatives, some observers have suggested that high rates of certification may, in part, be due to such incentives.[73]

This is not to lessen the positive gains achieved in seafood certification. What this does suggest, however, is that what happens on the ground can be, at times, very different than what is indicated within the requirements of voluntary sustainability standard documents, particularly within the context of the complexity and diversity associated with transboundary fish stocks and different fish farming practices and systems. Variability in auditor discretion points toward the importance of rigorous continuous improvement and impact assessment systems.

72 We measured two levels of evidence for auditor training: 1. Competency building through requirement for specific auditor training; 2. Direct evidence of competency requirement through generic testing or other evidentiary procedure. All except one standard assessed specify requirements for auditors to be standard specific trained but not all standards reveal evidence of specific requirements for the auditor to show competency in auditing processes.

73 A review of formal objections on MSC certification linked the low rate of responsiveness to objections to fishery certification presented by external stakeholders under the MSC system to economic incentives to approve fisheries. See Christian et al., 2013.

Box 13 Auditor discretion

Regardless of what may be required within any given standard document, all standards require a degree of discretion on the part of the auditor, or, as is the case for Naturland, the initiative's certification committee. This is particularly evident in the fisheries sector, where fisheries can differ substantially with respect to region, type of fisheries management, level of quality data, fishing gear, species, status of stock and conservation goals. For example, although Naturland's sustainable capture fishery criteria are considered obligatory to all producers, the standard specifically notes that "Naturland's certification committee is entitled to allow a producer contractor to diverge from Naturland's standards in specific points, where the exception is justified, and for a limited period of time, provided that the general management according to Naturland's standards is not adversely affected" (Naturland, 2015).

A Sri Lankan FOS audit report, on the other hand, reveals that auditor responses do not always provide quantitative evidence to support the assessment. For example, an auditor may use terminology like "no evidence found" or in the case of the existence of Flag of Convenience fishing vessels, "no [evidence] observed." In assessing the fishery's consideration of the role of the "stock under consideration" in the food web, the auditor notes that there is "no considerable effect on the foodweb" (FOS, n.d.-b).

With respect to FOS essential criteria 3.1 of the Sri Lankan fishery audit report, which specifies "The target species cannot be fished by gears that have discard levels higher than 8% in weight terms," the auditor notes that the discarding percentage "is less than 8 percent" but does not indicate the actual percentage (FOS, n.d.-b). In terms of continuous improvement, non-quantitative responses such as these do little to help determine if the fishery is improving over time. It also does little to determine how well the fishery is currently performing against that particular criterion. The discard percentage could be a mere half percentage point below the threshold.

As another example, the MSC applies a scoring system that results in a certain degree of auditor discretion. For example, in its guidelines on scoring a given fishery, the MSC standard stipulates:

7.10.1: After the team has compiled and analyzed all relevant information (including technical, written and anecdotal sources), they shall score the Unit of Assessment (UoA) against the Performance Indicator Scoring Guideposts (PISGs) in the final tree. The team shall:

7.10.1.1: Discuss evidence together

7.10.1.2: Weigh up the balance of evidence

7.10.1.3: Use their judgment to agree a final score following the processes below…(MSC, 2014c)[74]

High levels of discretionary authority can give rise to enhanced reputational risk and may be one explanation for the relatively high rate of formal objections to MSC certification lodged by third parties.[75]

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74 It should be noted that 7.10.2.3 of the guidelines further notes that in order to achieve a certain score, the relevant scoring issues must be met and each scoring issue needs to be justified by supporting rationale. The MSC has a system of checks and balances aimed at reducing variable outcomes, including a peer review process, stakeholder consultations, monitoring of assessors by Accreditation Services International, and technical oversight of individual fishery assessments by the MSC's fisheries team.

75 In a paper published independently in 2013, it was reported that of the 19 formal objections made against MSC-certified fisheries, only one was upheld and certification subsequently denied (Christian et al, 2013), which speaks to the degree of independence involved in dispute settlement. In tonnage, the fisheries that received formal objections represent 35 per cent of MSC-certified seafood (Christian et al., 2013). However, in 2015 the MSC published a paper referencing 29 received objections. Of the 29 objections, 14 were immediately dismissed. During the hearings of the remaining 15 some objections were dropped, while some changes were required to the fishery assessment changing the scores and either modifying conditions or adding new conditions to the certification. The most common reasons for the 14 objections that were dismissed were that the objections were received outside the objections period, the objector was not qualified to object to the specific fishery assessment, and the objection notice was not in the correct format (for further information, see Brown, 2015).

Table 3.12 Conformity procedures and frequency

Table 3.12 shows the different types of auditing procedures and frequency of audits across the seafood standards assessed. All schemes require certification bodies to be ISO 17065 accredited or equivalent[76] and therefore apply internationally accepted norms for certification independence.

Standard	Certificate duration (years)	Number of audits within certificate period			
		Self-assessment	Verification audit	Surveillance audit*	Unscheduled audits
ASC	3			2	Risk based
ChinaG.A.P.	1			1	1
FOS†	3			1	Risk based
GAA BAP‡	1	1	1		Risk based
GLOBALG.A.P.§	1	1			Ad hoc
IFOAM	1				1
IRF||	5			3	
MSC#	5			4	Ad hoc
Naturland**	1	1		1	1

* The number of surveillance audits refers to the number of surveillance audits that occur during the certificate period. Typically, surveillance audits occur annually between certification audits with some exceptions.
† FOS surveillance audits are conducted every one and half years (half of certificate period).
‡ BAP's verification audit is a short-term audit conducted to verify certification-body audits; self-assessment audits are part of the application process.
§ GLOBALG.A.P. requires a self-assessment prior to certification audit. An unscheduled audit may occur if a farm falls within audit sampling per cent range or is chosen by the GLOBALG.A.P. Integrity Program.
|| The IRF requires an initial verification assessment involving a site visit and assessment report prior to certification decision. An external peer review exams the assessment report, after which a final assessment report is developed, resulting in certification decision. The fishery then undergoes annual surveillance audits during validity of the certificate period.
The MSC conducts surveillance audits annually.
** Naturland requires self-assessment as a pre-certification measure. Announced and unannounced audits are performed to confirm compliance with standard.

76 FOS has obtained national accreditation through the Italian accreditation body Accredia.

The nine seafood standards reviewed all operate as certification schemes using a third-party certification body to issue a certificate to the producer unit upon confirmed compliance with the standard's requirements. Similarly, for all of the standards reviewed, certificate validity is five years or less, in accordance with FAO guidelines.[77] However, a number of schemes require recertification in significantly less time, with ChinaG.A.P., GLOBALG.A.P., IFOAM and Naturland all requiring full reassessment on an annual basis.

Audit frequency and certification duration signal the time between site visits and represent a potentially important variable in ensuring compliance at any given point in time. Conditions at production are highly dependent on political, economic and ecosystem conditions and, as a result, can change rapidly. More frequent verification processes potentially reduce the risk of misalignment between practices and standard requirements, but also represent an additional cost for the supply chain, which, if borne by producers, may hinder market access among more marginalized-producer regions.

Within any given period of certificate validity, standards may also require any of a number of additional audits to ensure that best practices are performed in a consistent and ongoing manner. There are typically four types of interim audits: self-assessments, surveillance audits, verification audits and unscheduled visits. The application of these audits is typically distributed in an effort to balance cost and rigour according to the different philosophies embodied by each initiative.

- **Self-assessments** are performed by the producer to assess their performance against a certain set of criteria and are submitted to the standard body for review. Three of the initiatives reviewed require these types of assessments, but they are intended as pre-certification measures.
- **Verification audits** can be used in different ways and at times can replace a certification audit whereby a licence is issued in place of a certificate; however, this is not typically the case across seafood standards. Verification audits can be performed to ensure a producer unit has reliable systems in place to monitor and control their sustainability performance. Standard bodies also use verification audits as a benchmarking process in achieving full certification. The GAA, the only initiative that requires verification audits, uses them as short-notice audits to verify routine certification audits.
- **Surveillance audits**, excluding the certification audits themselves, are the most commonly applied interim audit. Surveillance audits are typically carried out on an annual basis and are intended to monitor the ongoing fulfillment of the standards while identifying any corrective actions necessary to maintain compliance over the certification period. These are typically required for standards that have recertification periods longer than one year, although ChinaG.A.P. and Naturland are examples of standards that require surveillance audits within a one-year certification period.
- **Unscheduled audits**, as the name suggests, can occur at any time throughout the certification validity period and are most often implemented based on risk assessments of the certified production base.

77 See Article 114 of the FAO *Technical Guidelines on Aquaculture Certification* (FAO, 2011d), Article 142 of the FAO *Guidelines for the Ecolabelling of Fish and Fishery Products from Inland Capture Fisheries* (FAO, 2011a), and Article 91 of the FAO *Guidelines for the Ecolabelling of Fish and Fish Products from Marine Capture Fisheries* (FAO, 2009).

3.2.2 Traceability

In order to ensure that products marketed as compliant are indeed credibly linked to sustainable practices, some form of traceability system is required. Typically, any one or more of four different traceability models will be applied by a given standard:

- **Book and claim**: "Sustainable" certificate is granted based on the application of sustainable practices, but the certificate is completely decoupled from the product and transferable on the market
- **Mass balance**: The amount of certified product sourced and sold by each supply chain actor is tracked. However, the certified product and "sustainable" certificates do not need to be sold together (for example, FSC mixed sources)
- **Segregation**: The segregation model ensures that compliant products are kept segregated from non-compliant products during all stages of the supply chain
- I**dentity preservation**: The identity preservation model requires physical separation, tracking and documentation at every stage of the supply chain

While each system is designed to ensure that claims are matched by practices on the ground, only identity preservation ensures that a purchased product was *itself* produced using sustainable practices—assuming, that is, that the system is working as expected.

All but ChinaG.A.P. use both the segregation and identity preservation models of traceability, which ensure the most robust forms of traceability (see Table 3.13). A few of the standards also use mass balance and book and claim as well, which are most commonly used for feed components and other inputs such as in the case of BAP, GLOBALG.A.P.[78] and Naturland.

The high reliance on identity preservation by seafood standards is likely due to its ability to support multiple demands through a single process. In addition to offering the highest degree of certainty for matching sustainability claims to products, identity preservation can also play an important role in the management of food safety, the prevention of IUU harvest, and the accurate labelling of species and sources,[79] all of which represent distinct challenges within the seafood economy and potential drivers of certification. These pressures probably also help explain the high rate of the application of specific Chain of Custody (CoC) requirements within the given systems—either as an integral part of the system, or as a separate standard for application by all players along the supply chain, as is the case with eight of the nine standards reviewed.

78 GLOBALG.A.P. mass balance criteria for validation of inputs are also applicable for the use of the FOS logo and GGNs for on-product labelling.

79 Seafood is often mislabelled, with reported rates of mislabelling as high as 48 per cent (FishWise, 2012).

Table 3.13 CoC requirements

Standard	Separate CoC standard*	Chain of Custody model			
		Identity preservation	Segregation	Mass balance	Book and claim
ASC†	✓	✓	✓		
ChinaG.A.P.			✓		
FOS		✓	✓	✓	✓
GAA BAP‡		✓	✓	✓	
GLOBALG.A.P.	✓	✓	✓	✓	
IRF	✓	✓	✓		
IFOAM		✓	✓		
MSC	✓	✓	✓		
Naturland		✓	✓	✓	✓

* Four of the nine standards have a separate standard document for the CoC requirements. The BAP standards have traceability record-keeping requirements included in their standard documents as well as providing an appendix illustrating a sample product traceability form. Naturland also includes requirements for traceability within its standard documents, specifically within its labelling and marketing requirements, which are in line with EC regulations on organic production. With respect to Naturland aquaculture, the standard notes specific requirements to the origin of stock. The Naturland wild catch standard requests identification to be distinct from aquaculture with the words "product of sustainable fishery" to appear on the product.

† The newest version of the MSC CoC requirements version 2.0 integrates the ASC CoC requirements (see MSC, 2015b). ChinaG.A.P. information provided by ITC, 2015.

‡ BAP uses the mass balance model of traceability for feed components only.

Naturland uses mass balance and book and claim for feed, harvest estimation and larvae.

Traceability is closely related to the types of claims that can be made on a package or to eventual buyers in the case of business-to-business initiatives. Typically, a given initiative will specify rules for compliance-related claims based on the CoC system used as well as the percentages of standard-compliant inputs present. Of the nine initiatives assessed, eight[80] require a minimum of 95 per cent content to be compliant in order for users to make a legitimate claim of standard compliance for products.

80 Information unavailable for ChinaG.A.P.

3.2.3 The Assurance Index

Drawing from the broader set of indicators related to conformity assessment and assurance processes in our analysis above (Conformity Assessment – Traceability), we can assess the comprehensiveness of assurance-related measures implemented across the individual seafood standards in the form of an assurance index. Note the ISEAL-compliant indicator is in reference to the broader SSI indicator continuous improvement (see Section 3.3.2).

Neither the assurance index nor any of the other SSI systems indices should be interpreted as actual assessments of impact. These indices aggregate performance along specific indicators in order to facilitate a higher level analysis across and among initiatives.

Table 3.14 Assurance index indicators and explanation of assessment

Table 3.14 lists the SSI indicators chosen as the key elements in determining the comprehensiveness of assurance measures across the standards assessed. All indicators are weighted equally.

Indicator	Reference
Frequency and types of audits	Assessed of degree of rigour in terms of the number and frequency of audits. More points are assigned for shorter certificate duration and for more audits (see Table 3.12). Even though more rigorous processes are more costly and onerous for the producer, the confidence level is increased.
Independence	Assessed out of 100%. 33% for third-party certification bodies; 66% for being 17065 compliant or equivalent; 100% for 17065 compliant with third-party accredited certification bodies.
Purity policy	Investigates whether or not the initiative restricts the use of the label to products with a threshold percentage of compliant products. The threshold in this case is 95%. If the standard requires 95%, then it receives 100%; if information is unavailable the standard receives 50% (based on the assumption that the information does exist but is not readily available, such as in the case of ChinaG.A.P.).
ISEAL Assurance Code compliant	If compliance with the Assurance Code has been independently verified, then 100%. If a standard is a full member of ISEAL but has yet to have compliance independently verified, then 50%. If none of the above, then 0%.
CoC requirements	Based on a three-part score: If the standard has a separate CoC standard, score is 100%.[136] If CoC requirements are only contained within the actual standard document, initiative receives 50%. If CoC requirements are included in the standard document and also backed up by national legislation, then initiative receives 75%.
Auditor competency	Assessed on a three-part basis: If there is direct evidence of auditor competency along with requirements for standard-specific training, the initiative receives 100%. If there is evidence within the document for standard-specific training, but nothing specific to auditor competency, the initiative scores 50%. If there is no evidence within the standard for auditor training or competency, then the initiative receives no points.

As a general rule, all of the standards reviewed contain the key elements for making credible claims, with all initiatives averaging 69 per cent across the SSI assurance index. The ASC, GLOBALG.A.P. and MSC stand out with above-average systems for making credible claims of compliance. The highest level of diversity, as noted previously, appears in the frequency of audits across different systems.

Demonstrable compliance with the ISEAL Assurance Code represents an important tool for monitoring and ensuring overall stringency in matching claims and actions as well as for continuous improvement, but is only adhered to (officially) by two of the eight initiatives reviewed.

Figure 3.8 Assurance index assessment, from highest to lowest

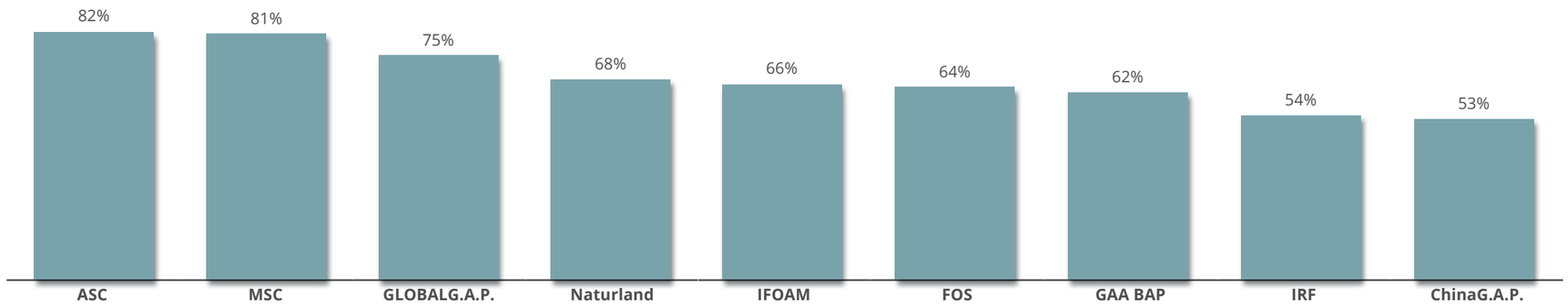


Table 3.15 Assurance index assessment, from highest to lowest

Indicator	ASC	MSC	GLOBALG.A.P.	Naturland	IFOAM	FOS	GAA BAP	IRF	ChinaG.A.P.
Frequency and types of audits	43%	37%	50%	60%	20%	33%	70%	27%	60%
Independence	100%	100%	100%	100%	100%	100%	100%	100%	33%
Purity policy	100%	100%	100%	100%	100%	100%	100%	100%	50%
ISEAL Assurance Code compliant	50%	50%	0%	0%	0%	0%	0%	0%	0%
CoC requirements	100%	100%	100%	75%	75%	50%	50%	100%	75%
Auditor competency	100%	100%	100%	75%	100%	100%	50%	0%	100%
Indicator average	82%	81%	75%	68%	66%	64%	62%	54%	53%

Figure 3.8 shows the total average across the assurance indicators for each initiative. Table 3.15 disaggregates the results to show the coverage of each standard across each indicator. See Appendix VII for the total average across the initiatives for each indicator. Note: The ISEAL Assurance Code is the newest ISEAL code; therefore, at the time of writing no standard had received independent verification of full compliance.

3.3 Responsiveness

One of the cornerstones of sustainability standards is their promise to maintain consistent practices across diverse production environments—irrespective of national policies or other socio-political contexts. In some ways, the very purpose of standards is to correct for inconsistencies in production that might threaten sustainability. However, sustainability itself is context dependent, suggesting that any credible approach to sustainable development also needs to be responsive to local and temporal context. Recognizing this, voluntary standards have adopted systems of regular review and refinement of the standards and related systems. Standards systems can also allow for variations in standards or compliance requirements based on producer size, production setting or geographic location. In this section we provide an overview of key systems that standards can employ to ensure maximum responsiveness to local conditions and a continuously evolving knowledge base.

3.3.1 Local and Smallholder Interests

Smallholder producers are the dominant source of supply from developing countries, accounting for most of the production from the developing world and 50 per cent of global production (FAO, n.d.-b). Smallholder producers face special challenges in obtaining and maintaining certification due to the fixed costs and paperwork associated with required management systems.

Although most systems offer a sliding scale for annual fees based on volumes or overall value of production, there are limits on the degree to which such costs can be adjusted to the smallholder scale. Regardless, the largest costs facing smallholders are likely to be those related to systems implementation and data provision, which simply may not be available on an individual producer basis. While this basic challenge points toward the importance of local governments in facilitating certification, it also suggests the need for smallholder specific requirements.

In response to the specific challenges facing smallholders, voluntary standards in other sectors have applied either specific standards for smallholders or customized procedures allowing smallholders to group certify. Among the seafood standards surveyed, all but one (ASC)[81] offer some sort of group certification process (see Table 3.16). The group certification process allows multiple smallholders to become certified through a single entity, thereby reducing fixed costs on an individual basis.

81 The ASC is developing a methodology for group certification as well as for a multi-site approach. The latter focuses on one company operating several sites in one region. The former deals with farms under different ownership while working together as a group. Both methodologies are expected to become available to the market in 2016.

Table 3.16 Principle of subsidiarity

Standard	Regional standards and localized indicator development	Local auditors engaged in the certification process	Separate standard for smallholders	Group certification
ASC*				
ChinaG.A.P.†	✓	✓		✓
FOS				✓
GAA BAP				✓
GLOBALG.A.P.	✓	✓		✓
IFOAM	✓	✓		✓
MSC‡		✓		✓
Naturland				✓

* At the time of writing ASC was in the process of developing group certification processes for its standards.
† Some local certification bodies used by ChinaG.A.P.: WIT Assessment (China); China Quality Mark Certification Group Co. Ltd.; Beijing Coops Integrity Certification Centre; CQC—China Quality Certification Centre; SGS-SCTC Standards Technical Services Shanghai, China). Co. Ltd. (see GLOBALG.A.P., n.d.-a). The principle of subsidiarity index is not applicable to Iceland Responsible Fisheries as it only operates within Iceland.
‡ The MSC includes competency requirements for at least one assessment team member to have current knowledge of the country, language and local fishery context.

Of those standards that offer group certification, four use the square root method[82] in determining the sample size to audit, while ChinaG.A.P. uses the percentage method.[83] All producers are audited for BAP audits.

None of the standards offer smallholder-specific standards (Table 3.16) though the MSC does offer a special risk-based framework for producers who are considered to have limited quantitative information, informal management systems, and/or a minimum average total catch.[84] To compensate for a deficiency in data, the MSC's risk-based framework process requires increased stakeholder involvement and an oftentimes more rigorous and potentially more onerous process than would otherwise be required.[85]

82 In the case of FOS, where there are high numbers of vessels or plants, the square root sample is applied with a reduction percentage. The MSC uses the square root method adopted from ISO 2859 and IAF mandatory requirements for multi-site certification (which is what the MSC calls a "group"). The MSC has four sample plans depending on the risk scoring of each company (high, medium, low, very low).

83 The sample number of certified producer groups during annual unannounced inspections can be 50 per cent of that during the initial certification. If no non-compliance is detected, the notice inspection sample number can be reduced to 50 per cent of the square root of producers. In cases where non-compliances are detected, the sample test during the next noticed inspection shall be conducted as initial certification (ITC, 2015).

84 <50,000 metric tons (MSC, 2014c).

85 Although the MSC recognizes that the risk-based framework may at times be more onerous for the producer, it is considered necessary for the MSC to stand by its high degree of scientific rigour (MSC, personal communication, 2015).

Within a context of increasingly complex demands upon producers, the ASC, GAA and GLOBALG.A.P. have sought to simplify the certification process for producers through the use of a harmonized checklist, facilitating more efficient and less costly certification across different systems. GLOBALG.A.P. also now offers an FOS add-on module for aquaculture. If the producer complies with four specific defined criteria at farm level, the producer can use a special consumer label that shows the FOS consumer label and the GLOBALG.A.P. number (GGN).[86]

Although standards systems themselves typically do not offer funds to facilitate compliance among poorer producers (see Table 3.18), some systems are associated with partner funds that can offer financial support to producers in need. For example, IDH's Farmers in Transition Fund offers support to smallholder producers seeking compliance with the BAP standards. These funds, though an important step in enabling greater access among smallholders, have not, to date, had significant impact on compliance rates among developing-country smallholders, which remains a small minority of overall certified volume largely due to the size of the infrastructure challenges facing certification for smaller producers (see Section 2).

Indeed, the magnitude of the sustainability challenges facing any given sector is such that no single actor (or initiative) can practically be burdened with the task of transitioning to sustainability unilaterally. FIPs draw from a variety of stakeholders simultaneously, and therefore offer an important vehicle for bringing about the systemic changes that can allow eventual certification and longer-term sustainability. Although FIPs can play a key role in enabling certification, they do not constitute an integral part of any of the certification schemes reviewed.

Another approach to enabling local responsiveness can be through the provision of intentional auditor discretionary authority to adapt to local conditions. While auditor discretion can enable a contextualized application of requirements, the use of regionally specific standards offers a more predictable and transparent pathway to local responsiveness. Among the seven seafood standards for which regional adaptation is relevant,[87] only GLOBALG.A.P. offers the possibility of regional variations. GLOBALG.A.P.'s use of local auditors for its certification and surveillance processes can also help ensure that the conformity assessment process is responsive to local conditions. Indeed, the relative absence of local flexibility in standard definition has given rise to a growing number of national initiatives seeking to enable sustainability claims based on local priorities (see Box 14).

86 The criteria cover impacts on water body sediment, access to drinking water and fishing areas for local communities, and social criteria via GLOBALG.A.P. Risk Assessment on Social Practice. This add-on can be assessed through GLOBALG.A.P. audits and is incorporated into version 5 of the GLOBALG.A.P. aquaculture standard.

87 This criterion is not applicable to ChinaG.A.P., it being a regional standard itself.

Box 14 National/regional standards as an alternative to international standards

Uptake of MSC certification has occurred unevenly around the world. The majority of its certificates are for fisheries in Europe and North America. Since one of the key requirements for MSC certification is the existence and subsequent assessment of a fisheries management regime, national and regional fisheries management regimes are, in essence, among the group of actors being assessed for certification in any certification process (Foley, 2013). It thus stands to reason that national response to MSC certification has been varied. For example, some countries have questioned whether it is appropriate for a private international body to govern practices conducted by public authorities or other national interests, giving rise to a number of nationally based schemes designed to replace the need for international certification. The following are some examples:

Iceland: Iceland Responsible Fisheries is the result of an agreement between the minister of fisheries, the director of the Marine Research Institute, the director of fisheries and the head of the Fisheries Association in Iceland. The initiative sets standards for Icelandic wild catch fisheries.

Alaska: The Alaskan Seafood Marketing Institute is a cooperative endeavor of industry and state (U.S.) government. The initiative sets standards for Alaskan wild catch fisheries.

Japan: Marine Eco Label is a joint effort by the fishing industry, scientific community, conservation organizations, fish processors and distributors, consumers and food specialists. The initiative sets standards for Japanese fisheries.

Sweden: KRAV organic is an incorporated association with members who represent farmers, processors and tradespeople, as well as consumer, environmental and animal welfare interests. The initiative sets standards for organic production.

It has been noted that nationally driven responses to global schemes like the MSC and FSC may be influenced by the type of policy regime already in place, not to mention special interests at the national level (Gale & Haward, 2011). At the same time, there is also some evidence that the heavy reliance of global initiatives on local management regimes leaves them vulnerable to such influence (Foley, 2013). Multistakeholder standards outside of government are also considered to have the potential to lead to better regulation, since national policy changes after each election (Webb, 2011).

Given the alignment of local ownership with more meaningful participatory governance regimes, the integration and institutionalization of local interests within certification regimes is not necessarily a negative development—but it does present challenges for the global management of fishery practices and stocks. In this regard, the FAO Guidelines, as well as precise rules set forth by global voluntary initiatives, represent an important reference point for ensuring that minimum practices are maintained across such diversity at the national level.

Box 15 National standards as a pathway to international certification

National governments and local infrastructure typically play a major role in determining the level of access to international markets among smallholder fishers and fish farmers. Government involvement is arguably a prerequisite for smallholder access to certified markets at the international level.

In an assessment of the costs and benefits associated with certification in Southeast Asia, the Asia-Pacific Fishery Commission noted the importance of regional involvement in order for certification to be beneficial, further adding that harmonization and equivalency systems across schemes are key (FAO, 2007).

VietG.A.P. is Vietnam's national certification standard and acts as an entry standard into international aquaculture certification schemes like GLOBALG.A.P., ASC and the GAA BAP standards. The VietG.A.P. aquaculture standard was developed by the Vietnamese government, which also manages its national certification body, QUACERT, which is one of a number of bodies that offers VietG.A.P. certification (VietG.A.P., n.d.).

Vietnam is the top global producer of farmed pangasius and the fourth global producer of farmed shrimp (Marschke & Wilkings, 2014). In the past, Vietnam's aquaculture industry has shown poor management, with publicized concerns over food safety (Little et al., 2012) as well as allegations of the plant-based gelatin agar-agar being injected into shrimp packaging to raise its pre-export weight (VASEP, 2014). In response to concerns over food safety, Japan announced testing of all shrimp imported from Vietnam for chemical and antibiotic use (SeafoodSource, 2014).

In 2014, the Vietnamese government announced that all pangasius farms and companies must be certified to standards like VietG.A.P., ASC or GLOBALG.A.P. by 2016 ("Decree to require all Vietnam farms," 2014). More recently, the country's Directorate of Fisheries signed a memorandum of understanding with the ASC to work together toward a stepwise approach from VietG.A.P. certification to full ASC certification (Kearns, 2015). Moving beyond the country's mandate that all farms must be VietG.A.P. certified, ASC certification is considered to be the next step in achieving international recognition for responsible aquaculture.

The national standard VietG.A.P. may prove to be a successful approach to international certification for a country where smallholder shrimp production constitutes 95 per cent of the country's farming area and two-thirds of its total shrimp production (Ahn, Bush, Mol, & Kroeze, 2011).

3.3.2 Continuous Improvement

Continuous improvement systems allow a standard to take stock of current performance and make revisions to allow for improved performance moving forward.[88] The process involves a method of regularly documenting and reviewing sustainable practices in order to determine measurable improvements beyond compliance with a baseline set of criteria (Bush et al., 2013a). As such, continuous improvement mechanisms can play an important role both in maintaining the integrity of a system over time and in facilitating access to producers with limited capacity for full certification.

The most direct technique for ensuring that a given standard remains relevant over time is through regular revisions of the standard itself. While four of the standards reviewed produce revised standards every five years (ASC, MSC, ChinaG.A.P. and IRF), four offer shorter revision periods: GLOBALG.A.P. (three years), BAP (three years), IFOAM (two years) and Naturland (one year). FOS has no set timeline for revisions.

But standard revision processes are dependent on the quality of the information feeding into them. A strong information platform for continuous improvement requires a formal monitoring and evaluation system with baseline measures over time. Although most systems will claim to have such measures in place, the ISEAL Impacts Code, which sets forth detailed requirements for credible monitoring and evaluation procedures, offers a useful measure of monitoring and evaluation rigour. Only two of the eight standards (ASC and MSC) reviewed are full members of ISEAL, with the MSC currently being the only standard in full compliance with the ISEAL Impacts Code (see Table 3.17).[89]

88 Note that revisions to the standard document are only one part of continuous improvement. Continuous improvement can also include requirements for accreditation and certification bodies as well as changes to licensing claims.

89 The ISEAL Impacts Code sets a benchmark for good practice in monitoring, evaluation and impact assessment (see ISEAL, n.d.-a).

Table 3.17 Monitoring and evaluation

Standard	ISEAL Impacts Code	Revision period for standard
ASC		5 years
ChinaG.A.P.		5 years
FOS		Ad hoc
GAA BAP		3 years
GLOBALG.A.P.		3 years
IFOAM		2 years
IRF		5 years
MSC	✓	5 years
Naturland		1 years

Information for ChinaG.A.P. from ITC (2015). FOS does not stipulate a specific revision period but rather notes that the revision period is continuous—anytime a member of the technical committee proposes a change, voting is carried out online. IFOAM has two versions of its aquaculture standard. Version 1 was developed from 2010 to 2012 and version 2 was developed from 2012 to 2014 (see IFOAM, n.d.–a).

Another technique for stimulating best practice employed by some standards schemes applies a reduced compliance bar for entry with further requirements for improvements along specified trajectories within a fixed time period. For example, the MSC standard currently requires that the fishery score between 60 and 80 per cent in order to become MSC certified, with the intent that the fishery will strive to attain 80 per cent (Best Practice level) during the course of certification.[90] There is, however, no mechanism in place to incentivize fisheries to move beyond the Best Practice requirements of an 80 per cent score to achieving a 100 per cent score.[91]

The GAA iBAP program offers a step-by-step, deadline-driven plan open to organizations along the entire aquaculture supply chain that are not yet ready to apply for BAP certification (see Table 3.18). This is the only seafood standard assessed that offers such a process.

Voluntary sustainability standards could make continuous improvements more desirable by providing producers with concrete incentives for exceeding basic compliance over time. However, of the eight initiatives[92] reviewed, none currently provide producers with incentives for continuous improvement.

90 A score of 80 per cent stipulates that it is "highly likely" that the stock in question meets the desired sustainability requirements. Reaching a score of 100 per cent stipulates that there is a "high degree of certainty" that the stock is indeed sustainable (MSC, 2014c).

91 There are reports that some MSC-certified fisheries have requested further recognition in moving beyond the MSC Best Practice requirements (Bush et al., 2013b).

92 Information unavailable for ChinaG.A.P.

Image: Paul D Lee

Table 3.18 Assistance provided to producer by scheme

Standard	Technical assistance (any support other than financial, such as tools, training or guidance)	Stepwise certification (step-by-step plan or pathway to reach certification)	Independent funds (funds provided to producers by independent organizations to aid in compliance with certification requirements)	Harmonized procedures (for recognizing compliance efforts with other standards)
ASC				Combined checklist with GAA BAP and GLOBALG.A.P. to minimize duplication of audit points between schemes. Checklist is supplemented by specific add-on clauses for the other standard(s). For multiple certifications, farm can select any one of the three programs as the primary standard and then select the desired add-on(s).
FOS				For farms certified against GLOBALG.A.P. Aquaculture version 5, it is by default that farms comply with both GLOBALG.A.P. and FOS, with the option of using a special consumer label that shows the FOS consumer label and the GLOBALG.A.P. GGN number.
GAA BAP		iBAP: Step-by-step, deadline-driven plan open to the entire aquaculture supply chain, including farms, processing plants, hatcheries and feed mills that are not yet ready to apply BAP certification.	Funding may be available for some of the improvement costs necessary for the iBAP program via the Farmers in Transition Fund supported by IDH (BAP, n.d.).	Combined checklist with ASC and GLOBALG.A.P. to minimize duplication of audit points between schemes. Checklist is supplemented by specific add-on clauses for the other standard(s). For multiple certifications, farm can select any one of the three programs as the primary standard and then select the desired add-on(s).
GLOBALG.A.P.	Risk assessment on social practice: Module for assessment of social practices on farm (non-obligatory).			Combined checklist with ASC and GAA BAP to minimize duplication of audit points between schemes. Checklist is supplemented by specific add-on clauses for the other standard(s). For multiple certifications, farm can select any one of the three programmes as the primary standard and then select the desired add-on(s). Combined checklist or FOS add-on (see FOS above) (GLOBALG.A.P., n.d-c).
IFOAM	Capacity building for the Intercontinental Network of Organic Farmers Organizations. Regional Cooperation for Organic Standards and Certification Capacity in East Africa Building sustainable food systems and capacity for organic agriculture development in the DPR Korea			

Table 3.18 Assistance provided to producer by scheme, continued

Standard	Technical assistance (any support other than financial, such as tools, training or guidance)	Stepwise certification (step-by-step plan or pathway to reach certification)	Independent funds (funds provided to producers by independent organizations to aid in compliance with certification requirements)	Harmonized procedures (for recognizing compliance efforts with other standards)
MSC	Fishery improvement action plan tool: Templates and operational guidance for developing fishery-improvement action plans. Benchmarking and tracking tool: Allows users to benchmark environmental performance of FIPs against the MSC standard. Partnership for sustainable fisheries tool: guide to developing and working in partnership with key stakeholders who may be able to provide funds, knowledge, skills or experience.	Fishery expected to reach 80% (best practices level) during the course of certification.		
Naturland	Naturland fair trade certification is a voluntary supplementary option for Naturland certified producers, processors and traders. In each and every case, the basis for fair trade certification is a valid certification by Naturland as organic. Tools and methodologies for implementation of social justice (IFOAM basic standards). Comparison of standards: Information on the most important differences between Naturland's standards and the requirements of the European Community organic regulation (Bio-Siegel, the German national eco-label).			

Information unavailable for ChinaG.A.P. and IRF.
See BAP (n.d.) for more information about iBAP.
See IFOAM (n.d.-b) for more information on IFOAM's technical assistance programs.
See MSC (n.d.-b) for more information on the MSC's accessibility tools.

3.3.3 The Responsiveness Index

Drawing from the broader set of SSI indicators related to responsiveness above (Local and Smallholder Interests — Continuous Improvement) we can assess the comprehensiveness of responsiveness-related measures implemented across the individual seafood standards in the form of a responsiveness index (see Table 3.19 for the list of indicators chosen for this index).

As Figure 3.9 reveals, attention to responsiveness-related issues appears to be much less consistent than with assurance-related issues (Figure 3.8). To a large degree this makes sense, given the high primacy that voluntary standards place on consistency and credibility of claims. At the same time, it also points to potential opportunities for promoting meaningfulness and accessibility at the local level and over time. The general convergence among initiatives around the use of group certification suggests the importance of this vehicle for enabling access to sustainable supply chains. Only a minority of the initiatives provide standards or indicators tailored to the national level. As noted earlier, none of the initiatives offer clear incentives or requirements for improving performance over time.

Table 3.19 Responsiveness index indicators and explanation of assessment

Indicator	Reference
ISEAL Impacts Code compliant	If compliance with the Impacts Code has been independently verified, then 100%. If a standard is a full member of ISEAL but has yet to have compliance independently verified, then 50%. If none of the above, then 0%.
Local indicator development: National or regional standards	Yes (100%) or no (0%). See Table 3.20.
Group certification	Yes (100%) or no (0%). See Table 3.20.
Incentives	The scheme provides the producer with concrete incentives for exceeding basic compliance over time. Yes (100%) or no (0%).
Local auditors	The audit team includes local experts who have knowledge of culture and legislation. Yes (100%) or no (0%). See Table 3.20.

Figure 3.9 Responsiveness index assessment, from highest to lowest

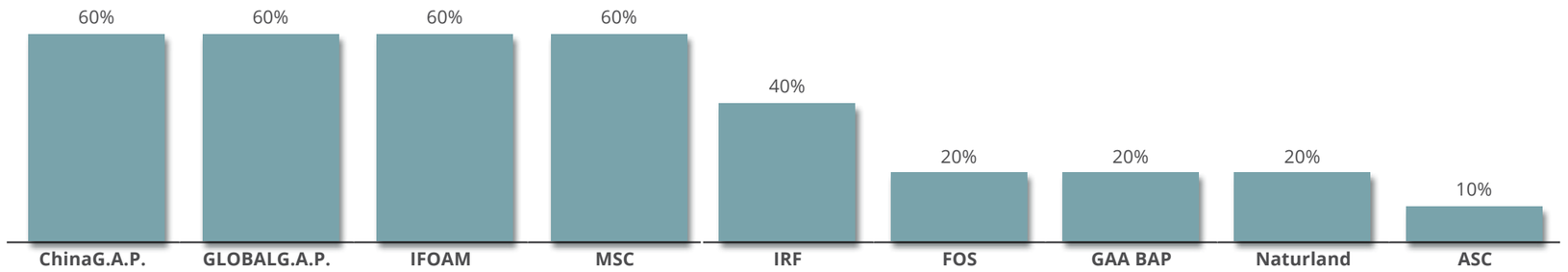


Table 3.20 Responsiveness index assessment, from highest to lowest

Indicator	ChinaG.A.P.	GLOBALG.A.P.	IFOAM	MSC	IRF	FOS	GAA BAP	Naturland	ASC
ISEAL Impacts Code compliant	0%	0%	0%	100%	0%	0%	0%	0%	50%
Local indicator development: national or regional standards	100%	100%	100%	0%	100%	0%	0%	0%	0%
Group certification	100%	100%	100%	100%	0%	100%	100%	100%	0%
Incentives	0%	0%	0%	0%	0%	0%	0%	0%	0%
Local auditors	100%	100%	100%	100%	100%	0%	0%	0%	0%
Indicator average	60%	60%	60%	60%	40%	20%	20%	20%	10%

Figure 3.9 shows the total average across the responsiveness indicators for each initiative.
Table 3.20 disaggregates the results to show the coverage of each standard across each indicator.

ChinaG.A.P., GLOBALG.A.P., IFOAM and the MSC reveal the highest coverage across the responsiveness index due in part to their focus on local conditions.[93] See Appendix VII for the total average across the initiatives for each indicator.

93 Note: ChinaG.A.P.'s coverage of the SSI indicator "local indicator development and national/regional standards" goes without saying, since it is a national standard. Local certification bodies used by ChinaG.A.P. include WIT Assessment (China), China Quality Mark Certification Group Co. Ltd., Beijing Coops Integrity Certification Centre, China Quality Certification Centre and SGS-SCTC Standards Technical Services Shanghai, China. Co. Ltd. The IRF's certification body is Global Trust, headquartered in Ireland.

3.4 Engagement

One of the core assets of voluntary standards is their ability to allow a wide spectrum of stakeholders to have a voice in the rule-making, enforcement and implementation processes. Participatory governance, itself a pillar of sustainable development, helps voluntary standards and the supply chains they service implement interpretations of sustainable development that are meaningful to the stakeholders they involve. Thus, although voluntary sustainability standards typically operate as "private" initiatives, they often rely on quasi-public processes to fulfill their objectives. An initiative's openness and exposure, or accountability, to a wide variety of interests provides one important indicator of an initiative's ability to implement a relevant and meaningful vision of sustainability. In an effort to facilitate a better understanding of the different ways in which seafood standards can promote accountability, we consider the main international seafood standards along three parameters that function as major determinants of overall initiative accountability: access to decision making, access to dispute resolution and access to information.

3.4.1 Access to Decision Making

As a general rule, seafood producers are price and rule takers on the market. They are destined to provide goods that meet the demands of the regulatory framework and markets within which they operate. Within the context of global supply chains, the decision-making chain is largely dominated by commercial interests. To the extent that international frameworks exist, there are often major gaps between actual stakeholders and rule design and implementation. Voluntary standards offer an important opportunity to provide more direct input into rule development and implementation through their individualized governance structures.

3.4.1.1 Board-Level Representation

An organization's board of directors typically represents the highest level of decision-making authority responsible for setting the overall vision, mission and policies by which the initiative operates.[94] Board representation, therefore, provides an important indication of engagement of and accountability to diverse groups.

Across the eight initiatives surveyed, a high degree of variability in board representation was observed (Figure 3.10).[95] FOS and Naturland report no industry[96] representation at the board level. ASC, GAA, GLOBALG.A.P.[97] and IFOAM are the initiatives that offer the greatest diversity and/or balance between competing stakeholder interests within their respective boards.

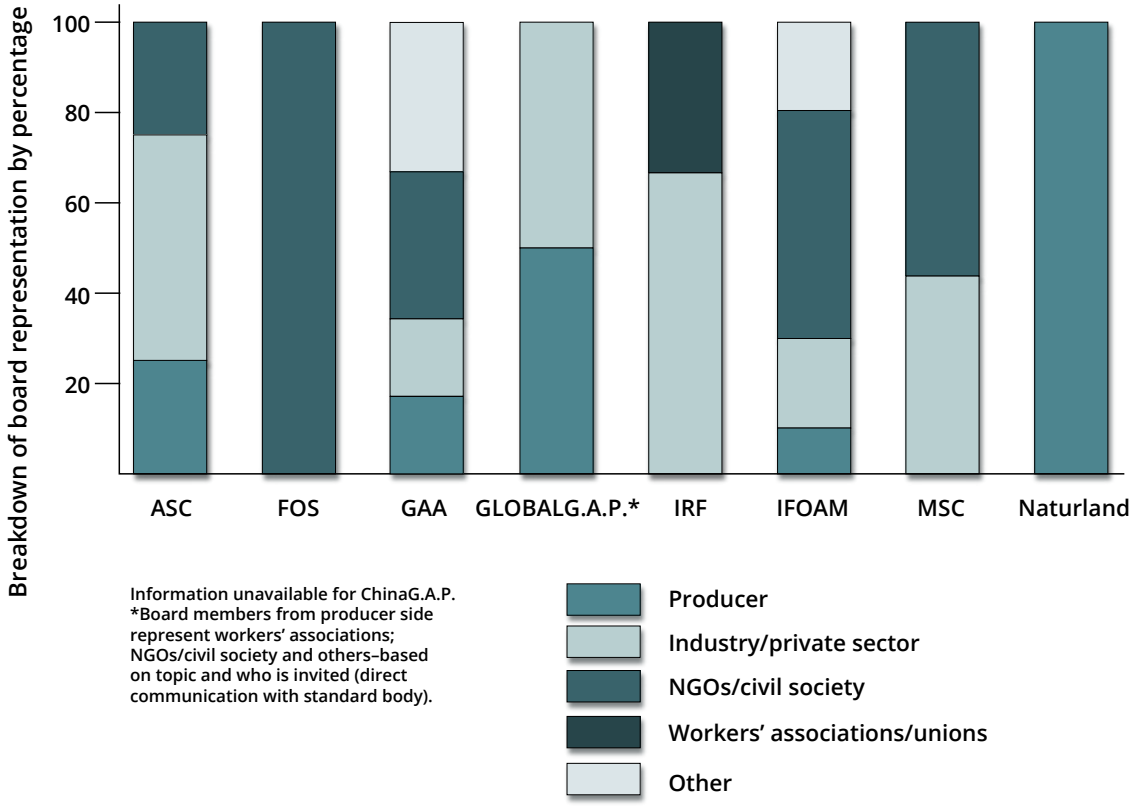
94 This is not applicable to all schemes. One obvious exception is ChinaG.A.P., which is a nationally run initiative. It is also not always the board that is responsible for scheme revisions, and oftentimes the board does not have the freedom to edit the standard at its decision phase. Some organizations use technical bodies to decide on revisions to the standard, as in the case of FOS. The MSC's Technical Advisory Board also leads on revisions to the standard with final sign off by the board.

95 Individual board representatives change frequently; however the overall breakdown of stakeholder group tends to remain fairly consistent. Figure 3.10 represents 2015 board makeup for the standards assessed.

96 Industry representation refers to processors, retailers, brands and so on.

97 GLOBALG.A.P. board members from the producer side represent workers' associations, NGOs/civil society and others, based on topic and who is invited (GLOBALG.A.P., personal communication, 2015).

Figure 3.10 Board representation by stakeholder in supply chain, 2015*



Box 16 Good governance

Since the Rio Declaration and Agenda 21, participatory governance has been globally recognized as a cornerstone of sustainable development. Significant opportunities remain within the seafood sector for improving participatory governance, a fact recognized explicitly in the development of the *Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security,* where participatory and decentralized governance coupled with increased multistakeholder dialogue have been formally recognized as essential elements for ensuring sustainability within the sector. Building from the governance pillar of sustainable development and the deep importance of seafood production and consumption to the world's poor, proactive efforts toward the inclusion of those most dependent on fisheries production has the potential to inform best practices while building local stewardship and equity. Voluntary sustainability standards have the potential to provide a vehicle for the integration of marginalized stakeholders into global planning for sustainability in seafood- and ocean-based economies.

Figure 3.11 Board representation by developed vs. developing country, 2015

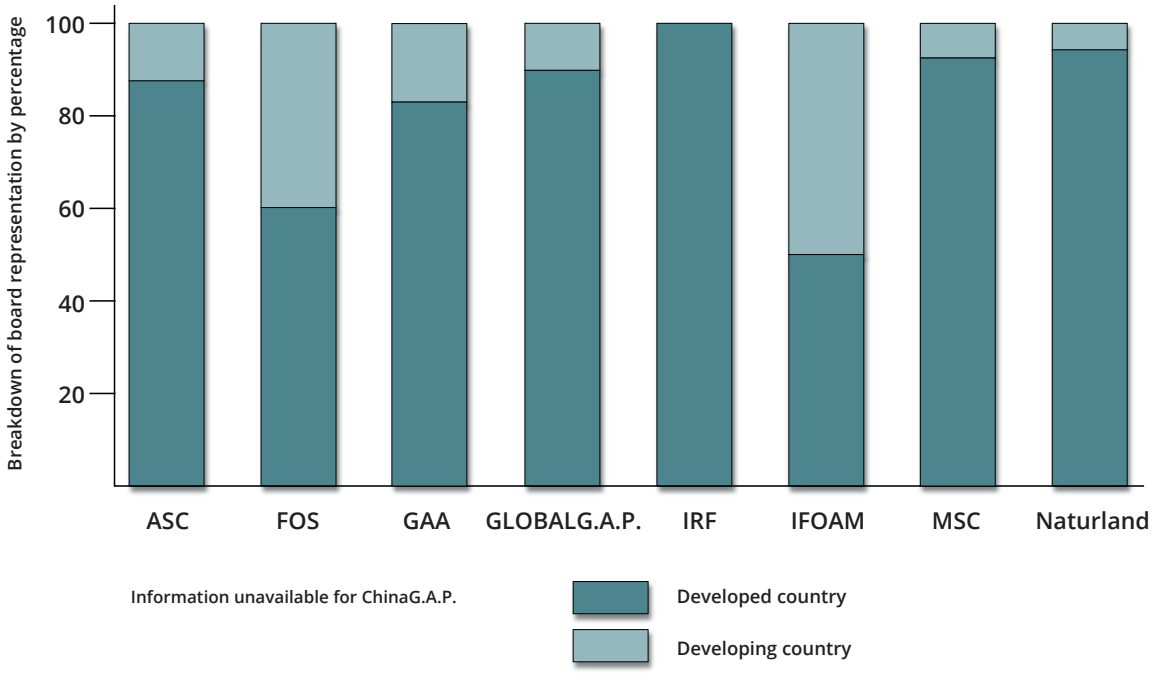
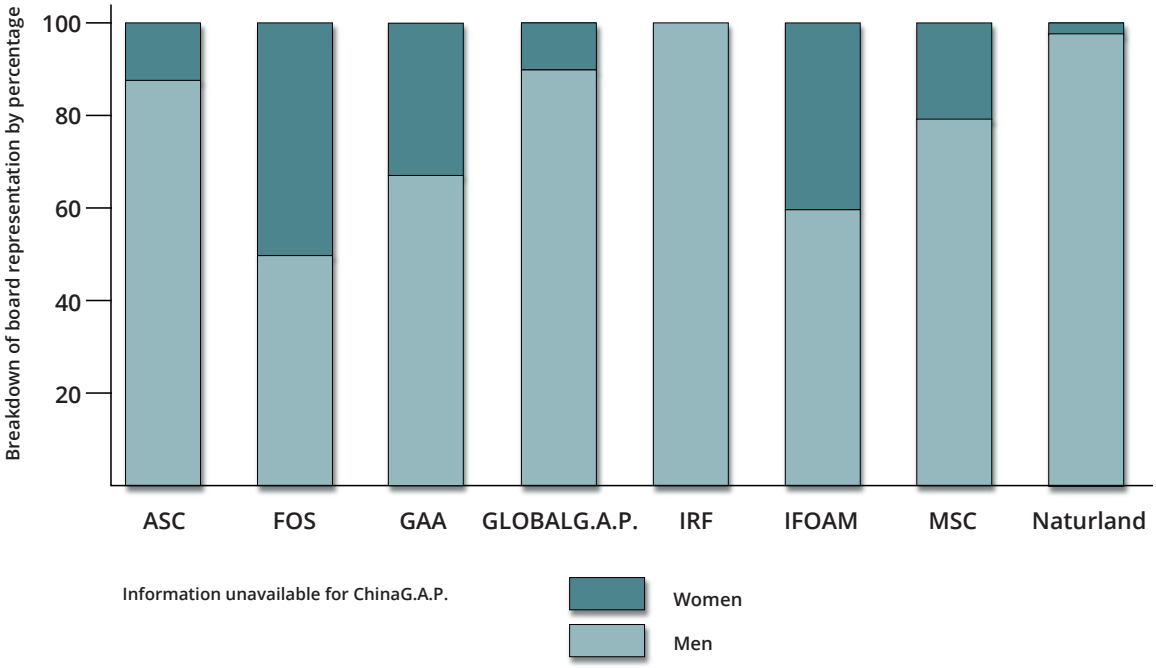


Figure 3.12 Board representation women vs. men, 2015



Global supply chains tend to be dominated by the consumption side of the supply chain (Konig, 2009). Where global trade occurs between developed and developing countries, the resulting decision-making paradigm can sometimes take the form of developed-country stakeholders dictating terms for developing-country stakeholders. While voluntary standards hold the promise of attenuating for this imbalance, board representation among the leading initiatives suggests that little has been achieved in the inclusion of developing-country interests within the respective initiatives, with only IFOAM illustrating an equal presence of developed and developing countries on their board (Figure 3.11). Although one might explain the high concentration of developed-country stakeholders at the board level by the corresponding concentration of production *and* sales within such countries, this result does beg the question of the ability and/or interest of such initiatives to respond to developing-country needs overall and may also provide a further explanation of why certified production is not more present across the developing world.

A similar division of board representation is found along gender lines, with men filling the vast majority of board positions across the different initiatives surveyed (Figure 3.12). This tendency within the seafood certification initiatives would appear to be a reflection of trends within the seafood industry more generally.[98] Given the importance of women in the supply of fish to market[99] and their importance in building sustainable livelihoods on the ground, the gender gap across the various boards would appear to be a missed opportunity in action.

3.4.1.2 Standard Development

Standards schemes can also enable participatory governance by allowing stakeholders to engage in the standard-development process explicitly. Four of the initiatives reviewed allow for public consultation online. The degree to which these consultations impact the outcome of the standard-development process, of course, varies depending on who is involved in the *final* decision-making process. While it is unrealistic to expect standards to have all stakeholders involved in the decision-making process, four of the seafood standards (ASC, GAA, GLOBALG.A.P. and MSC) provide for public consultation in the standard-development process, but only three (ASC, GLOBALG.A.P. and MSC) allow stakeholders outside of membership to participate in the decisions related to standards adopted (see Table 3.21).

98 Across the seafood industry more generally, the presence of women declines the higher the position (Monfort, 2015). Over half (55 per cent) of 68 leading global seafood companies are run exclusively by men, without any presence of women as directors or on boards and with none of these companies run solely by women (Monfort, 2015).

99 In Asia alone, women make up 72 per cent of the total aquaculture production workforce (Monfort, 2015). Approximately 27 per cent of people engaged in fisheries and aquaculture are women, with significant differences in their share (fishers: 3.6 per cent; processors: 58 per cent; and aquaculture workers: 4 per cent) (FAO, 2014).

Table 3.21 Stakeholder participation in the standard-setting process

Standard	ISEAL standard-setting code*	Membership system	Number of voting board members	External stakeholder engagement	
				Consultation in standard-setting process	Decision-making in standard-setting process
ASC	Yes			Publicly available for review	Yes: Supervisory board can deviate but must react in writing
FOS			10 voting members	Technical committee	No: Technical committee votes
GAA BAP		Yes	12 voting members	Publicly available for review	No: Members only
GLOBALG.A.P.		Yes	Different voting parties‡	Publicly available for review	Yes: Stakeholder committees made up of members and non-members from all stakeholder groups
IFOAM		Yes		Members only	No: Members only
MSC	Yes		17 voting members	Publicly available for review	Yes: Public consultation, formal approval by stakeholder council and technical advisory board
Naturland		Yes	~3,000	Members only	No: Members only

* The ISEAL standard-setting code establishes a benchmark for transparent and participatory governance and standard-setting processes for sustainability standards (ISEAL, n.d.-c).
† General regulations: Certification Body Committee; standard guidance on revision process: Technical Committees for Crops, Livestock and Aquaculture, respectively; GLOBALG.A.P. Risk Assessment on Social Practice (GRASP), flower and ornamentals, microbiological risk for crops, sustainability crops, water, CoC: stakeholder committees, respectively; integrity and sanctioning: Integrity Committee (GLOBALG.A.P., personal communication, 2015).
All information provided directly by standard bodies or information publicly available. ASC, GAA, GLOBALG.A.P. and MSC standard revisions are publicly available to comment online. IFOAM's and Naturland's participation in standards development and revision is open to members only.
Information unavailable for ChinaG.A.P. and IRF.

3.4.1.3 Access to Independent Dispute Resolution

Meaningful participation in the implementation of a system implies the existence of clear and transparent rules for settling disputes. The ability of stakeholders to contest certification or other decisions through an independent body helps ensure that due diligence, impartiality and fairness are applied in the adjudication process.[100] In cases where stakeholders face systemic barriers to market and political processes (e.g., developing-country stakeholders), the provision of special processes or tools to facilitate access to the dispute settlement process, such as informal complaints mechanisms and the ability to launch complaints in local languages, can enhance overall accessibility of the dispute resolution mechanism.

Of the six initiatives operating in multiple countries, five (ASC[101], BAP, GLOBALG.A.P., IFOAM and MSC) allow for complaints to be submitted through informal means (see Table 3.22). Four initiatives (BAP, FOS, IFOAM and Naturland) also provide access to dispute resolution processes in languages other than English. Perhaps most importantly, only three of the initiatives (FOS, IFOAM and MSC) provide access to independent dispute resolution processes.[102]

One of the challenges facing any dispute resolution process is the costs associated with maintaining it. Voluntary standards schemes, as a general rule, have very limited resources for managing disputes, which may arise on an ad hoc basis, and as a result may charge complainants for certain classes of disputes. The MSC, for example, charges approximately US$8,000 to launch a formal objection to a certification decision.[103] FOS, on the other hand, charges would-be complainants the cost of establishing a panel, which will normally run into the thousands of dollars.[104]

100 The FAO *Guidelines for the Ecolabelling of Fish and Fish Products from Marine Capture Fisheries* (FAO, 2009) and FAO *Guidelines for the Ecolabelling of Fish and Fishery Products from Inland Capture Fisheries* (FAO, 2011a) stipulate that procedural rules "should contain a mechanism for the impartial resolution of any substantive or procedural disputes about the handling of standard-setting matters" (Article 47 and Article 58 respectively).

101 Included in the ASC's updated 2016 certification and accreditation requirements.

102 Although the ASC does not have an independent dispute settlement body per se, its dispute resolution panels include an ombudsman who has a specific mandate of overseeing its whistleblowing policy (ASC, 2012).

103 Formerly US$15,000 (Christian et al., 2013).

104 FOS charges the cost of establishing and maintaining an objection committee. An objection committee consists of at least three experts and one coordinating chair. The cost of establishing an objection committee is reported as US$1,000 per person per day, plus travel, accommodation and per diem expenses (FOS, 2009).

Table 3.22 Dispute settlement

Standard	Independent dispute-settlement body	Public access to policies and procedures for complaints	Complaints and dispute resolution procedures available in other languages	Ability to launch complaints at local level	Complaints accepted through informal means
ASC	✓*	✓		✓	✓
ChinaG.A.P.	Information unavailable	✓	Not applicable	Information unavailable	Information unavailable
FOS	✓	✓	✓	✓	
GAA BAP		✓	✓	✓	✓
GLOBALG.A.P.		✓		✓	✓
IFOAM	✓	✓	✓	✓	✓
IRF		✓	Not applicable	Not applicable	Not applicable
MSC	✓	✓			✓
Naturland			✓	✓	

All information provided directly by standard bodies to SSI unless otherwise specified.
*Although ASC does not have an independent dispute settlement body, the organization's complaints panel consists of an ombudsman who investigates any conflict of interest. ASC notes that the ability to launch complaints at the local level exists via certification bodies. Although it is technically possible to launch complaints at the local level this has not yet occurred to date (ASC, personal communication, 2015).
ChinaG.A.P. information from ITC (2015).
IRF does not provide access to policies and procedures for complaints on their website. There is also no mention of an independent dispute settlement body.
For the MSC, complaints have to be raised either with the certification body, the accreditation body or the MSC; although there are forms for submission for complaints, stakeholders can also submit complaints initially via email or personal correspondence (MSC, personal communication, 2015).
Naturland provides complaints and dispute resolution procedures in English and German (Naturland, personal communication, 2015).

3.4.2 Access to Information

Public disclosure on the operations and financial data of an organization represents an important tool for enabling effective participatory governance. Information on organizational performance, in many ways, represents the necessary foundation of any democratic process. Table 3.23 reveals a wide range of document availability online across initiatives. Notably, standard-setting review processes appear to be one of the most transparent information pathways, with the vast majority of initiatives providing access to such processes online. The high degree of access to documents related to standard setting reveals the priority given to broader buy-in and participation within the rule-making aspect of standards. Equally notable is the absence of data related to independent audited financial reports, pointing to a reduced commitment to broader stakeholder participation in aspects related to the management or implementation of any given organization. Overall, there would appear to be significant opportunities for the standardization and harmonization of documentation availability online by standards schemes.

Table 3.23 Availability of documents and decisions online

Standard	List of board members	List of committee members	List of compliant enterprises	List of certification decisions	Committee meeting minutes	Standard-setting and review processes	Independently audited full financial statements	Annual reports	Certified units' environmental impact assessment reports
ASC	✓	✓	✓	✓	✓	✓		✓	
ChinaG.A.P.			✓	✓		✓			
FOS			✓				✓	✓	
GAA BAP	✓	✓	✓			✓			
GLOBALG.A.P.	✓	✓	✓			✓		✓	
IFOAM	✓	✓				✓		✓	
IRF	✓	✓	✓	✓					
MSC	✓	✓	✓	✓		✓	✓	✓	
Naturland	✓								

ASC meeting minutes available online are for the Technical Advisory Group only, but not for supervisory or executive board meeting minutes (ASC, n.d.-a).
ChinaG.A.P. information from ITC (2015).
The GAA notes that online access for annual reports and financial statements are in line with requirements for operating a non-profit organization in the United States, but the GAA lists no online access to these documents.
GLOBALG.A.P.'s list of compliant enterprises is available online through a number of different search methods that require specific information such as the GGN, global location number, localg.a.p. number, CoC number, certification body registration ID, GLOBALG.A.P. certification number, producer name and location, or specific scheme requirements (see GLOBALG.A.P., 2015).
Naturland documents are available to members only. Both Naturland and FOS note that documents may be available upon request.
IRF data searched from IRF website.
MSC data provided by ITC (2015) and MSC, personal communication (2015).

Box 17 Revenue

Voluntary standards come in a wide range of shapes and sizes. Also reflecting the organizational diversity within the voluntary sector is a high degree of variation in the annual budgets of individual initiatives. Reported annual revenues (2014) among those initiatives reviewed ranged from US$465,000 (IRF) to US$31 million (MSC) (see Figure 3.13).

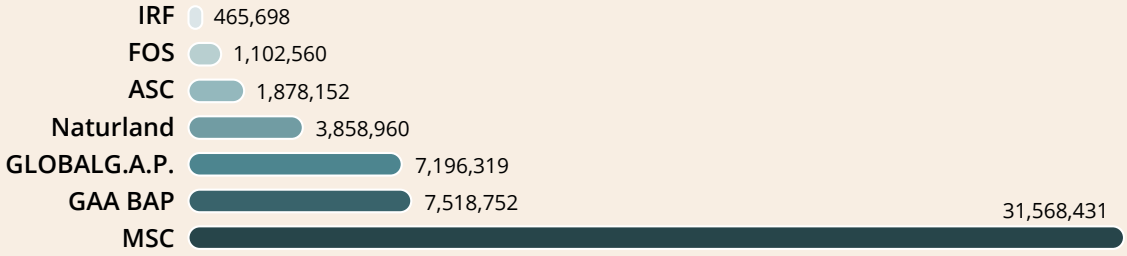
A variety of factors will influence the revenue required and/or earned by any given initiative. Most notably, market size and the corresponding size of the client base is an obvious driver of revenue. The MSC, having one of the largest certified volumes, logically has one of the highest annual budgets. However, there are also clear exceptions to this rule. For example, FOS, with the single largest value globally, modestly reports an annual revenue of US$1.1 million. Total annual revenue also appears to be linked to system maturity, with older initiatives commanding the largest annual revenues.

Overall revenue can determine an initiative's capacity to manage credible conformity assessment processes, manage participatory governance, drive market growth and/or facilitate transition to sustainability among non-compliant producers. In this sense, greater revenues can point toward a greater capacity to stimulate transformative change. On the other hand, organizations that are able to manage the complexities of sustainable production for the lowest cost offer a market advantage to the supply chains they service.

At one level or another, standards systems will inevitably be accountable to those that financially support the organization. All other things being equal, organizations that rely heavily on non-recurring sources of revenue (e.g., donors) are likely to have more freedom to pursue mission-oriented objectives but are likely to be financially less sustainable. It is common for organizations to rely more heavily on non-recurring sources during their start-up phase or due to particular allegiances within the NGO community. Organizations that rely heavily on recurring sources of revenues (e.g., licence fees) tend to be more mature, more closely affiliated with business, and are likely to be more financially sustainable. However, they may also encounter special pressures to reduce system rigour over time in an effort to retain and/or grow market share.

The ASC, as a new initiative, reported more of a reliance on non-recurring sources of revenue than the other initiatives reviewed. However, the ASC has noted increased revenue from licensing fees, so this is likely to change over time.

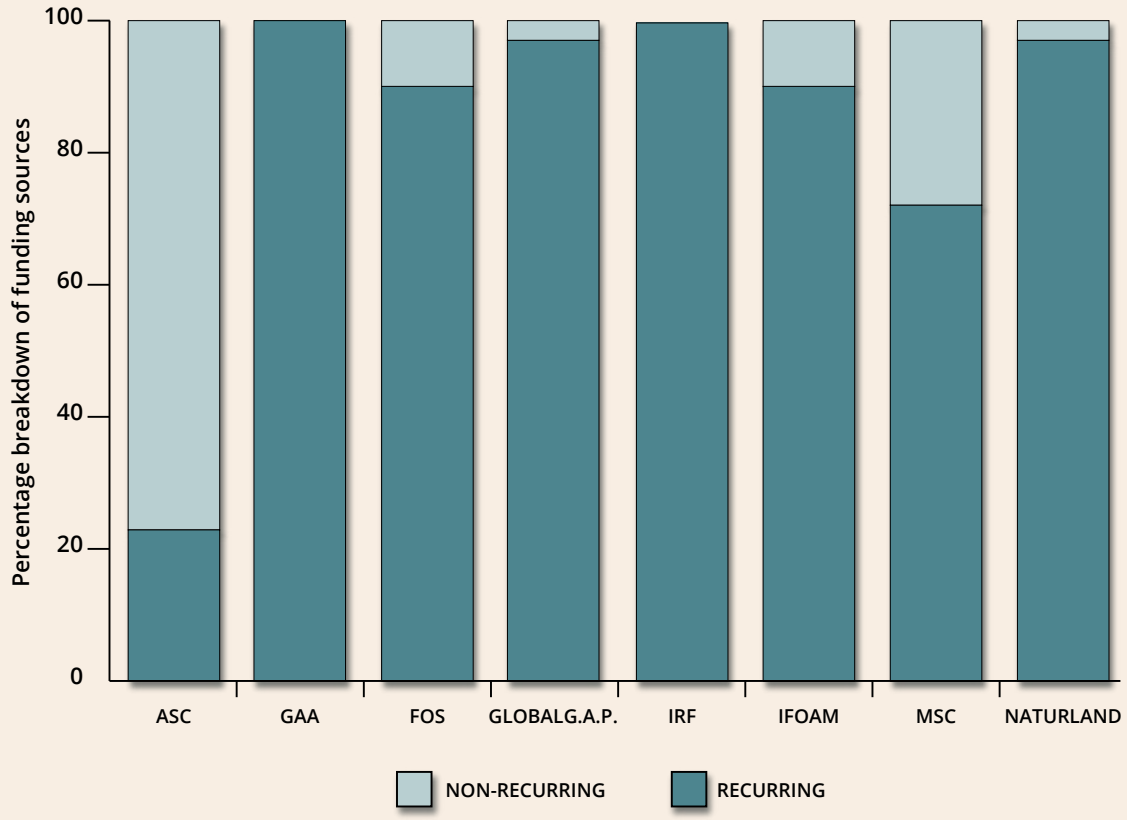
Figure 3.13 Annual budgets (USD), from lowest to highest



IRF and ASC figures for 2013; all other standards for 2014. ChinaG.A.P. and IFOAM data unavailable. GLOBALG.A.P. budget for aquaculture and agriculture.

Box 17 Revenue, continued

Figure 3.14 Revenue sources*



*ASC, 2013; FOS, 2014; GAA, reported to SSI in 2014; GLOBALG.A.P., 2013–2014; IRF, 2013, reported to SSI in 2015; IFOAM, reported to SSI in 2013; MSC, 2014; Naturland, reported to SSI in 2014.
Information unavailable for ChinaG.A.P.
All Information provided to SSI by standard bodies.

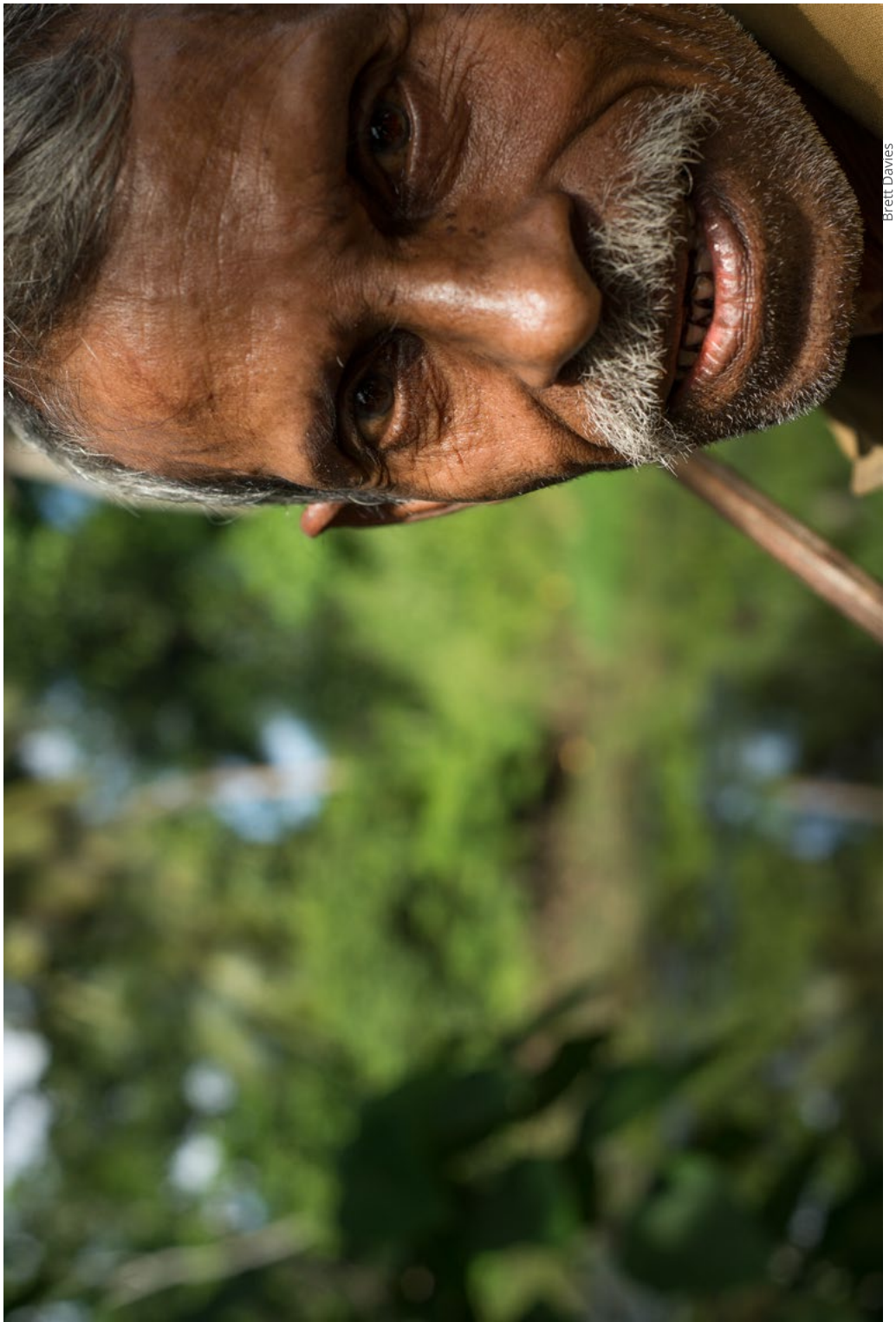
3.4.3 The Engagement Index

Drawing from the broader set of SSI indicators related to stakeholder engagement and accountability (sections 3.4.1 and 3.4.2), we can assess the comprehensiveness of engagement-related measures implemented across the individual seafood standards in the form of an engagement index. See Table 3.24 for the indicators chosen for the engagement index.

As a general rule, the seafood standards reviewed display relatively low levels of integrated accountability mechanisms. The absence of explicit policies and mechanisms for enabling wide stakeholder engagement and due process within existing initiatives is also reflected in the relatively low levels of diversity in board representation across the various initiatives as well (see Figure 3.10, Figure 3.11 and Figure 3.12). Given that one of the core assets of voluntary standards is their ability to include stakeholders from diverse interests and jurisdictions, the absence of a greater emphasis on transparency, stakeholder access and due process is both surprising and would appear to represent a missed opportunity. The MSC and the ASC stand out as exceptions to this general rule.

Table 3.24 Engagement index indicators and explanation of assessment

Indicator	Reference
ISEAL standard-setting code	If compliance with the standard-setting code has been independently verified, then 100%. If a standard is a full member of ISEAL but has yet to have compliance independently verified, then 50%. If none of the above, then 0%.
Stakeholder decision making in standard-setting process	Yes (100%) or no (0%). See Table 3.25.
Existence of independent dispute-settlement body	Yes (100%); Presence of an ombudsman to investigate conflict of interest (50%); No (0%). See Table 3.25.
Independently audited financial statements available online	Yes (100%) or no (0%). See Table 3.25.
Online data index	This includes one point for all online documents in Table 3.23: List of board members, list of committee members, list of compliant enterprises, list of certification decisions, committee meeting minutes, standard-setting and review processes, policies and procedures for complaints, annual reports and environmental impact assessments. Yes (100%) or no (0%).



Brett Davies

Figure 3.15 Engagement index assessment, from highest to lowest

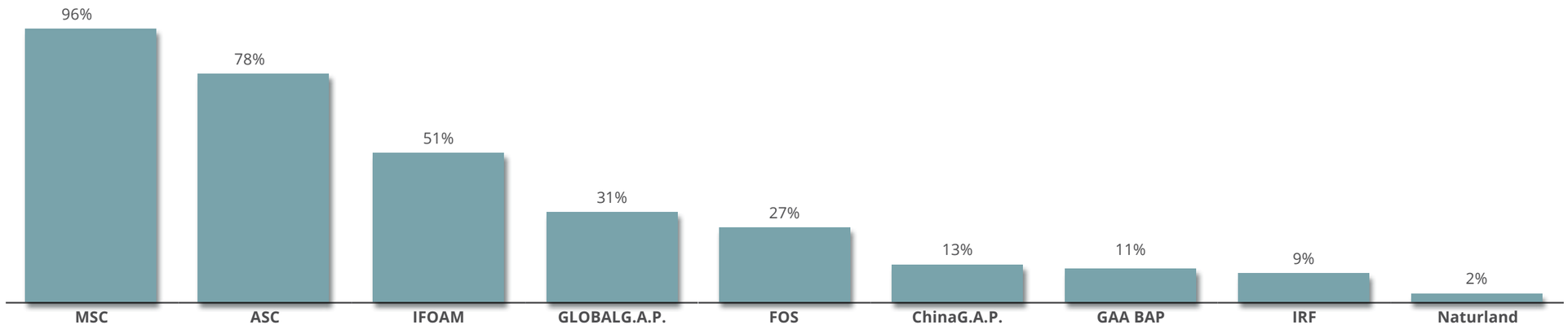


Table 3.25 Engagement index assessment, from highest to lowest

Standard	MSC	ASC	IFOAM	GLOBALG.A.P.	FOS	ChinaG.A.P.	GAA BAP	IRF	Naturland
ISEAL standard-setting code compliant	100%	100%	0%	0%	0%	0%	0%	0%	0%
External stakeholder decision making in standard-setting process	100%	100%	0%	100%	0%	0%	0%	0%	0%
Existence of independent dispute settlement body	100%	100%	100%	0%	100%	0%	0%	0%	0%
Independently audited financial statements available online	100%	0%	100%	0%	0%	0%	0%	0%	0%
Online data index	78%	89%	56%	56%	33%	67%	56%	44%	11%
Indicator average	96%	78%	51%	31%	27%	13%	11%	9%	2%

Figure 3.15 shows the total average across the engagement indicators for each initiative. Table 3.25 desegregates the results to show the coverage of each standard across each indicator.

MSC and ASC are the initiatives that reveal the highest coverage across the engagement index due in part to their focus on external stakeholder and third-party involvement, as well as the availability of independently audited financial statements. See Appendix VII for the total average across initiatives for each indicator.

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4 Analysis

Although consumers may notice little difference in the final end products they consume, aquaculture and wild catch fisheries represent substantially different production processes, presenting distinct sustainability challenges. As a result, efforts to promote sustainability across the two sectors justify distinct strategies. In a general way, the existence of distinct standards for not only different systems of production (aquaculture and capture) but also different species, represents an accurate reflection of actual sustainability challenges facing the respective production systems.

Nevertheless, our review brings together initiatives that seek to specifically leverage market forces and, more specifically, supply chain management systems, for the promotion and implementation of preferred sustainability practices in seafood production. That is to say, while there is an explicit attempt to tailor sustainability initiatives to the specific conditions of each production system, the methods and means available to certification systems are, irrespective of the production system at hand, relatively constrained by the forces that drive them.

The potential and limitations facing voluntary supply chain approaches to seafood sustainability become particularly evident within the context of a blue economy that fundamentally recognizes the interrelation between ocean health and the social, economic and environmental well-being of the global community. While voluntary standards have the potential to promote an integrated approach to sustainable development by incorporating a multiplicity of criteria and applying principles of good governance, they are nevertheless limited by their point of intervention, which is, by definition, through individual operators and/or individual fisheries.

Where sustainability issues (and solutions) are driven by the absence of coordination between individual economic actors or the persistent application of bad practices by a few rogue actors, voluntary standards may have little to offer in the way of solutions. These limitations can become exaggerated where market forces fail to align with sustainability objectives, thereby putting market-based approaches in the unfortunate position of having to choose between market relevance and meaningful impact.

Needless to say, the specific characteristics of voluntary standards suggest a specific rather than comprehensive solution to seafood sustainability and the broader implementation of a blue economy. Having said that, voluntary standards, by offering a direct link between the operation of the market and the implementation of sustainable development, hold the promise of playing a key role in the implementation of a blue economy. In Section 1.1, we outline several high-level vectors through which voluntary standards might be expected to contribute to a blue economy. Below, we consider our survey of leading initiatives in light of these high-level categories.

4.1 Defining Targets

Voluntary standards have played, and continue to play, a leading role in defining the boundaries of sustainable practice for supply chain actors within the seafood sector. The vast majority of voluntary sustainability standards have focused on managing sustainability issues at production, leaving broader supply chain sustainability issues related to processing and manufacturing open for further development. The one exception to the trend of production-focused standards falls under the ambit of food safety, which entails specific supply chain management and traceability systems and is also addressed by several of the seafood standards reviewed.

Regarding production-level criteria, there is a strong emphasis across all of the initiatives reviewed on the promotion of environmental sustainability. Given the prominence of environmental issues as a driver for the development of such standards, this emphasis would appear to be appropriate. Similarly, the makeup of the environmental requirements across the different standards reflects the specific priorities associated with the respective production systems. Capture fishery standards place an emphasis on ecosystem and biodiversity management (including stock management), while aquaculture standards place an emphasis on the management of synthetic inputs, water quality, GMOs, ecosystem management and biodiversity.

With the exception of the notable absence of greenhouse gas accounting or management requirements, seafood standards would appear to have established a robust basis for managing the major globally important environmental issues related to seafood production.

Social and economic requirements related to human rights, gender and sustainable livelihoods are noticeably absent from the criteria of the different systems reviewed. Aquaculture standards do have a moderate to high coverage of labour standards—perhaps related to the history of similarly situated agriculture standards, which themselves have a long-established history of requiring minimum labor standards. The same is not the case for wild catch fisheries, however, which evidently also employ workers in their production processes.

The only consistently covered economic criterion observed in our analysis is the application of minimum wage requirements across the different initiatives.

Overall, the emphasis on environmental criteria can be said to reflect the historic drivers of voluntary standards in the seafood sector. **The absence of criteria coverage on social and economic issues, on the other hand, might be a reflection of the expectation that these sustainability issues are most effectively addressed through the market benefits associated with standard compliance.**

Notably, by defining measurable targets for sustainable production, seafood standards potentially play an important role in the realization of the SDGs, which call upon governments and other actors to implement and document their own progress toward globally agreed-upon targets (see Box 18).

Ultimately, the ability of voluntary standards to contribute to a blue economy (and/or the SDGs) will be dependent not only on the specification of preferred practices for fish farmers and fishing vessels but also upon the following:

1. The manner in which such practices are defined and enforced (governance and conformity assessment systems).
2. The overall manner in which such practices are supportive of, and supported by, sustainable economic conditions.

Understanding the relationship between economic forces, decision-making structures and seafood standards is therefore central to understanding the opportunities and challenges facing seafood standards.

Box 18 Sustainable Development Goal (SDG) 14: The role of voluntary standards

Voluntary sustainability standards have an important role to play in documenting the achievement of sustainable practice and, as such, in documenting the attainment of the SDGs. The potential role of seafood standards in supporting ocean health-related SDGs is particularly evident (but not limited to) SDG 14, which calls upon world governments to "Conserve and sustainably use the oceans, seas and marine resources for sustainable development." The table on the next page provides a high-level analysis of the potential role of standards in meeting the different targets listed under SDG 14.

Table 4.1 Role of standards in meeting SDG 14 targets

Target	Degree to which standards currently address target	Mechanism by which standards can support target	Possible contribution of voluntary standards
14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.	Moderate	Limit pollution from aquaculture farms into marine resources.	Moderate
14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans.	Moderate	Limit the impact of aquaculture systems on coastal regions.	Moderate
14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels.	Low	Limit pollution from aquaculture production.	Low
14.4 By 2020, effectively regulate harvesting and end overfishing; illegal, unreported and unregulated fishing; and destructive fishing practices, and implement science-based management plans in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics.	Moderate	Limit overfishing by only allowing fishing where stocks are not overexploited. Limit bycatch associated with wild catch fishing. Ensure legality of source through CoC monitoring and enforcement protocols.	High
14.5 By 2020, conserve at least 10% of coastal and marine areas, consistent with national and international law and based on the best available scientific information.	Low	Limit overexploitation of coastal resources by limiting intensity of aquaculture and capture production.	Low
14.6 By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing; eliminate subsidies that contribute to illegal, unreported and unregulated fishing; and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least-developed countries should be an integral part of the World Trade Organization's fisheries subsidies negotiation.	Low	Identify sustainable practices as potential targets for implementation of more sustainable subsidy strategies.	Moderate

Table 4.1 Role of standards in meeting SDG 14 targets, continued

Target	Degree to which standards currently address target	Mechanism by which standards can support target	Possible contribution of voluntary standards
14.7 By 2030, increase the economic benefits to small island developing states and least-developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism.	Low	Offer new and more direct access to international markets.	High
14.a Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing states and least-developed countries.	Moderate	Identify and disseminate protocols for best practices. Support international processes for shared learning.	Moderate
14.b Provide access for small-scale artisanal fishers to marine resources and markets.	Low	Offer new and more direct access to international markets.	High
14.c Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in UNCLOS, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of *The Future We Want*.	Low	Require compliance with international and national laws. Provide additional monitoring and enforcement regimes to support compliance with international and national laws.	Moderate

4.2 Ocean Health

One of the central components of the blue economy initiative is the promotion of ocean health as a foundation for social, economic and environmental sustainability. By directly linking economic returns to the implementation of practices that protect marine ecosystems, seafood standards would appear to be uniquely positioned to support a blue economy.

Seafood standards do, however, face an inherent challenge in their effort to ensure ocean health per se. All of the standards reviewed rely principally on fishers and fish farmers for the implementation of specific production practices. Such a strategy can only be expected to have an effect on outcomes directly related to the actions of compliant supply chain actors. The quality of ocean health, however, is, as with many public goods, determined by the actions of all seafood producers (not to mention other industries). **Any effort to manage ocean health through point-specific interventions will be challenged in its ability to impose significant change in the absence of near-complete market uptake within the relevant markets.** That is to say, the presence of free riders, as well as specific demand forces, represent a persistent limitation on the ability of seafood standards to substantively alter ocean health.

Our market analysis reveals that while the market for certified seafood products has grown significantly over the past two decades, overall demand reflects a minority of production, leaving significant opportunities for non-compliant producers to eliminate any gains that might otherwise be achieved by compliant producers themselves.

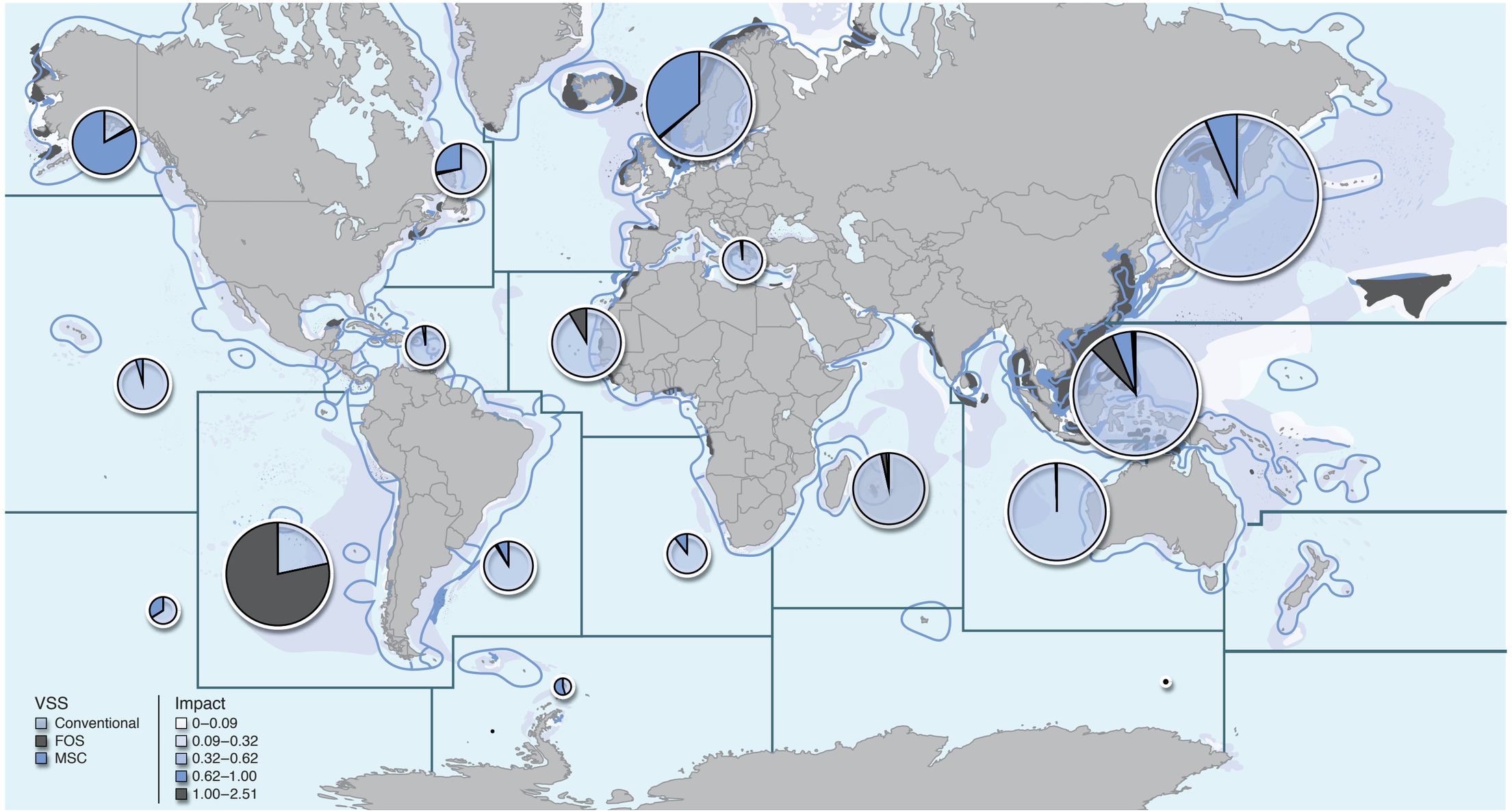
The challenge faced by partial market coverage is exacerbated by the specific drivers of seafood certification, namely manufacturers and retailers of "retail-friendly" species across a number of developed-country markets. This has in turn led to an uneven distribution of certified production sources, leaving specific regions of the ocean mostly or even entirely unaddressed.

Mirroring the important limitations of compliant production due to the distribution of demand are constraints associated with the distribution of infrastructure for sustainable production. Research by the World Bank estimates that only between 17 and 25 per cent of global catch is sourced from stocks that have been scientifically assessed.[105] Accurate and timely data on stock levels is a prerequisite to sustainable extraction. **Based on current levels of wild catch certification (accounting for approximately 20 per cent of global wild catch production), the absence of more complete data on stock levels presents a significant and immediate infrastructural barrier to the continued expansion of reliable wild catch certification.** Moreover, the investment for more complete data collection on stock levels will almost certainly require multilateral collaboration beyond the resources or authority of any given voluntary standard.

105 The World Bank estimates that the range of assessed stocks is between 17 and 25 per cent (Trevor, Jensen, Ricard, Ye, & Hilborn, 2011).

Image: Tim Mossholder

Figure 4.1 Global distribution of wild catch certification*



* Spatial and temporal changes in cumulative human impacts on the world's ocean (Halpern et al., 2015).

Although similar problems face the expansion of sustainable aquaculture, particularly in light of the concentration of aquaculture production in developing countries, the entirely "managed" nature of production combined with rapidly growing aquaculture sector would suggest greater opportunities for overcoming existing infrastructural barriers. However, the more concentrated zones of aquaculture production may also point toward reduced opportunities for impacting global ocean health.

Regardless of the sector, the absence of a direct link between demand for certification and the geographic presence of certification where it is potentially most needed (see Figure 4.1) raises questions of the role of purely market-driven approaches to the promotion and maintenance of ocean health.

4.2.1 Good Governance

Good governance is a key pathway by which seafood standards have the potential to promote a blue economy. Proponents of the blue economy seek, among other things, more open and transparent governance structures that can permit ocean-reliant economies to participate more effectively in decisions related to sustainable and economic development.[106] The assurance, responsiveness and engagement portion of our CARE analysis attempts to capture core elements of the governance package standards offer.[107]

4.2.1.1 Assurance

Seafood sustainability standards, in addition to placing an emphasis on practices related to overall ocean health, have, for the most part, placed a high degree of importance on the implementation of *independent* conformity assessment processes. In this sense, **sustainability standards within the sector would appear to be playing a significant role in increasing transparency and predictability in at least those supply chains within which they operate**. The natural link between increased transparency and improved management has been leveraged by initiatives such as GLOBALG.A.P. and GAA BAP as mechanisms for also ensuring food safety. Notwithstanding this major asset, a diversity in the discretionary authority of auditors, combined with the high cost of launching appeals on certification decisions, reduces the level of precision that can be associated with the market claims made by the respective seafood initiatives. Perhaps not surprisingly in light of the size of the fisheries certified, wild catch standards face particular challenges in this regard.

4.2.1.2 Responsiveness

One of the major challenges facing global seafood sustainability standards is the need to strike a balance between global norms and local relevance. Within the context of major developed- and developing-country supply, the disparities between production systems and capacities are great and justify some degree of differential treatment or implementation—particularly where a needs-based approach to sustainable development is sought, such as in the case of a blue economy. Clear continuous improvement strategies can play an important role in bringing credibility and predictability to such treatment.

In our review we found relatively little emphasis on responsiveness-enhancing systems among the global initiatives. A general absence is observed across the initiatives of locally adapted requirements, local participation, or clear systems for managing and incentivizing continuous improvement. The importance of localized systems for enabling participation in global sustainable markets, however, has not been lost upon the

106 Indeed, one of the very rationales for the blue economy movement is to provide ocean-dependent economies with a voice in global sustainability discussions, which such economies argue have been dominated by a terrestrial-led vision of sustainable development (see UNEP, 2012 and WWF, 2015a).

107 Philosophically, the CARE components of our analysis could be said to speak to elements that define the respective "identities" of the initiatives—that is to say, who they "are."

sector. There are numerous examples of national strategies for enabling certification, some of which focus on building up certification according to nationally defined targets and others which focus on building up certification to globally defined targets. **The depth of the tension between local conditions and global requirements, although persistent across many commodity sectors, is perhaps nowhere more apparent than in the seafood sector, due to its deep reliance on government infrastructure for demonstrating compliance with sustainability targets.**

4.2.1.3 Engagement

Although the vast majority of the initiatives surveyed claim to be multistakeholder initiatives, the diversity of stakeholder participation varies significantly across initiatives. While it may make strategic sense to focus stakeholder participation to a limited group based on the given business model or audience, the stakeholder base represents an important foundation for understanding the interests behind the respective initiatives themselves. Importantly, and notwithstanding the diversity of stakeholder representation among the different initiatives, there is a very clear and high level concentration of developed-country, male representation on the international boards of the initiatives reviewed. Notably, this dominance does not proportionately reflect the actual distribution of women and developing-country stakeholders in the global supply of seafood.[108]

To the extent that any given initiative seeks to promote an integrated and needs-based approach to sustainable development at the international level, the concentration of authority in an exclusive and comparatively well-off group would appear to be a systemic challenge facing global seafood sustainability standards.

4.2.2 Economic Growth and Poverty Reduction

The concept of a blue economy, following Agenda 21 and in alignment with the SDGs, points toward poverty reduction as the pillar upon which all others must rest. The general absence of economic criteria (and social criteria in wild catch fisheries) underscores the general reliance of seafood standards on the role that they can play in enabling improved economic conditions and opportunities of compliance.[109]

The most obvious and direct economic benefit to producers from certification arises through increased pricing as a reflection of the higher quality of fish associated with sustainable production practices. As noted in Box 19, however, the literature reveals very little in the way of consistent sustainability-based premiums. Where premiums are recorded, they appear to accrue the clearest benefits to retailers and others downstream on the supply chain, with little impact on producer prices per se. At any rate, even where premiums exist *and* are passed down to producers, the current geographic concentration of production would appear to limit the role of such initiatives in alleviating poverty where it is most needed, namely in developing countries.[110]

In light of this context, the most promising economic benefit associated with certification would appear to be increased access to global markets. Even this benefit, however, will only be accrued to the extent that markets actually *demand* compliance. And although there is a significant movement among developed-country retailers toward commitments to sourcing

108 Though it could be argued that the current distribution of board making authority *does* represent the traditional make-up of decision making positions among certified fishing operations—for example, mostly male-managed developed-country fisheries.

109 It is unclear whether this reliance is based on an intentional belief that compliance with standards brings significant economic benefits or whether it is simply due to a focus on non-economic sustainability priorities for strategic reasons.

110 FOS aquaculture certification is a clear exception with a clear dominance of production from developing countries but with no recorded premiums, obvious market benefits or clearly stipulate economic requirements would not seem to offer any guarantees to economic stability for certified producers.

sustainable seafood, delays in the fulfillment of such commitments would suggest that gaps continue to exist between intentions and willingness to pay (in many cases) for the infrastructure necessary to guarantee sustainable supply—an observation that would appear to be confirmed by the general absence of premiums associated with certified seafood products.

Moreover, even as market demand for certification grows, it is not self-evident that those most in need will be the immediate beneficiaries. Considering that the existing concentration of certified production comes from more developed countries (often due to underdeveloped stock data and related infrastructure of poorer producing regions and units), then any marginal market growth can be expected to follow similar patterns, focusing on lower-cost developed country sources, unless such market growth is matched by reduced barriers to market entry for poorer producers.

Although scheme owners have adopted some measures to facilitate certification for developing-country producers, it is clear that much more will need to be done to overcome the massive systemic barriers currently in place. Indeed, while helpful, increased responsiveness to local conditions by scheme owners will almost certainly need to be complemented by significant investment from public or private actors. **In the absence of such investment, certification, as a matter of fact, may well be leading to deeper isolation of many of the poorest would-be providers to international markets.**

Box 19 The economics of a blue economy

One of the advertised rationales for voluntary standards is the potential for economic benefits available to certified producers. Voluntary sustainability standards can provide economic benefits to seafood producers through many different channels, price premiums being only one of them. Others include, but are not limited to, market access (particularly to retailers that have committed to sourcing certified seafood), increased likelihood of finance and support from governments or third parties (for example, access to capacity building funds; see Table 3.18), and productivity improvements. None of the standards included in our review requires the payment of price premiums to producers, and evidence of premiums paid at the producer level for other kinds of standard-compliant seafood are inconsistent.[111]

The majority of research on pricing and premiums of certified seafood has been done in relation to the MSC. One study found evidence that premiums are paid ex-vessel for certain species like pink salmon in Alaska and flathead flounder in Japan (Stemle, Uchida, & Roheim, 2015), while others found little or no premiums paid at dockside for the producers they studied (Bellchambers, Phillips, & Pérez-Ramírez, 2015; Blomquist, Bartolino, & Waldo, 2015). While acknowledging that their study demonstrated no statistically significant premiums for the lobster fisheries involved, Bellchambers et. al. (2015) nevertheless conclude that the producers they studied did benefit from the MSC program through, among other things, increased access to European markets, reduced European tariff on Australian seafood, government investment in the MSC program[112] and infrastructure, as well as an increase in the certified fishery's formal representation on national committees.

Washington and Ababouch (2011) note, however, that "the most robust evidence of price premiums suggests that they accrue to the retailers who demand certification," and while several additional studies have supported this statement, they also support the conclusion

111 In personal communications with standard bodies, none were able to provide data on pricing related to their products.

112 $14 million in this case.

that the economic benefits of certification are both complex and varied across players and markets. Blomquist et al. (2015) show statistically significant price premiums at the retail level for MSC-certified seafood (2014), as do Roheim, Asche, and Insignares (2011) (observing a 14.2 per cent premium for frozen processed Alaska pollock products in the London metropolitan area in the UK market). Asche, Larsen, Smith, Sogn-Grundvåg, & Young (2013; 2015) and Sogn-Grundvåg, Larsen, & Young (2014) and also reveal statistically significant premiums for MSC-certified seafood at low-end UK retail chains but none at high-end chains.

Few studies have examined price premiums or the profitability of certification adoption for certified aquaculture producers, although Chang (2012) found in a study of 560 households that aquaculture producers that adopted the Taiwan Good Agricultural Practices eco-label enjoyed higher incomes. Nevertheless, the study did not investigate whether these incomes were explained by producer premiums, improved market access or other causes attributable to certification itself. Whether these effects are enjoyed by other national and international eco-labelling schemes remains to be seen.

Similarly, in a study of organic shrimp aquaculture in China, Xie et al. (2014) estimated that organic farmed shrimp was more profitable than conventional shrimp aquaculture, with the increased profitability explained by, among other factors, price premiums, overall product size, quantity and quality, alongside input and operational costs. In Europe, the Centre for the Promotion of Imports from Developing Countries estimates the import premium for organic shrimp to be 20 per cent, while premiums for ASC- and BAP-certified shrimp are limited. According to the ASC, higher prices for the first certified farms of newly certified species by the ASC have been noted, although it is reported that these effects dissipate as the number of certified farms increases (ASC, personal communication, June 18, 2015). This phenomenon has also been observed by Washington and Ababouch (2011).

Approaches to price premiums and producer revenues varied across the standards studied, and business-to-business standards like GLOBALG.A.P. actually aim to avoid premiums throughout the value chain, aiming to benefit producers through such methods as lowering input costs through bulk purchasing, as well as improving quality management practices (GLOBALG.A.P., personal communication, October 5, 2015).

Overall, it would appear that price-related benefits associated with certification, whether within the wild catch or aquaculture sectors, are collected most consistently by retailers rather than producers. Nevertheless, there is a small but growing body of evidence that seafood certification has been associated with a variety of other economic benefits through improved access to markets, investment, higher productivity and market positioning. Given that available evidence is limited to specific cases, further research on the economic benefits of certification, particularly for smaller producers, is warranted.

4.2.3 Investment and Public Policy

While there is plenty of evidence that seafood standards are conceptually aligned with the promotion of a blue economy, there is also considerable evidence that the forces of the market limit the ability of such initiatives to stimulate comprehensive changes in seafood production practices. Limited market growth along specific species lines combined with underdeveloped infrastructure at production would appear to be the most important barriers to a fully inclusive expansion of supply to, and benefits from, expanding markets for sustainable seafood products.

Price differentials have not, for the most part, been sufficient to generate major infrastructural investments among individual private sector players themselves. Established private funds, such as

the IDH Farmers in Transition Fund, offer a helpful model for enabling certification in underserved producer regions and represent an important strategy for overcoming the systemic challenges faced by poorer regions. However, the success of such privately managed efforts will depend on a significant increase in available funds.

Historically, the most important source of investment for sustainable seafood production has been from nationally driven initiatives, principally in the form of Fisheries Improvement Programs with direct support from public agencies. There are numerous instances of government-led processes seeking the development of the requisite infrastructure to enable certification against international standards (or through a national equivalent; see Box 14 and Box 15). The historical link between public investment and certification capacity in the seafood sector is undeniable and points toward the critical role of public policy in actually enabling the transition to sustainable management and production of seafood more generally. The symbiotic relationship between public initiative and private standards is a natural reflection of the respective roles and limits of markets in the protection of global public goods.

Nevertheless, engagement by public authorities has been inconsistent at the global level, and this may be in part due to some expectation that markets (through certification) could, and would, manage the transition unilaterally. Even if this were a theoretical possibility, which given our preceding analysis seems unlikely, **we estimate that the global economic losses from overexploitation of fish stocks could amount to more than $2 trillion before global production were fully compliant with a given sustainability standard (based on a constant growth scenario at today's growth rates; see Box 21).** Although one might expect the prospect of such losses to be a sufficient basis for driving public investment, waiting for the market to solve the seafood sustainability problem simply does not seem to be a plausible option. If it is accepted that the purely voluntary market forces behind voluntary standards are unlikely *drivers* of comprehensive transformation, the potential value of their contribution to achieving sustainability should not be underestimated—particularly if policy-makers invest in enabling compliance.

Seafood standards, in addition to contributing to international definitions of sustainable practice, offer clear value in providing assurance that sustainable practices are being applied on a consistent and verifiable basis. Rather than driving change, seafood standards may play a more direct role in locking in and maintaining preferable practices over time as public policy demands and public investment enables. In fact, we may now be on the cusp of entering into a new phase where the traceability and assurance elements of sustainability standards operate not only as their most valuable assets but also as the most important sources of growth.

While international policy has long condemned IUU fishing, it has historically had little in the way of tools for enforcing such objectives. Part of the problem, to be sure, has been the absence of political will. But new policy frameworks such as the SDGs and the recently negotiated Trans-Pacific Partnership (TPP), which require parties to implement fishery management plans to manage stocks sustainably and eliminate fishery subsidies that lead to overexploitation and IUU fishing (see Box 18 and Box 20), are offering a new basis for holding countries accountable. In the absence of internationally negotiated protocols for implementing such trade obligations, voluntary standards, through their tested conformity assessment and traceability regimes, have the potential to offer a fast-track solution for demonstrating that the efforts of local governments support TPP obligations.[113]

113 A similar situation exists with respect to compliance with food health and safety regulations. The very existence of the largest certifier of sustainable aquaculture production (GLOBALG.A.P.) can be traced to growing pressures felt by retailers in ensuring compliance with food health and safety regulations. The ability of sustainability standards to facilitate these hard-policy objectives through credible traceability programs gives them a special role in policy implementation.

The natural alignment between the SDGs in demonstrating achievement against measurable targets and voluntary standards in providing a measurable indicator of production practices points toward a potentially symbiotic role between the implementation of the SDGs and voluntary standards.

While taking full advantage of this changing policy context will no doubt require a certain degree of adjustment on the part of existing voluntary standards, experience from the forestry sector suggests that arrangements such as the TPP could become major, if not some of the most important, drivers for the adoption of certification.[114]

114 Sustainable forestry certifications have been used as tools for demonstrating compliance with legislation prohibiting the importation of illegally forested products as per the U.S. Lacey Act and the EU FLEGT system (see U.S. Fish and Wildlife Service, n.d., and EU FLEGT, n.d.)

Box 20 The Trans-Pacific Partnership (TPP)

The TPP represents a unique effort to combine trade liberalization with commitments to respect international social and environmental norms of production. The TPP explicitly requires members to eliminate subsidies that promote overexploitation of fisheries and implement fisheries management systems that promote sustainable exploitation of stocks and eliminate IUU fishing. Article 20:11 (*Voluntary Mechanisms to Enhance Environmental Performance)* of the TPP also encourages governments to support voluntary actions, such as sustainability standards, to promote environmental sustainability within their territories.

Combined, these provisions would appear to position seafood sustainability standards to play an important role in supporting not only government efforts in eliminating IUU fishing and stock depletion but also in documenting such efforts as protection against eventual trade disputes.

Article 20.16: Marine wild catch fisheries

1. The Parties acknowledge their role as major consumers, producers and traders of fisheries products and the importance of the marine fisheries sector to their development and to the livelihoods of their fishing communities, including artisanal or small-scale fisheries. The Parties also acknowledge that the fate of marine wild catch fisheries is an urgent resource problem facing the international community. Accordingly, the Parties recognise the importance of taking measures aimed at the conservation and the sustainable management of fisheries.

2. In this regard, the Parties acknowledge that inadequate fisheries management, fisheries subsidies that contribute to overfishing and overcapacity, and illegal, unreported and unregulated (IUU) fishing 11 can have significant negative impacts on trade, development and the environment and recognise the need for individual and collective action to address the problems of overfishing and unsustainable utilisation of fisheries resources.

3. Accordingly, each Party shall seek to operate a fisheries management system that regulates marine wild capture fishing and that is designed to: (a) prevent overfishing and overcapacity; (b) reduce bycatch of non-target species and juveniles, including through the regulation of fishing gear that results in bycatch and the regulation of fishing in areas where bycatch is likely to occur; and (c) promote the recovery of overfished stocks for all marine fisheries in which that Party's persons conduct fishing activities. (Office of the U.S. Trade Representative, 2015.)

To the extent that policy provides a clear driver for wholesale adoption of certification, it also provides a clear driver for wholesale public investment aimed at enabling certification. Given the sizeable assessment hurdles facing the certification of wild catch fisheries beyond current levels, it seems fair to conclude that public investment in assessment represents one of the most important targets for enabling the growth of certified production more generally.

While it is clear that one of the primary targets of public investment will need to be aimed at wild catch fisheries, it is nevertheless the case that the options for promoting sustainable production through investment in aquaculture are also growing rapidly. On the one hand, the prospect of growing markets for aquaculture products is already stimulating investment in production among both private and public sectors. There is a particular opportunity for enabling entry of smallholder aquaculture producers into international markets for certified products. The aquaculture growth phase represents a low-cost point of entry for complementary measures aimed at ensuring that fish farms are managed sustainably and ensuring that poorer producers have improved access. On the other hand, there is also a role for governments, and possibly voluntary standards, to play a more proactive role in facilitating a transition to greater reliance on aquaculture production for the meeting of global seafood demand. Under the right management conditions, one can expect the growth of aquaculture markets to relieve the overall burden on ocean stocks, potentially allowing overexploited fisheries to recover. To date, voluntary standards have played little in the way of a direct role in promoting a transition from wild catch to aquaculture-sourced seafood, pointing toward an untapped opportunity for enhanced impact through more direct collaboration between aquaculture and wild catch seafood standards.

Regardless of the sector, the rate of investment in sustainable production would appear to be as much of a determinant in overall market growth as actual market demand. Recognition of this basic point signals the importance of public investment aimed at making the requisite investments and/or establishing policy (like the TPP) that might force such investment.

Box 21 Economic losses as a stimulus for investment?

The World Bank estimates that the economic losses due to overfishing are on the order of US$50 billion per year, representing more than a third of the global fish trade. At historical growth rates, certification as a driver of sustainable practice would theoretically take more than 45 years, with interim losses of upwards of US$2 trillion. Meanwhile, the estimates of the investment needed to overcome overexploitation range between US$100 and US$300 billion (UNEP, 2013b). These figures offer an argument for more radical investment in reducing overexploitation. One of the biggest hurdles in managing overexploitation is poor assessment data, which in turn points to the importance of investment in assessment data as a springboard to sustainable seafood production and sustainable seafood certification.

Table 4.2 Wild fisheries: Stocks, losses and certification

Economic losses per year due to overfishing (World Bank estimate)	US$50 billion (World Bank, 2009)
Value of global fish trade (including aquaculture)	US$136 billion (FAO, 2014b)
Estimated proportion of overexploited fisheries	29.9% (FAO, 2011b)
Proportion of unassessed fish stocks	75–83% (FAO, 2011b)
Proportion of fisheries certified	18% (MSC, 2015, personal communication)
Years that some form of certification has been available	15 (MSC rock lobster in 2001) (MSC, n.d.-a)
Additional landings that are certified per year, on average, as a proportion of total	1.2%*
At this rate, years needed to certify all the world's wild fisheries	46†
Economic losses (1974–2007)	~$2 trillion (World Bank, 2009)

* SSI Calculation

† Calculation based on extrapolation of current growth rates of certification to complete certification of global production

5 Conclusion

Seafood sustainability standards have grown in conjunction with a broader recognition among policy-makers, the private sector and consumers of the importance of markets for sustainable products as drivers for the adoption of sustainable production practices. With an estimated retail value of US$12.9 billion in 2013, certified seafood products have potentially significant economic and sustainability impacts.

Voluntary standards, by linking sustainable practice to physical products, offer the possibility of generating prices and even new markets for sustainable production. There is little doubt that seafood sustainability standards have played a role in informing consumers and other actors about the sustainability challenges of seafood production. Our review suggests that moving forward, seafood standards are likely contribute to a blue economy primarily through the identification, measurement and locking-in of sustainable practice, rather than through driving consumer demand for, or corporate investment in, such practices per se.

While early growth of voluntary standards can largely be traced to adoption by major manufacturers and retailers seeking to manage reputational risk, it would appear that current oversupply of certified seafood to such markets, combined with near-capacity certification of assessed capture stocks, could mean a reduced role for purely market-driven growth for capture fishing in the immediate future.

Aquaculture certification stands out, due to its early growth stage and growing demand for aquaculture production more generally, as having significant market-driven growth ahead of it in the coming years. However, the largest drivers for growth in both capture and aquaculture are likely to come from policy measures aimed at eliminating IUU fishing and perverse subsidies and/or promoting local management and production capacity. Whether through novel trade agreements such as the TPP or the rollout of the SDGs, policies seeking to eliminate IUUs and develop a stronger production infrastructure could benefit significantly by leveraging the significant infrastructure and private sector networks associated with voluntary standards.

The special capabilities of voluntary standards in managing credible traceability and conformity assessment protocols, combined with their ability to promote efficient implementation by leveraging market forces, gives them a special and invaluable role in promoting and verifying policy objectives in a cost-effective manner.

Currently, voluntary seafood standards are most present and active in the developed-country markets they serve. As a result, the role of such standards as vehicles for driving economic development across poorer regions of the seafood-producing world remains limited at present. The geographic concentration of certified production across a limited number of developed countries is also reflected, to a large degree, in the governance of such initiatives, pointing toward significant opportunities both for market growth and increased inclusion with respect to developing-country production.

Taking advantage of these opportunities to their fullest capacity, however, will require major investments led by either the public or private sectors, or both. While the public sector has a role to play in building accurate national and regional stock assessments, the private sectors may have a more central role to play in making direct investments in production infrastructure. Both will need to be engaged in the development of national strategies designed to leverage the supply chain management infrastructure and market forces associated with markets for certified products to achieve policy objectives (including the elaboration and implementation of national criteria or standards).

To the extent that such investments are forthcoming, seafood sustainability standards are well positioned not only to play a critical role in the realization of the planet's most immediate seafood-related policy objectives, but also to provide a model for a new form of public-private partnership in the governance of global ocean resources. ■

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Appendix I SSI Reference Indicators

Table I.1 SSI reference indicators

All indicators new to this edition of the SSI are highlighted with a brown background. Indicators are presented by country, region, fishing zone, species, or species group where appropriate.

MARKET INDICATORS

Indicator	Definition
Export volume (mt)	Volume of certified product that is exported, excluding the volume of compliant product exported as conventional.
Import volume (mt)	Volume of certified product that is imported.
Production volume (mt)* ("production")	Production volume that is compliant under a sustainability standard, even if not sold as compliant at the first point of sale.
Production value (US$)	Value of compliant product that is sold as compliant at the first point of sale (i.e., total producer revenues from compliant product). Production market share refers to the value of compliant production as a percentage of total production.
Multiple certification	Percentage of compliant production that has more than one sustainable certification. If an actual measurement is not available, an estimate will be accepted so long as it is specified as an estimate.
Reported premiums (US$)	Estimated additional dollar value per volume paid at farm gate that is attributable strictly to certification (e.g., not for physical quality differences).
Price differentials (US$)	Price differentials (estimated additional dollar value per volume paid at farm gate) that is strictly attributable to certification.
Private sector sustainable sourcing	Amount of certified purchases currently sourced sustainably, as a percentage of total purchases.
Private sector commitment to sustainable sourcing	Percentage of certified purchases that companies commit to sourcing sustainably, and date by which commitment will be fulfilled.
Retail sales value	Value of compliant retail sales (if an actual measurement is not available, an estimate will be accepted so long as it is specified as an estimate).

SYSTEM INDICATORS

GENERAL INDICATORS	
Indicator	**Definition**
Founding stakeholders	Producer, industry, NGO or other. Informs different underlying philosophies, which the founders of the initiative typically define prior to the standard-setting process itself.
Business model	Business to business vs. business to consumer (consumer-facing label).
Distribution of income/revenue sources	Public or private grants, membership fees, fees for services, or other. The percentage of total income derived from public grants and donations, including loans (e.g., soft loans at low interest rates); the percentage of total income from private grants and donations; the percentage of total income brought in by membership fees; the percentage of total income from fees for services.
Activity scope	Developing standards, marketing and labelling, certification, verification, accreditation.
Species scope	Number and type of aquatic species certified by the standard.
Geographic scope	Indicates a short description of the geographical scope of the sustainability initiative or standard system, discusses where verification or certification activities operate, and may include potential market outreach for certified goods and services.

*Expressed in live weight equivalent.

ENVIRONMENTAL		
Index	**Indicator**	**Definition**
Biodiversity	Habitat set-asides	The standard requires that certain areas not be used for production or extraction in order to conserve, protect and restore habitat areas for wild plants and for aquatic animals and other species.
	Monitoring and protection of high-conservation-value areas	The standard document prohibits conversion of high-conservation-value areas.
	Escapee prevention	The standard requires the certified unit to have systems in place to minimize the unintentional release or escape of farmed species.
	Management of non-target species (bycatch)	The standard requires bycatch management and reduction of discards.
	Use of hatchery-raised seed	The standard promotes the use of hatchery-raised seed.
	Prohibition of lethal predator control	The standard favours passive and/or non-lethal methods of predator control.
	Minimization of "ghost fishing"	The standard requires measures be taken to minimize loss of fishing devices and ensure their immediate retrieval in order to avoid "ghost fishing."
Ecosystems	Prohibition of destructive fishing practices	The standard prohibits use of destructive fishing methods such as dynamite and poison.
	Responsible sourcing of aquatic animal feed	The standard requires that marine-based feed ingredients come from sustainable sources.
	Feed regulation and handling	The standard includes criteria related to animal feeding, including type, ingredients and handling methods.
	Disease management	The standard requires establishment and implementation of procedures to prevent the spread of disease.
	Environmental risk and impact assessment	The standard requires assessment of potential impacts on production and harvesting sites (production land, water, processes, new crops, etc.).
	Stock regulation	The standard promotes the sustainable exploitation of marine resources, including restoration of overfished and depleted stocks.
	Fishing vessels in legal compliance (illegal, unreported or unregulated. fishing)	The standard requires that the fishing fleet not include illegal, unreported or unregulated fishing boats and that the fleet operate in regulated and managed areas.
	Stocking density	The standard requires stocking density of ponds and cages to allow for appropriate movement, resting, feeding, social and reproduction habits of stocked species.

Waste and water management	Waste disposal	The standard addresses proper disposal of waste (including solid waste, non-solid waste and hazardous waste).
	Waste management plan	The standard includes control of the collection and treatment of different wastes.
	Water-use management plan	The standard requires a plan that includes planning, development, distribution and optimal use of water resources under defined management strategies.
	Wastewater management	The standard requires appropriate management of wastewater.
	Water pollution	The standard includes criteria preventing water contamination.
Greenhouse gas and energy	Greenhouse gas accounting	The standard requires measurement of carbon emissions.
	Greenhouse gas reductions	The standard explicitly requires management of greenhouse gas emissions.
	Energy-use management	The standard includes criteria for the application of a set of clean production principles.
	Energy-use reduction	The standard includes requirements to reduce energy use.
Synthetic inputs	Prophylactic use of antimicrobials prohibited	The standard prohibits prophylactic use of antimicrobials and may require that antimicrobials are used only in response to a diagnosed disease.
	List of prohibited antibiotics	The standard prohibits the use of antibiotics considered by the World Health Organization to be highly or critically important to human health.
	Management plan for application of chemicals and veterinary drugs	The standard requires that the certified unit have in place a management plan for the application of chemicals and veterinary drugs.
	Prohibition of genetically modified organisms (GMOs)	The standard prohibits the use of genetically modified organisms (GMOs).

SOCIAL		
Animal welfare	Humane methods of slaughter	The standard requires slaughter practices that consider the welfare of aquatic animals.
	Welfare during transport	The standard includes criteria related to minimizing the effect of transport on the welfare of wild caught and farmed fish.
Labour rights	Freedom of association	The standard includes criteria for freedom of association, as defined by ILO 87.
	Forced labour	The standard prohibits use of forced labour, as defined by ILO 29.
	Minimum age	The standard sets a minimum age for workers, with ILO 138 as minimum threshold.
Labour rights	Non-discrimination	The standard prohibits discrimination due to race, religion, social, cultural, age, gender or other factors, as defined by ILO Convention 111.
	Worst forms of child labour	The standard prohibits the use of child labour, as defined by ILO Convention 182.
	Collective bargaining	The standard includes criteria for collective bargaining, as defined by ILO 98.
	Equal remuneration	The standard requires equal remuneration in accordance with ILO 100.
	Women's labour rights	The standard includes explicit criteria to protect women employees' rights, such as by prohibiting mandatory pregnancy testing.
Employment conditions and benefits	Treatment of part-time and seasonal workers	The standard requires equal rights and benefits for all types of workers, including full time, seasonal, part time and temporary.
	Written contracts for employees	The standard requires written contracts with employees.
	Timely payment of wages	The standard requires wage payment be made without delay.
	Maximum number of working hours	The standard explicitly sets a maximum number of working hours.
	Paid maternity, paternity and sick leave	The standard requires provision of paid leave for workers, which may include maternity, paternity, sick and public holiday leave.
	Pension and security benefits	The standard requires provision of pensions and social security benefits.

Human rights	Access to education	The standard requires the promotion, enhancement of education or training for workers and/or their families.
	Access to medical care	The standard requires access to and provision of medical care for workers' families.
	Access to housing and sanitary facilities	The standard includes criteria related to provision of housing and sanitary facilities where onsite housing is provided.
Workers' health and safety	Safety at work	The standard specifies minimum standards for safety at work.
	Healthy work conditions	The standard requires protection and promotion of health at work.
	Access to safe drinking water at work	The standard requires workers' access to safe drinking water.
	Access to sanitary facilities at work	The standard includes criteria relating to sanitary facilities in the workplace (e.g., showers, toilets and changing rooms).
	Access to medical assistance at work	The standard requires access to and provision of medical care in the workplace.
	Access to medical insurance at work	The standard requires access to medical insurance in the workplace.
Community involvement	Community consultation	The standard requires consultation with the community regarding changes or impacts from business activities on local resources and communities.
	Local hiring	The standard includes criteria promoting preference policies for local hiring and purchasing contributing to the economic development of local communities.
	Access to natural resources	The standard protects access to natural resources for local and indigenous people.

ECONOMIC		
Minimum wage	Minimum wage	The standard requires compliance with local, regional or national minimum wage laws.
Living wage	Living wage	The standard requires workers to be paid minimum levels of wages that cover basic human needs.
Premiums	Premiums	The standard requires premium over the conventional price of a product be paid to the producer.
Written contracts	Written contracts	The standard includes criteria for setting up contracts with traders.
GFSI compliant	GFSI compliant	The standard is recognized by the Global Food Safety Initiative at the farm level.

ASSURANCE	
Indicator	**Definition**
Accreditation	Third-party attestation related to a conformity-assessment body conveying formal demonstration of the standard body's competence to carry out specific conformity-assessment tasks (ISO/IEC 17000).
Auditor competency	The initiative requires auditors to perform competency evaluations. In addition to competency requirements, a standard may specify for auditors to undertake standard-specific training
Book and claim	Sustainability certificates are granted based on the application of sustainable practices, but the certificates are completely decoupled from the product and are transferable on the market.
Conformity assessment	Any activity concerned with determining directly or indirectly that relevant requirements are fulfilled. Typical examples of conformity assessment activities are sampling, testing and inspection, evaluation, verification and assurance of conformity (supplier's declaration, certification), registration, and accreditation and approval, as well as their combinations (ISO Guide 2, 12.2).
Certificate duration in years	The validity period of certification.
Certification	Third-party attestation related to products, processes, systems or persons (ISO 9000/2005).
Certification audit	The certification body confirms the producer's performance against a certain set of criteria; compliance is confirmed by certificate.
Chain of Custody	The document trail recording the sequence of companies and individuals that have custody of seafood as it moves through a supply chain.
Degree of independence	The degree of independence between the manufacturer of a product and claims of conformity assessment.
Frequency of audits	Frequency of full assessment as required by the standard.
Identity preservation	Requires physical separation, tracking and documentation at every stage of the supply chain.
ISEAL Assurance Code compliant	The standard has been independently evaluated against the ISEAL Assurance Code. Standards that conform to the requirements of the Assurance Code embody the principles of consistency, confidence, impartiality and transparency within their assurance processes.

ISO 17065 or 17021 compliant	ISO 17065, which replaced ISO 65 in 2012, sets quality and independence requirements for certification bodies and offers an internationally recognized instrument for assessing the strength of the conformity assessment process. ISO 17021 sets requirements for bodies providing audit and certification of management systems. It is the base standard used by accreditation bodies when assessing the competence of management-system certification bodies. It replaced two previous ISO/CASCO guides (ISO/IEC Guide 62 and ISO/IEC Guide 66).
Mass balance	The amount of certified product sourced and sold by each supply chain actor is tracked. However, the certified product and "sustainable" certificates do not need to be sold together.
Purity policy	The use of the label is restricted to products with a threshold percentage of compliant products. For this review the threshold is assessed at 95%.
Segregation	The segregation model of traceability ensures that compliant products are kept segregated from non-compliant products during all stages of the supply chain.
Separate Chain of Custody standard	The existence of a separate standard that defines the principles, criteria and standard indicators for CoC.
Self-assessment audit	The execution of an audit by the administrative unit being audited (internal audit as defined by the OECD).
Surveillance audit	Audit visits to the producer to verify and monitor the ongoing fulfilment of the standards and to identify any corrective actions necessary to maintain compliance.
Traceability	The physical tracking of seafood at all points of the trading chain, from their point of origin to their point of export (OECD).
Unscheduled audits	The auditor visits the producer to verify and monitor the ongoing fulfillment of the standards and to identify any corrective actions necessary to maintain compliance. Can occur at any time during the validity period of the certificate.
Verification audit	Confirmation through the provision of objective evidence that specified requirements have been fulfilled (ISO 9000/2005). The audit can: • Check if the producer has reliable systems in place to monitor and control their sustainability performance. • Operate similarly to a certification audit, where a licence rather than a certificate is issued following a third-party audit. • Operate as a benchmarking process leading to certification.

RESPONSIVENESS	
The principle of subsidiarity	Centralized rulemaking and implementing organizations should only perform those tasks that cannot be performed effectively at a more intermediate or local level.
Continuous improvement requirement	A defined continuous improvement requirement is explicitly written into organizational documents.
Group certification	The standard system sets specific requirements for group certification; i.e., requirements for sampling policies and audit evaluations, among others.
Harmonization	Adjustment of differences and inconsistencies among different standards to make them uniform or mutually compatible
Incentives	The scheme provides the producer with concrete incentives for exceeding basic compliance over time.
Independent funds	Funds are provided to producers by independent organizations to aid in compliance with certification requirements.
ISEAL Impacts Code compliant	The Impacts Code, which provides a framework for building a monitoring and evaluation system capable of examining both short-term and long-term outcomes, and requires standards systems to publicly report on the results of their evaluations.
Local auditors engaged in the certification process	Initiative draws on the expertise of local auditors who are familiar with local contexts for the certification process.
Regional standards and localized indicator development	The initiative allows for adaption of indicators and standards to local and regional contexts.
Revision period for standard	The period in which a standard is reviewed and revised based on changing needs and conditions.
Separate standard for smallholders	Standards and/or processes have been written specifically for smallholders and differ from the standards and processes for large producers.
Stepwise	A step-by-step plan or pathway to reach certification.
Technical assistance	Any support provided to the producer other than financial, such as tools, training and guidance.
ENGAGEMENT	
Access to decision making	
Board representation by developed vs. developing country	Percentage of total board members who are from developed countries vs. developing countries.
Board representation by stakeholder in supply chain	Percentage of total board members who represent producers, industry or the private sector (e.g., retailers, traders), workers' associations or unions, or civil society organizations or NGOs, or who fall under the category of "other" (e.g., consultants, lawyers or financial institutions).
Board representation, women vs. men	Percentage of total board members who are male vs. female.
Standards development	
ISEAL standard-setting code	The ISEAL standard-setting code defines good practices to be followed in standard development for any sector or product to ensure the standard is credible and effective and that it achieves its objectives.
Membership system	The initiative is based on membership.
Number of voting board members	Number of members on the board who vote at annual general meetings.
Stakeholder consultation in standard-setting process	Stakeholders are asked their opinions pertaining to standard development.

Stakeholder decision making in standard-setting process	Stakeholders have the power to reject, accept or influence the decisions made during the standard-development process.
Dispute settlement	
Independent dispute settlement body	A dispute settlement body that is not made up of the organization's board members has been established and formally recognized in writing.
Public access to policies and procedures for complaints	The standard body's policies and procedures for complaints are available online to the general public.
Complaints and dispute resolution procedures available in other languages	The standard body's complaints and dispute-resolution procedures are available online in other languages (apart from English) to the general public.
Ability to launch complaints at local level	Processes are in place that enable complaints to be received locally and that take into consideration language or literacy barriers or lower access to formal means of communication.
Complaints accepted through informal means	Processes are in place that enable complaints to be addressed regardless of language.
Access to information	
Annual budget	Total annual income earned by a standard body. Overall revenue can determine an initiative's capacity to manage credible conformity-assessment processes, manage participatory governance, drive market growth or facilitate transitions to sustainability among non-compliant producers.
Annual reports	The standard body's annual reports are made available online to the general public.
Certified unit environmental impact assessment reports	Environmental impact assessment reports submitted by the producer unit are made available online to the general public.
Committee meeting minutes	The standard body's committee meeting minutes are made available online to the general public.
Independently audited full financial statements	The standard body's independently audited financial statements are made available online to the general public.
List of board members	A list of the standard body's board members is made available online to the general public.
List of certification decisions	A list of certification decisions for enterprises applying for certification is made available online to the general public.
List of committee members	A list of the standard body's committee members is made available online to the general public.
List of compliant enterprises	Enterprises that hold certificates and are compliant with the standard requirements are made available online to the general public.
Non-recurring revenue	Income of an infrequent nature unlikely to occur again in the normal course of business.
Recurring revenue	Segment of an organization's revenue that occurs frequently, regularly or periodically, such as membership fees. This is revenue that is predicable and relied upon in the future with a high degree of certainty.
Standard-setting and review processes	The processes undertaken by a scheme owner in setting and reviewing the standard(s) are made available online to the general public.

Appendix II SSI Methodology

Data Sources

The SSI was launched in 2008 with a view to providing an international baseline for understanding key performance characteristics associated with voluntary sustainability initiatives.[115] A key aspect of the SSI analysis is its use of standardized indicators and methodologies throughout its reporting. A full listing of the SSI indicators, including modifications adopted for reporting on seafood standards, can be found in Appendix I.

One of the objectives of the SSI project is to contribute to the development of a more harmonized infrastructure for data collection and reporting. To that end, the SSI has worked in close partnership with a number of other leading organizations that share a similar objective, including, among others, the ITC, ISEAL and FiBL.

Wherever possible, we have relied on data from the ITC Standards Map. Due to the relative scarcity of fisheries data in the ITC database, significant portions of the data were derived directly from standard bodies and standard documents themselves. Below is a brief listing of data sources, unless otherwise specified in the report:

- Standard system data: standard documents and websites, the ITC, and standard bodies
- Governance data: standard websites, standard bodies and the ITC
- Standard system content and criteria data: standard documents and the ITC
- Market data: standard bodies, institutional documents and third-party literature

All of the market analysis and numerical representations of all data, regardless of the source, are strictly the work and responsibility of the SSI. Although we have done our best to ensure that our reporting reflects the data as provided by these sources as accurately as possible through a two-stage vetting process,[116] the SSI takes full responsibility for all data and analysis contained within this report.

Market Analysis: Issues and Approach

The market data are presented in Section 2 of this review in the form of maps, charts and tables. Our market analysis is based primarily on raw data received from the standard bodies in accordance with a harmonized set of market indicators developed by the IISD, ITC and FiBL.

The following general assumptions and methodology were used throughout the market analysis section. In certain cases, specific assumptions or methodological techniques used for a statistic or figure are identified in the section's footnotes:

Species Groupings

Aquaculture and wild catch production data were derived from the FAO's online statistical query database. Given that there are several hundred species listed in the FAO database, in certain figures and analyses different species of fish are grouped together into a higher level "species group" or "family" for organizational or visualization purposes. The species group tuna, for example, is made up of albacore tuna, Atlantic bluefin tuna, bigeye tuna, blackfin tuna, bullet tuna, dogtooth tuna, frigate tuna, longtail tuna, Pacific bluefin tuna, skipjack tuna, slender tuna, southern bluefin tuna, tuna-like fishes not elsewhere identified (nei) and yellowfin tuna.

We opted for 40 species groups for our analysis: anchoveta, carp, catfish, clams, cod, crab, freshwater fishes nei, freshwater

115 The full set of SSI indicators, including the content and criteria indices, were developed with the oversight of the advisory panel to the *SSI Review 2010*. These indicators were subsequently integrated directly into the ITC T4SD Standards Map database and represent the backbone of the ITC's global framework for tracking standards-related data and information (ITC, 2015). For the *SSI Review: Standards and the Blue Economy*, social, environmental and economic indicators specific to the aquaculture and wild catch fisheries sector were added that have since been incorporated into the ITC T4SD Standards Map.

116 The report is vetted by a series of expert reviewers and the standards bodies included in the report.

gobies nei, freshwater perches nei, freshwater siluroids nei, grenadier, haddock, hake, halibut, herring, lobster, mackerel, marine fish nei, miscellaneous coastal fishes, miscellaneous demersal fishes, miscellaneous diadromous fishes, miscellaneous marine crustaceans, miscellaneous marine molluscs, miscellaneous pelagic fishes, mussels, other, oysters, pangasius, pollock, salmon, sardines, scallops, seabream, shrimp/prawns, swordfish, tilapia, toothfish (Chilean sea bass), trout and tuna.

In creating each grouping, best efforts were made to correctly categorize species whose names are misnomers or synonymous with other species. For example, pilchards were designated to the sardine family (as they are synonymous), and saithe were designated to the pollock family. In the case of Alaska pollock and walleye pollock, which are members of the cod (and not pollock) family, they were grouped into their own family as "Alaska pollock (cod)" due to their singular importance as a productive species.

Groupings whose names include "nei" or "miscellaneous" are original FAO groupings that indicate production for which little data exists. The "other" grouping is made up of species that have been identified by the FAO but whose species group would make up less than 1 per cent of certified and/or total production aggregates. For example, species with relatively minor commercial or productive importance, such as African lungfish, clown knifefish and piranhas, were all categorized as "other."

Grouping by Fishing Zone

Data for wild catch landings were provided with attribution to fishing zones, in addition to species and countries. This offered opportunities for additional data visualizations, as well as comparison with FAO's data on the state of the world's marine fishery resources. The attribution of production data to species and fishing zones is the only major modulation of the indicator set that are specific to this review.

Multiple Certification

Because the production data provided by the FAO and the standard bodies are granular to the species, country and, in the case of wild catch, FAO fishing zone level, there is ample room to determine the potential for multiple certification in the fisheries space. Given this information, we found multiple certification to be negligible in both aquaculture and wild catch fisheries, insofar as it would affect the percentage of total fisheries certified, and so multiple certification is assumed to be 0 per cent across wild catch fisheries and aquaculture.

Data Years

When production aggregates are presented for specific years, data are used to the extent possible from that year. When data from that year are not available, data from the most recent year are used, and the substitution or estimation is mentioned in a footnote. In the cases where there are gaps between production years for a time series, production values were estimated for years where data was missing by interpolating a "smoothed" average growth or decline rate between years.

Disaggregated Production Estimates

When production was reported in an aggregate figure for a single country, or across several fishing zones, disaggregated estimates for each species were attained by dividing the production per country for each species by the number of producers per species in that country (where such data was publically available or provided by the standards), or by dividing the landed catch per species by the number of fishing zones in which the standard is known to fish for that species.

The quality of data received varies considerably among the initiatives surveyed. Reporting consistency requires the use of specific techniques for presentation of cross-cutting data. Table II.1 lists the issues and corresponding techniques used to enable multi-year comparison across initiatives.

Table II.1 Data issues and treatment by initiative

Initiative	Data Issue	Data Importance	Data Solution	Sources of discrepancy
Organic (aquaculture)	Incomplete species data	Necessary to observe trends in the adoption of organic certification	Data presented as is, with volumes for specific species available for certain countries, but not all. Although incomplete, the available data helps give an indication of the primary species certified in Organic aquaculture. Species-level data from Naturland, which is a complete set, also helps give an idea of what aquaculture species are being certified Organic more generally.	Incomplete dataset
Friend of the Sea	Aquaculture production not broken down by country	Necessary to provide an accurate picture of the global distribution of production, which is needed to observe where VSS are having potential impact	Estimated by dividing the 2014 total certified production volumes for each species by the per species and per country number of aquaculture certificate holders, as retrieved from the FOS website. Relative to reported species volumes from the FOS website and public presentations, the dataset provided by FOS left approximately 190,000 metric tons of aquaculture from several species that needed to be accounted for (e.g., sea bass, gilthead, and sea bream). To estimate the remaining production per species per country, the resulting volume was divided by the total number of producers per country for all remaining species.	The per-country attribution assumes proportional productivity across aquaculture certificate holders in all countries and for all certified species.
Friend of the Sea and MSC	Wild catch landings sometimes reported across multiple FAO fishing zones	Necessary to provide an accurate picture of volume and distribution of production across fishing zones, which vary in their relative need for controlling overfishing	For species landed in the same country but from multiple fishing zones, the total landings for each country were evenly divided between the fishing zones.	Assumes an even distribution of landings along the relevant fishing zones
ChinaG.A.P.	Data likely not complete	Necessary to provide an accurate picture of the development of aquaculture certification in China	Reported data provided but caveat that it may be an incomplete data set and hence underestimates production.	Potentially incomplete and inaccurate dataset

Systems Analysis: Issues and Approach

The systems and criteria analysis is found in Section 3 of this review. The SSI indicators and indices, which measure conformity assessment protocols, governance structures, as well as system requirements, represent an attempt to capture not only the sustainability aspirations of different initiatives but also the credibility, transparency, accountability and overall quality of the systems in place for implementing those aspirations.

Our criteria analysis is designed to assess the aspirations of different standards (as opposed to actual impacts) vis-a-vis specific social, economic and environmental vectors. Our systems analysis is designed to measure the actual structure of governance and implementation of the respective initiatives.

However, it is important to note that working from a limited set of indicators, the actual applicability or appropriateness of a given SSI index will vary depending on the specific commodity sector or standard in question (for example, the inapplicability of the prohibition of genetic modification in wild catch fisheries).[117] Indicators that are only applicable to the wild catch fisheries commodity sector have been omitted from the aquaculture analysis (e.g., IUU fishing, ghost fishing and stock regulation). Indicators that are only applicable to the aquaculture commodity sector have been omitted from the wild catch fisheries analysis (e.g., disease management, escapees and stocking density). All crosscutting indicators have been analysed across both aquaculture and wild catch commodity sectors (e.g., labour conditions, animal welfare, energy, gender and greenhouse gas emissions).

Some sustainability issues, such as greenhouse gas mitigation, can be addressed indirectly through a variety of good management practices not specifically targeting greenhouse gas reduction (e.g., reduced energy use and reduced use of synthetic inputs). However, to reduce the potential for subjective bias in our assessments, *indicator coverage is determined based on explicit written reference to the specific environmental, social or economic issue of concern within standards documents.* Although some indicators within a given index might contribute to the management of more than one issue, such as greenhouse gas reductions, we chose only a select group of representative indicators directly related to greenhouse gas management in order to avoid complexity and/or duplication of indicators across indices. With this in mind, actual index scores should be considered as indicative and not determinative.

Criteria and Requirements Analysis

The SSI has developed a four-point scale based on the degree of compliance associated with each environmental, social and economic criterion. Each criterion is scored as "not covered," "recommended," "required" or "critical." "Critical" applies to criteria with which compliance is mandatory prior to certification. "Required" applies to criteria that involve a degree of flexibility in the certification decision (e.g., on the part of the auditor or certification committee, or with respect to a specific project or regional context). Table II.2 and Table II.3 show the verbiage used within the standard documents assessed in determining the degree of criticality across each SSI indicator.

117 With this in mind, the **SSI** is committed to reviewing and revising its indicator set over time through ongoing collaboration with standard-setting bodies and other stakeholders.

Table II.2 Methodology for determining the content criteria for degree of coverage, aquaculture

Initiative	Version of standards assessed	Not covered (0)	Recommended (1)	Required (2)	Critical (3)
ASC*	ASC Pangasius Standard v1.0 Jan 2012 ASC Salmon Standard v1.0 June 2012 ASC Shrimp Standard v.1.0 March 2014 ASC Tilapia Standard v1.0 Jan 2012	No reference	Criteria indicated in "Guidance" section of standard	"Within 1 year" "Within 3 years" "Within 5 years"	"Yes"/"No" or Specified metric
ChinaG.A.P.	GB/T 20014.13-2013	No reference	"Level 3"		"Level 1"/ "Level 2"
FOS	FOS-Aqua—Aqua Marine First Review 03/11/2014	No reference	"Recommended"	"Important"†	"Essential"‡
GAA BAP	Finfish/Crustacean Farms Standards and Guidelines, Issue 2, Sept. 2014 Salmon Farm Standards and Guidelines, v2, May 2015	No reference	"Should"		"Shall"
GLOBALG.A.P.	GLOBALG.A.P. Integrated Farm Assurance: All Farm Base—Aquaculture Module v5.0, Feb 2016	No reference	"Recommended"	"Minor must" and GRASP criteria§	"Major must"
IFOAM	IFOAM Norms for Organic Production and Processing v2014	No reference	"Should"	"Regional or other exception"	"Shall"/"is prohibited"/ "are prohibited"
Naturland	Naturland Standards for Organic Aquaculture v05/2015	No reference	"Recommended"		"Shall"/ "must"/"is prohibited"/ "are prohibited

* Note: these are just the four ASC standards assessed in this review. For the complete list of ASC standards see ASC (n.d.-b).

† For FOS "important" requirements, 100 per cent conformity is required in order to allow the certification body to recommend the company for certification. Each deficiency against these requirements is considered a minor non-conformity, and the company is required to propose appropriate corrective measures (declaration of intents and implementation plan), to be submitted to the certification body within three months from when the non-conformity was found. This proposal must also include a chronogram concerning the implementation of each corrective measure. Certification may be granted only after the corrective actions are accepted by the certification body, with the relative timeline for their implementation.

‡ For FOS "essential" requirements, 100 per cent conformity is required in order to allow the certification body to recommend the company for certification. Each deficiency against these requirements is considered a major non-conformity, and the company is

Table II.3 Methodology for determining the content criteria for degree of coverage, wild catch

Initiative	Version of standards assessed	Not covered (0)	Recommended (1)	Required (2)	Critical (3)
FOS	FOS-Wild—Generic First Issue 18/01/2013	No reference	"Recommended"	"Important"	"Essential"
IRF	The Fisheries Association of Iceland v1, rev1 March 2014	No reference			"Shall"/ "must"
MSC	MSC Fisheries Certification Requirements and Guidance v2.0 1 October 2014	No reference		Specific reference to scoring or assessment	"Shall"
Naturland	Naturland Standards for Sustainable Capture Fishery v05/2015	No reference	"Should"	Reference to project specificity	"Shall"/ "must"/"has to be"/"is responsible"/ "need to"/"is prohibited"/ "are prohibited

required to undertake appropriate corrective measures, to be implemented within three months from when the non-conformity was found. The company must provide the certification body with satisfactory evidence regarding the correction of all major non-conformities, even through additional audits if necessary. Exclusively for requirements 2.1 and 2.2, considering the complexity of possible missing data to be retrieved, the time interval allowed for the assessment of the correction of non-conformities is extended to six months.
§ Although the GLOBALG.A.P. Risk Assessment on Social Practice (GRASP) criteria is not obligatory, GLOBALG.A.P. producers are mandatorily assessed against the GRASP.
|| Besides the general regulations for Naturland sustainable fisheries, project-specific management conditions are imposed on each fishery project. Taken together with the general regulations for sustainable fisheries, these special conditions constitute a catalogue of measures to be adopted in the management plan and quality assurance system of the project.

Once the degree of criticality is assessed for each criterion, the criterion is then converted into a four-level sustainability number system (see Table II.4). Results for each indicator are then aggregated accordingly for each index on a scale of 0 to 100 per cent. Two separate analyses are applied to interpret results and overall trends:

- **Index-specific analysis** examines criteria coverage across various indices (each index houses a number of indicators). The primary focus of this analysis is to identify the overall coverage according to the core sustainability issues along the social, environmental and economic dimensions of sustainability.
- **Indicator-specific analysis** examines criteria coverage according to the individual indicators that make up the indices. The primary focus of this analysis is to identify the disparities evident in disaggregated data that may not be fully reflected in an overall aggregate index analysis. This analysis helps provide an understanding of which criteria are most common and which are the least developed across the initiatives and sectors examined (See Appendix IV and Appendix V for specific indicator analysis across the wild catch and aquaculture sectors, respectively).

Table II.4 Degree of coverage methodology

Degree of coverage	Requirement	Rating
Critical	Full compliance as a condition of certification	3
Required	Degree of flexibility on part of auditor or certification decision-makers	2
Recommended	Criterion exists but is not binding	1
Not covered	No requirements	0

Calculations: Based on Table II.4, if an initiative covers the SSI indicator *energy use management*, for example, as a recommendation (1) and does not address the SSI indicator *energy use reduction* (0) the score for the SSI energy index would be 1+0 =1. The highest score achievable for the energy index would be 6 (3+3), which would equal 100%. Therefore, the total for the energy index is averaged across both indicators (in this case divided by 6) to get the final score. In this example, the initiative would score 16.6 per cent (1/6) for the SSI energy index. For SSI indices consisting of three indicators, the total score is averaged by dividing by 9 (3+3+3), for indices with four indicators the total is divided by 12 (3+3+3+3) and so on. This is the process by which the percentages for the coverage of specific criteria across the environmental, social and economic dimensions are determined for this review.

Data Disclaimer

Although any given indicator could apply to multiple themes, each indicator is housed in only one index. For example, disease management can also contribute to the protection of biodiversity as well as the enhancement of ecosystems. Ensuring fishing vessels are in legal compliance to avoid IUU fishing also cuts across both the biodiversity and ecosystem indices and contributes to the prevention of increased levels of water pollution, energy use and greenhouse gas emissions. However, despite the crosscutting thematic nature of various indicators, to avoid double counting, each indicator has been assigned to only one index and scored using the same methodology as all other indicators (see “Calculations” under Table II.4).

Specific Standards Data Notes and Disclaimers

Aquaculture Stewardship Council (ASC)

1. The ASC represents the average across the ASC shrimp, pangasius, tilapia and salmon standards. See Appendix VII for complete breakdown.
2. Although the ASC was established in 2010, the first ASC-certified product (tilapia) appeared on the market only in 2012. Since then multiple species have entered the market, with salmon and shrimp being the main ones in terms of certified farms and volume produced. The year 2013 saw a period of initial growth that accelerated enormously once salmon and shrimp became available to the market. With the recent development of the ASC in mind, it should be noted that many indicators not covered by the ASC at the time of writing this report were either in the process of becoming implemented or are likely to be implemented in the near future. This has been noted as much as possible throughout the report. Accelerated expansion of the salmon and shrimp standard also represents a rapidly evolving stage for the ASC's market share.

Best Aquaculture Practices (BAP)

1. GAA's BAP provides a separate standard for finfish and crustacean farms, one for salmon farms and one for mussel farms. We built our analysis across standards covering finfish and crustacean farmed species. In line with the selected ASC standards assessed for this review, BAP represents the average across the BAP finfish/crustacean and salmon standards. See Appendix VII for a complete breakdown.
2. A note on the treatment of the GFSI indicator (see Section 3.1.4): Although GLOBALG.A.P. is the only standard assessed that is GFSI compliant at the farm level, it should be noted that BAP is compliant with the GFSI at the processing level. The GFSI sets an internationally recognized benchmark for good practice in food safety and therefore offers a useful reference point for understanding whether or not a given sustainability initiative credibly covers food safety.

ChinaG.A.P.

1. ChinaG.A.P. reported that they did not have the time to provide data to the SSI. As a result, ChinaG.A.P. data have not been vetted by the initiative itself.

Friend of the Sea (FOS)

1. A note on treatment of social indicators (see Section 3.1.3): FOS makes reference to the SA8000 standard as the relevant standard for certifying social conditions on fisheries. Certification under SA8000 is recommended within the FOS standard for its social criteria.
2. A note on treatment of ISO 17065 compliant indicator (see Section 3.2): FOS has obtained national accreditation through the Italian accreditation body Accredia.

GLOBALG.A.P.

1. A note on treatment of social indicators (see Section 3.1.3): GLOBALG.A.P. producers are mandatorily assessed against the GRASP. Actual compliance with GRASP criteria is not obligatory, but the GRASP assessment must be uploaded onto the GLOBALG.A.P. database, providing buyers with access to the full report in order to evaluate what is in compliance and what is not.[118] Since the GRASP criteria are not currently obligatory, the criteria is assessed as "recommended".[119]

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118 During GLOBALG.A.P.'s last public consultation for version 5 of the standard, it was requested to implement a stepwise approach regarding social criteria. Farms will therefore be ready for full compliance for the next version of the GLOBALG.A.P. standard. GLOBALG.A.P. reports that in most cases where farms are currently GRASP assessed, the non-compliance of the criteria is typically records related and not due to socially unacceptable practices.

119 For companies interested in using the FOS logo linked to the GGN, they are required to have a GRASP

IFOAM

1. IFOAM is an international umbrella organization for organic production, and as such addresses "norms" for organic standards. The organic standards that are members of IFOAM typically address more specific criteria within the overarching principles and norms that constitute the IFOAM standard. Consequently, the IFOAM standard tends to be more general in language. For example, IFOAM considers its requirements to address greenhouse gas through the sum of many norms, which can be said of a number of environmental criteria across sustainability standards. However, to protect against subjective interpretations in our assessment, each indicator measurement is determined based on explicit reference to the environmental, social or economic issue within its standards documentation.[120] As there is no specific reference to greenhouse gas reductions or accounting in the IFOAM standard, the indicator is shown as not covered. This methodology was used consistently across all standard assessments.

Iceland Responsible Fisheries (IRF)

1. IRF did not provide feedback to this review during the vetting process. The initiative expressed initial interest in being involved in this review and attended the preliminary SSI Seafood Indicator Development Workshop in Rome in 2014. However, after providing the SSI with some minor data points, the organization declined further involvement.

Naturland

1. A note on treatment of social indicators (Section 3.1.3): Within its social responsibility requirements, Naturland requires workers to be paid at least the official national minimum wage currently applicable or the relevant industry standard when employed in processing operations but does not state the same for farm level.
2. A note on treatment of social indicators (Section 3.1.3): Naturland Fair Standard is a voluntary supplementary list of requirements that address premiums and trading relationships and is therefore assessed as "recommended" within the SSI economic criteria analysis.

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assessment and be in full compliance with these criteria.

120 The absence of explicit reference to a given SSI indicator within a standard document should not be interpreted as an indication that the issue is of no importance to the organization or that the issue is not addressed in other ways. IFOAM, for example, publishes a number of position papers expressing the benefit of organic production to matters of sustainable development. One such position paper discusses how organic production benefits gender equality, showing the importance of the issue to the organization. However, because there is no explicit reference to gender within the standard document, the SSI indicator "women's labour rights" is not covered within our assessment. See IFOAM (n.d.) for IFOAM position papers.

Appendix III Fisheries and Aquaculture Standards and Certification Schemes

Table III.1 Standards and certification schemes

Name	Type	Market orientation	Food safety	Animal health	Environment	Social	Food quality
Agriculture Biologique	Standard, label	Europe	✓	✓	✓ Organic		
Alaska Seafood Marketing Institute	Standard, certification scheme	Global	✓		✓		✓
Alter Trade Japan	Code, label	Japan			✓	✓	?
AquaG.A.P.	Standard, label	Global	✓	✓	✓	✓	✓
BioGro (New Zealand)	Standard, label	Global	✓		✓ Organic		
Bioland (Germany)	Label, certification scheme	Europe	✓	✓	✓ Organic		
Bio Suisse	Code, label	Switzerland	✓	✓	✓ Organic		
British Retail Consortium	Standard, label, certification scheme	Global	✓				✓
ChinaG.A.P.	Code, certification scheme	Global	✓	✓	✓	✓	✓
COC-certified Thai Shrimp, Thailand	Standard, label	Europe, United States	✓	✓	✓	✓	
Codex Alimentarius	Standard, code, guidelines	Global	✓				✓
Debio (Norway)	Label, certification scheme	United Kingdom, Europe	✓	✓	✓ Organic		
fair-fish	Standard, label	Switzerland		✓	✓	✓	
Fairtrade	Label	Global				✓	
Federation of European Aquaculture Producers Code of Conduct	Code	Europe	✓	✓	✓	✓	✓
Code of Responsible Practice for Fishmeal and Fish Oil	Code, certification scheme	Global	✓		✓		✓
Friend of the Sea	Standard, code	Global	✓		✓	✓	✓
Global Aquaculture Alliance Best Aquaculture Practices	Certification scheme, label	Global	✓		✓	✓	
The Global Partnership for Good Agricultural Practice	Standard, certification scheme	Global	✓	✓	✓	✓	✓
Iceland Responsible Fisheries	Standard, label, certification scheme	Global	✓		✓		✓
International Federation of Organic Agriculture Movements	Standard, label	Global	✓	✓	✓ Organic	✓	✓
Irish Quality Salmon and Trout	Code, label	Europe	✓	✓	✓ Organic		✓
ISO 22000	Standard	Global	✓		✓		✓
ISO 9001/14001	Standard	Global			✓		✓
La Truite Charte Qualité	Code, label	France, European Union	✓				✓
Label Rouge (France)	Code, label	France, European Union	✓				✓

Source: Adapted from FAO, 2011b.

Table III.1 Standards and certification schemes, continued

Name	Type	Market orientation	Food safety	Animal health	Environment	Social	Food quality
KRAV (Sweden)	Code, label	Europe	✓	✓	✓ Organic		
Marine Stewardship Council	Code, standard, label				✓		
National Association for Sustainable Agriculture, Australia	Code, label	Global	✓	✓	✓ Organic		
Naturland	Certification scheme, label	Global	✓	✓	✓ Organic	✓	✓
Norge Seafood from Norway	Standard, label	Europe			✓		
Norway Royal Salmon	Standard, label	Europe	✓	✓			✓
Safe Quality Food	Standard, label, certification scheme	Global	✓				✓
Scottish Salmon Producers' Organization Code of Good Practice	Code, label	Global	✓	✓	✓		✓
Seafood Watch	Code, label	United States			✓		
Pêche Responsable Carrefour (France)	Code, label	Global			✓		
Qualité – Aquaculture de France	Standard, label	France, European Union			✓		✓
Quality Certification Services	Label, certification scheme	Global	✓				✓
Shrimp Quality Guarantee, Brazilian Association of Shrimp Producers	Code, label, certification scheme	United Kingdom, Europe	✓	✓	✓	✓	✓
Shrimp Seal of Quality (Bangladesh)	Standard, label	Global	✓		✓	✓	✓
SalmonChile Integrated Management System	Label, certification scheme	Europe, United States	✓	✓	✓		✓
Soil Association	Standard, label	United Kingdom	✓	✓	✓ Organic	✓	✓
Thai Quality Shrimp	Standard, label	Europe, United States	✓				✓
Seafish Responsible Fishing Scheme	Code, certification scheme	United Kingdom			✓	✓	
VietG.A.P.	Label, guidelines	Europe, United States, Japan	✓	✓	✓	✓	✓
World Organization for Animal Health	Standard, code, guidelines	Global	✓	✓			

Appendix IV SSI Indicator Coverage across Wild Catch Standards

Table IV.1 Environmental indicator coverage, wild catch, from highest to lowest

Index	Indicator	Average coverage of indicator
Biodiversity	Management of non-target species (bycatch)	100%
Ecosystems	Prohibition of destructive fishing practices	100%
Ecosystems	Stock regulation	92%
Ecosystems	Environmental risk and impact assessment	92%
Ecosystems	Illegal, unreported and unregulated fishing: fishing vessels in legal compliance	67%
Ecosystems	Minimization of "ghost fishing"	58%
Waste and water management	Waste management plan	58%
Waste and water management	Water pollution	58%
Biodiversity	Habitat set-asides	50%
Waste and water management	Waste disposal	33%
Greenhouse gas and energy	Energy use management	33%
Greenhouse gas and energy	Energy use reduction	8%
Greenhouse gas and energy	Greenhouse gas accounting	8%
Biodiversity	Monitoring and protection of high-conservation-value areas	0%
Greenhouse gas and energy	Greenhouse gas reductions	0%

Table IV.2 Social indicator coverage, wild catch, from highest to lowest

Index	Indicator	Average coverage of indicator
Community involvement	Community consultation	83%
Labour rights	Worst forms of child labour	50%
Human rights	Access to medical care for workers' families	50%
Workers' health and safety	Safety at work	50%
Labour rights	Forced labour	33%
Labour rights	Freedom of association	33%
Labour rights	Non-discrimination	33%
Labour rights	Collective bargaining	33%
Labour rights	Equal remuneration	33%
Employment conditions and benefits	Treatment of part-time and seasonal workers	33%
Employment conditions and benefits	Timely payment of wages	33%
Employment conditions and benefits	Maximum number of working hours	33%
Human rights	Access to education for workers and/or their families	33%
Human rights	Access to housing and sanitary facilities	33%
Labour rights	Women's labour rights	33%
Workers' health and safety	Healthy working conditions	33%
Workers' health and safety	Access to safe drinking water at work	33%
Workers' health and safety	Access to sanitary facilities at work	33%
Workers' health and safety	Access to medical assistance at work	33%
Employment conditions and benefits	Pension and security benefits	33%
Labour rights	Minimum age	25%
Employment conditions and benefits	Written contracts for employees	25%
Employment conditions and benefits	Paid maternity, paternity and sick leave	25%
Community involvement	Local hiring	25%
Community involvement	Access to natural resources	17%
Workers' health and safety	Access to medical insurance at work	0%

Table IV.3 Economic indicator coverage, wild catch, from highest to lowest

Index	Indicator	Average coverage of indicator
Economic	Minimum wage	25%
Economic	Product quality	25%
Economic	Living wage	8%
Economic	Premiums	8%
Economic	Written contracts between buyer and seller	8%
Economic	Compliant with the Global Food Safety Initiative	0%

Appendix V SSI Indicator Coverage across Aquaculture Standards

Table V.1 Environmental indicator coverage, aquaculture, from highest to lowest

Index	Indicator	Average coverage of indicator
Waste and water management	Water pollution	100%
Synthetic inputs	List of prohibited antibiotics	100%
Biodiversity	Escapees	100%
Ecosystems	Responsible sourcing of aquatic animal feed	91%
Ecosystems	Disease management	91%
Ecosystems	Feed regulation	91%
Synthetic inputs	Prophylactic use of antimicrobials prohibited	88%
Synthetic inputs	Prohibition of genetic modification	82%
Waste and water management	Wastewater management	82%
Waste and water management	Waste disposal	79%
Synthetic inputs	Management plan for application of chemicals and veterinary drugs as recommended by a health specialist	76%
Waste and water management	Water-use management plan	73%
Biodiversity	Monitoring and protection of high-conservation-value areas	73%
Greenhouse gas and energy	Energy-use management	67%
Waste and water management	Waste management plan	67%
Ecosystems	Stocking density	55%
Biodiversity	Use of hatchery-raised seed	52%
Biodiversity	Prohibition of lethal predator control	48%
Ecosystems	Environmental risk and impact assessment	45%
Biodiversity	Habitat set-asides	33%
Greenhouse gas and energy	Greenhouse gas accounting	27%
Greenhouse gas and energy	Energy-use reduction	24%
Greenhouse gas and energy	Greenhouse gas reductions	3%

Table V.2 Social indicator coverage, aquaculture, from highest to lowest

Index	Indicator	Average coverage of indicator
Workers' health and safety	Safety at work	100%
Workers' health and safety	Healthy work conditions	94%
Human rights	Access to housing and sanitary facilities	94%
Workers' health and safety	Access to medical assistance at work	91%
Labour rights	Forced labour	79%
Labour rights	Collective bargaining	79%
Labour rights	Worst forms of child labour	76%
Community involvement	Access to natural resources	76%
Labour rights	Minimum age	73%
Labour rights	Non-discrimination	70%
Employment conditions and benefits	Maximum number of working hours	70%
Employment conditions and benefits	Written contracts for employees	67%
Workers' health and safety	Access to safe drinking water at work	67%
Workers' health and safety	Access to medical insurance at work	64%
Labour rights	Freedom of association	61%
Employment conditions and benefits	Treatment of part-time and seasonal workers	61%
Workers' health and safety	Access to sanitary facilities at work	58%
Human rights	Access to medical care for workers' families	55%
Community involvement	Community consultation	55%
Aquatic animal welfare	Welfare during transport	55%
Labour rights	Equal remuneration	52%
Aquatic animal welfare	Humane methods of slaughter	45%
Labour rights	Women's labour rights	30%
Human rights	Access to education for workers and/or their families	27%
Employment conditions and benefits	Paid maternity, paternity and sick leave	27%
Employment conditions and benefits	Timely payment of wages	24%
Employment conditions and benefits	Pension and security benefits	24%
Community involvement	Local hiring	21%

Table V.3 Economic indicator coverage, aquaculture, from highest to lowest

Index	Indicator	Average coverage of indicator
Economic	Minimum wage	79%
Economic	Living wage	39%
Economic	Product quality	27%
Economic	Written contracts between buyer and seller	12%
Economic	Compliant with the Global Food Safety Initiative	9%
Economic	Premiums	3%

Appendix VI Content Criteria of Aquaculture Standards Assessed by Species

Table VI.1 Average coverage by species of SSI environmental indices, aquaculture, from highest to lowest

	Synthetic inputs	Waste and water management	Ecosystems	Biodiversity	Greenhouse gas and energy	Total average
GLOBALG.A.P.	100%	100%	100%	93%	42%	87%
ASC pangasius	100%	100%	80%	60%	50%	78%
IFOAM	100%	100%	80%	73%	33%	77%
Naturland aquaculture	83%	87%	100%	80%	33%	77%
ChinaG.A.P.	92%	87%	100%	60%	17%	71%
ASC salmon	100%	60%	40%	60%	50%	62%
GAA BAP salmon	75%	100%	80%	47%	0%	60%
ASC tilapia	100%	40%	60%	60%	25%	57%
GAA BAP finfish/ crustaceans	75%	80%	60%	60%	0%	55%
ASC shrimp	50%	80%	73%	40%	25%	54%
FOS aquaculture	75%	47%	47%	40%	33%	48%
Index average	85%	78%	72%	58%	27%	64%

Table VI.2 Average coverage by species of SSI social indices, aquaculture, from highest to lowest

	Workers' health and safety	Labour rights	Human rights	Community involvement	Aquatic animal welfare	Employment conditions and benefits	Total average
Naturland aquaculture	67%	96%	100%	78%	100%	100%	90%
GAA BAP finfish/ crustaceans	83%	75%	100%	67%	100%	50%	79%
IFOAM	100%	71%	78%	11%	100%	100%	77%
GAA BAP salmon	100%	50%	67%	67%	100%	33%	69%
ASC pangasius	67%	88%	33%	100%	50%	67%	67%
ASC shrimp	100%	100%	33%	100%	0%	33%	61%
GLOBALG.A.P.	78%	29%	44%	33%	100%	28%	52%
ASC salmon	67%	88%	33%	67%	0%	50%	51%
ASC tilapia	67%	75%	33%	33%	0%	17%	38%
ChinaG.A.P.	100%	0%	67%	0%	0%	0%	28%
FOS aquaculture	39%	42%	56%	0%	0%	22%	28%
Index average	79%	65%	59%	51%	50%	45%	58%

Table VI.3 Average coverage by species of SSI economic indices, aquaculture, from highest to lowest

	Minimum wage	Living wage	Written contracts between buyer and seller	GFSI compliant	Premiums	Total average
ASC shrimp	100%	100%	100%	0%	0%	60%
ASC pangasius	100%	100%	0%	0%	0%	40%
ASC salmon	100%	100%	0%	0%	0%	40%
GLOBALG.A.P.	67%	0%	0%	100%	0%	33%
FOS aquaculture	100%	33%	0%	0%	0%	27%
IFOAM	100%	0%	0%	0%	0%	20%
ChinaG.A.P.	100%	0%	0%	0%	0%	20%
GAA BAP finfish/ crustaceans	100%	0%	0%	0%	0%	20%
GAA BAP salmon	100%	0%	0%	0%	0%	20%
ASC tilapia	0%	100%	0%	0%	0%	20%
Naturland aquaculture	0%	0%	33%	0%	33%	13%
Index average	79%	39%	12%	9%	3%	28%

Appendix VII Assurance, Responsiveness and Engagement Indicator Averages

Table VII.1 Indicator averages for assurance index across initiatives, from highest to lowest

Standard	Independence	Purity policy	CoC requirements	Auditor competency	Frequency and types of audits	ISEAL Assurance Code compliant	Total average
ASC	100%	100%	100%	100%	43%	50%	82%
MSC	100%	100%	100%	100%	37%	50%	81%
GLOBALG.A.P.	100%	100%	100%	100%	50%	0%	75%
Naturland	100%	100%	75%	75%	60%	0%	68%
IFOAM	100%	100%	75%	100%	20%	0%	66%
FOS	100%	100%	50%	100%	33%	0%	64%
GAA BAP	100%	100%	50%	50%	70%	0%	62%
IRF	100%	100%	100%	0%	27%	0%	54%
ChinaG.A.P.	33%	50%	75%	100%	60%	0%	53%
Total indicator average	100%	100%	75%	71%	42%	8%	66%

Table VII.2 Indicator averages for responsiveness index across initiatives, from highest to lowest

Standard	Group certification	Local auditors	Local indicator development: national or regional standards	ISEAL Impacts Code compliant	Incentives	Total average
ChinaG.A.P.	100%	100%	100%	0%	0%	60%
GLOBALG.A.P.	100%	100%	100%	0%	0%	60%
IFOAM	100%	100%	100%	0%	0%	60%
MSC	100%	100%	0%	100%	0%	60%
IRF	0%	100%	100%	0%	0%	40%
FOS	100%	0%	0%	0%	0%	20%
GAA BAP	100%	0%	0%	0%	0%	20%
Naturland	100%	0%	0%	0%	0%	20%
ASC	0%	0%	0%	50%	0%	10%
Total indicator average	78%	56%	44%	17%	0%	39%

Table VII.3 Indicator averages for engagement index across initiatives, from highest to lowest

Standard	Online documentation index	Existence of independent dispute settlement body	Stakeholder decision-making in standard-setting process	ISEAL standard-setting code compliant	Independently audited financial statements available online	Total average
MSC	78%	100%	100%	100%	100%	96%
ASC	89%	100%	100%	100%	0%	78%
IFOAM	56%	100%	0%	0%	100%	51%
GLOBALG.A.P.	56%	0%	100%	0%	0%	31%
FOS	33%	100%	0%	0%	0%	27%
ChinaG.A.P.	67%	0%	0%	0%	0%	13%
GAA BAP	56%	0%	0%	0%	0%	11%
IRF	44%	0%	0%	0%	0%	9%
Naturland	11%	0%	0%	0%	0%	2%
Total indicator average	54%	44%	33%	22%	22%	35%

Schweizerische Eidgenossenschaft
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Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
State Secretariat for Economic Affairs SECO