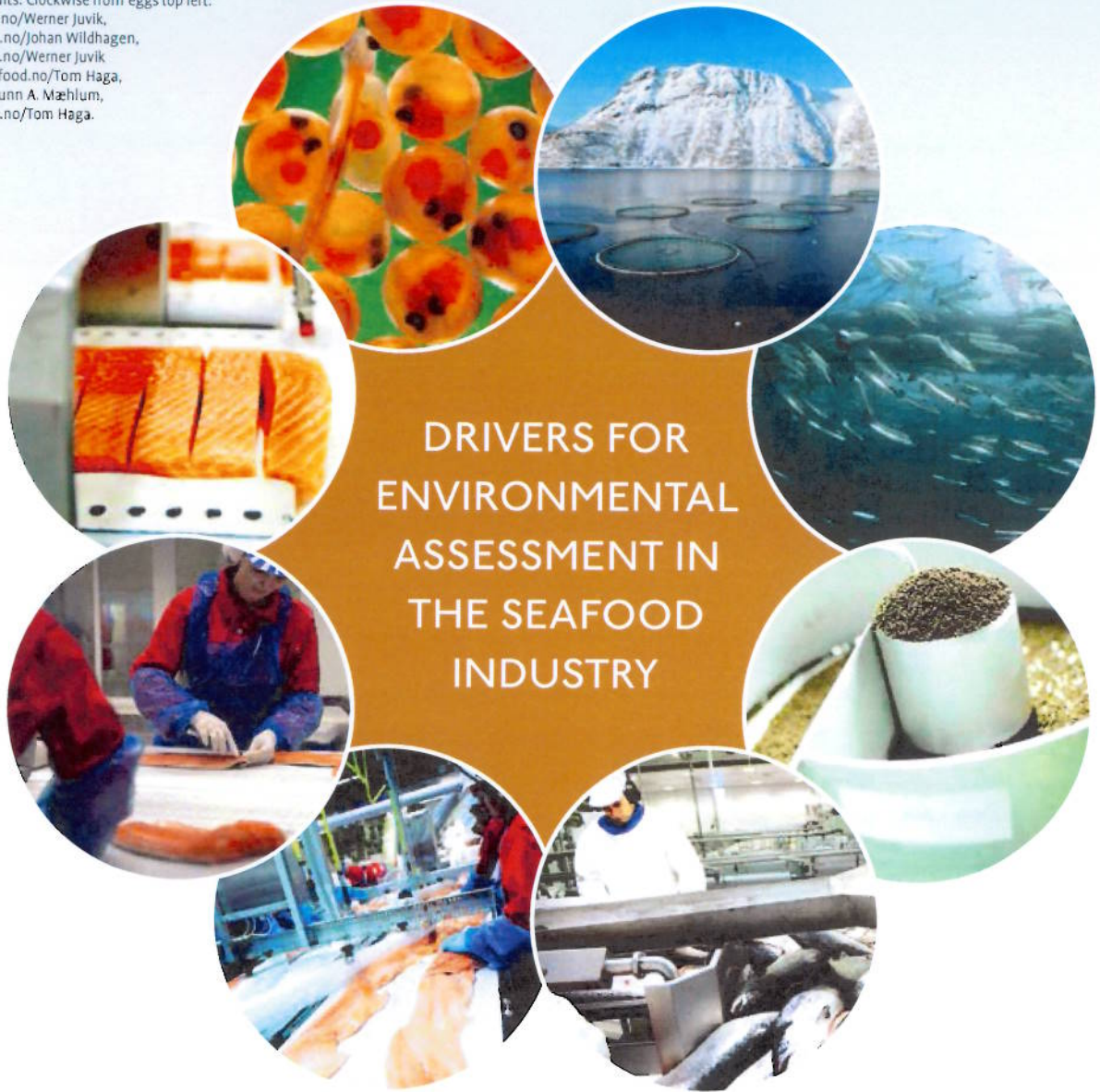


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Retailers, consumers, policy-makers and other stakeholders in the seafood industry expect seafood producers to be able to provide documentation of the environmental footprint of their products. This is already happening for individual parts of the value chain, e.g. the salmon farm, but now the requirements start to include documentation of the sum of environmental impacts from the complete seafood production system, from extraction of raw materials until the product is delivered to the consumer. Life Cycle Assessment is an established and standardised method to book-keep environmental impacts that a product causes throughout its life cycle. This article presents some of the important sources of demand for environmental documentation in a LCA perspective and standards used to fulfil this demand.

Photo: seafood.no/ Norwegian Seafood Council





Introduction to LCA

Life Cycle Assessment (LCA) is a holistic method assessing a broad set of environmental impacts of a product's entire production system, all the way from extraction of raw materials through production, distribution, use and end of life treatment. This way LCA can help to avoid replacing one type of environmental impact for another. Some types of impacts are global (e.g. climate change and ozone depletion), while others are more regional or even local. LCA keeps track of how changes in the production system might change both location for the environmental impact and/or type of environmental impact. An LCA that only assesses the potential climate impacts is called a "GHG assessment" and its result a "carbon footprint".

The life cycle perspective means that the producer has to be able to quantify environmental impacts not just from their own activities but also from the production, distribution and end of life treatment of both operational and capital expenses (upstream processes) and finally from the distribution, use and end-of-life treatment of their product (downstream processes). For feed and salmon producers this will involve collecting data from growing of crops, fishing, transport and oil and meal processing; often originating from a range of different geographical locations and technologies. For the fish exporter it will mean that data have to be collected all the way from fishing, feed and smolt production, grow-out, processing and transport of the seafood product.

The LCA assessment includes a big amount of data to be able to keep track of a complementary set of environmental impacts from extensive production systems. This makes available and transparent LCA databases a necessity to make LCA an applicable tool. Just as an economic assessment, the LCA also includes several methodical choices that can colour the results. This makes it necessary to use and develop standards that ensure that the assessment produces trustworthy and transparent results.

Standards

Standards only employ changes once they are used in a certification scheme or as a part of the request by a retailer or legislation. Standards are merely a transparent way of producing and defining requirements. Several standards exist for LCA and GHG assessments of products and business.

The international standardization organization (ISO) have the most widely used standards for LCA in their ISO 14000 family for environmental management. An environmental management system is a necessity to organize and monitor active strategies to reduce the environmental footprint of a business and its products. Thus good environmental management is a request from both employees and external stakeholders. The ISO 14000 standards range from how an environmental management system should be built and operated to how LCA should be performed, used and communicated. The newest member to this family is the ISO 14 067 specifying principles, requirements and guidelines for the quantification and communication of the carbon footprint of a product. The ISO 14 000 standards have

formed the basis for many sector and/or impact specific standards.

The World Resources Institute (WRI) and the World Business Council on Sustainable Development (WBCSD) developed their "GHG protocol standards" for GHG assessment of businesses (activities) and products. The corporate standard offers methodologies for business and other organizations to quantify and report GHG emissions from their business activities and operations. The products standard enables companies to measure the greenhouse gases associated with the full life cycle of products including raw materials, manufacturing, transportation, storage, use and disposal. These standards are accompanied with guidelines, tools and datasets to facilitate the assessments.

One important driver for the use of the GHG protocol standards is the Carbon Disclosure Project (CDP) that motivates big companies to require that their suppliers disclose their impacts on the environment and their actions to reduce them according to the GHG protocol standards. In addition, investors commit to require CDP reporting from their investment objects. Today this mass of investors represent US\$87 trillion in assets. The aquaculture company Marine Harvest is one major company reporting to the CDP.

The British Standards Institute developed a publically available specification for GHG assessment of goods and services, the PAS 2050. This guideline is today one of the most applied standards for GHG assessment and products globally. The PAS system is now developing supplementary requirements for specific products and in 2012 a specification for the use of PAS 2050 on seafood was released, the PAS 2050:2. Similarly Standards Norway developed NS 9418, containing specifications of the ISO standards for carbon footprint of seafood products.

Sustainability initiatives

Retailers who want to brand themselves as sustainable must ensure that the products they sell come from a sustainable production. A premise for that is that the producer has a well-established and operating environmental management system. Global initiatives with members from both retailers and producers are developing reporting methods that capture the different environmental aspects of the products. In addition, governments look at reporting as an efficient tool to drive environmental improvement, e.g. the French government suggested that their new environmental law, the "grenelle 2" should request that consumer products carry an LCA-based environmental product declaration.

The Sustainability Consortium (TSC) is a global organization to improve consumer product sustainability by building a scientific foundation for developing criteria for environmental, social and economic sustainability for consumer products. More than 100 of the world's largest producers, retailers and their organizations are represented in TSC.

The TSC has developed a Sustainability Measurement & Reporting System, for finding hotspots and related improvement opportunities in the products value chain.

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The process starts with using LCA studies to produce a sustainability profile for the product category. From this profile Key Performance Indicators (KPI's) that define performance levels for social, environmental and economic sustainability. Participating companies choose to join the consortium e.g. to facilitate setting joint social and environmental goals, so that both suppliers and buyers have the same specific measurable objectives to work against. The sustainability consortium originated in the US and initiated by Walmart, but now TSC also have offices in Europe and European members such as the retailer Royal Ahold.

Under the product sector Food, Beverage & Agriculture, farmed salmon is included. The KPIs coupled to farmed fish focus on the feed use, due to greenhouse gas emissions, overfishing and land use in farming and fishing of the raw materials used in the feed. The inclusion of various activities coupled to fish feed production as hotspots in the life cycle of farmed fish in the TSC framework is a strong reason to investigate the environmental impact of salmon feed further, as a routine for salmon farmers and feed suppliers. Working continuously with LCA will facilitate the mapping of the environmental footprint of the salmon feed and resulting salmon products.

The European Food Sustainable Consumption and Production Round Table is an initiative driven by organizations representing the entire food industry in collaboration with the European Commission, to build a science-based approach for the development of sustainability along the food chain in Europe. The goal is to promote sustainable consumption and production of food where focus is on developing a protocol that ensures correct and reliable information on environmental impacts throughout the value chain, including communication to the consumer.

In November 2013 the round table published the ENVIRONMENTAL assessment of FOODS and DRINKS (ENVIFOOD) protocol that is a scientifically reliable, practical and harmonised methodology for the environmental assessment of food and drink products. It represents an intermediate step between the ISO standards for LCA, the European Commission's Product Environmental Footprint Guide and product-specific rules.

The ENVIFOOD protocol is not a standalone document for environmental assessment of all food products, but indicates areas where further sub-sectorial and more specific guidance is needed. When claiming compliance with the protocol, such sub-sectorial methodologies, have to be checked against the protocol by a third party reviewer. During the past year, a draft version of the ENVIFOOD protocol has been tested by more than 20 companies, e.g. in the EU project WhiteFish, to evaluate if modifications were necessary. These tests form the foundation for further testing of the Product Environmental Footprint (PEF), an LCA-based methodology for measuring a product's environmental footprint, developed by the Joint Research Centre of the European Commission. This forms the basis for a harmonized method for environmental assessment of products to be used within the European Union



Photo: Erik Skontorp Hognes

Seafood certification

Environmental certification schemes, and the eco-labels that accompany them, often contain LCA related requirements. The aquaculture stewardship council (ASC) certification standard for salmon was finished in 2012 and is well received by the salmon industry. The Global Salmon Initiative, representing more than 70% of global salmon production, has stated that all their members should be ASC certified before 2020. The Salmon ASC certification mainly sets requirements on the farm site and its direct environmental impacts, but also contains requirements on the inputs to the farming process. The fourth principle of the salmon ASC on the use of resources in an environmentally efficient and responsible manner includes criteria that require the farmer to know the exact composition and origin of the feed and its ingredients and to make sure that they are sourced in a responsible and sustainable manner. It is also a current requirement to do a complete energy and GHG assessment of the farm activities and from 2015, a complete GHG assessment of the feed will also be required.

The energy and GHG assessment of the fish farm should be performed according to the GHG Protocol Corporate Standard or ISO 14064-1 for quantification and reporting of greenhouse gas emissions and removals. These standards require that the assessment include emissions from sources that are owned or controlled by the farming company (Scope 1) and emissions from the generation of purchased electricity, heating and cooling (Scope 2). Emissions from other commodities and infrastructure that underpin the corporate activity (Scope 3) is voluntary. Within 3 years of the publication of the salmon ASC the feed used at the farm must also be documented with a cradle-to-gate GHG assessment of the feed: From fishing/growing, harvesting, processing and transportation of raw materials (vegetable and marine raw materials) to the feed mill and processing at feed mill and finally transports.

Retailer requests

To investigate retailer requirements to LCA based data from their suppliers a selection of retailers were contacted: the three largest retailer chains in Sweden ICA, Coop and Axfood in Sweden.

All retailers contacted have their own policies for sustainable fish and seafood products, including farmed



fish/seafood products. The main driving force to work for sustainable fish products is to fulfill their policy statements for responsibility rather than to act on customer demands.

The three retailers use their own developed reporting standards and have a continuous dialogue with their seafood suppliers. To consumers, they mainly communicate sustainability in relation to wild caught fish products through labels like MSC or KRAV (Swedish eco-label). The most important sustainability issue for wild caught fish is a responsible utilization of fish stocks. The WWF seafood guide is followed to a large extent in the retailer's range of products. Their fish policies are also communicated on their websites and they use criteria based claims in communication with suppliers. Also when it comes to farmed fish/seafood products the system perspective is important and claims on ecosystem friendly fish farming are used in procurement. The most important claims are sustainability/responsible sourcing of the feed, farming ecology and antibiotic use. In case where ASC certification is applicable on farmed fish products, the retailers ask for it. All the Swedish retailer actors also endeavor to offer eco labeled farmed seafood products in their product range.

One of the global retail chains, Tesco, works besides their own fish policy standard and code of practice, also through the **Sustainable Seafood Coalition** to ensure transparency and consistency when communicating sustainability to their customers. Their codes of practice are independently audited. Their sustainability codes of practice on farmed fish/seafood include impact on water quality, sustainability/responsible sourcing of feed including both marine and vegetable content. Also issues of feed conversion and use of alternative feeds to ensure sustainability are included. The retail chain has suppliers approved to ASC certification but do not accept it alone since ASC does not cover areas as welfare and food safety in detail. Instead they accept e.g. ASC together with Global G.A.P. The retail chain also consider their own standard to have tight environment and ethical requirements and therefore other certification claims will probably not be implemented since it would add on costs.

To conclude, for the time being retailers only ask for the environmental information that is needed to comply with the certifications used. Requirement of documentation of environmental impacts using LCA will be required if incorporated into the certification systems, as is currently being done both within the ASC and KRAV/Debio. However, the producer today

being able to deliver documentation of environmental impacts based on detailed LCA or knowledge gained from LCAs certainly has a competitive advantage over competitors not being able to deliver this information about their products. In addition, performing LCAs usually identifies improvement options that lead to more efficient production both in environmental and economic terms and hence cost savings, which also contributes to increased competitiveness.

Conclusions

Retailer, consumers, policy-makers, investors and employees expect the seafood industry to document and communicate the environmental properties of their products and a to show proof of holistic environmental management system to identify improvement options and monitor progress on the reduction of their environmental footprint. It is also expected that this documentation, which is increasingly incorporated into seafood certification systems used by retailers, should be produced with recognized, standardized, transparent and auditable methodology such as Life Cycle Assessment.

To be able to fulfill this, seafood producers need to become familiar with the LCA methodology and its accompanying standards and tools. The strength of LCA lies in it being a recognized tool for a holistic environmental management of products with a value chain perspective. The holistic properties, however, also cause challenges: An LCA includes data on material and energy use and emissions from the whole life cycle of the product, all the way from extraction of raw materials and until consumption. To be able to cope with this without unrealistic costs the seafood industry has to cooperate to build databases for common processes and to build tools. The seafood industry also needs to build up their own competence in the LCA methodology to be able to participate in the arenas where LCA related requirements and standards for seafood are developed and discussed. The LCA methodology also contains methodological choices that influence the results considerably. Proper use of LCA results and knowledge is dependent on an understanding of the basic LCA methodology and its limitations and possibilities.

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Addendum to the article on Measuring biofouling: A practical approach for including fouling into numerical net models

The September 2013 edition of *Aquaculture Europe* (Volume 38 (2)) contained an article entitled "Measuring biofouling: A practical approach for including fouling into numerical net models" – on pages 22-24.

However, the authors of the article were not listed. They are therefore provided here.... **Full title:** Measuring biofouling: A practical approach for including fouling into numerical net models

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