Aquaculture is crossing a threshold into uncharted waters. Pressure on wild catch, and the world’s insatiable demand for protein means that new waters beyond the confines of relatively benign near-shore fish farming facilities must be found. As pioneering projects in Norway and elsewhere take to offshore waters, DNV GL has issued a new research paper exploring the risks and opportunities associated with offshore aquaculture – and stands ready to help.

Much is expected from aquaculture production in the coming decades. In order to fulfil these expectations, the industry needs both to develop existing segments and to cultivate new ones. This short article gives you a flavour of some of the possibilities and challenges associated with offshore aquaculture that we cover in our recently-released position paper.

Offshore aquaculture is still something of a novelty, with existing ‘offshore’ developments falling more into the category of exposed areas rather than fully offshore. Development and knowledge-building are needed in several fields for the available deeper water opportunities to be realized.

“There is a truly massive, unused potential for producing healthy marine proteins in a sustainable way,” says Ingunn Midttun Godal, Global Manager, Food & Beverage, DNV GL. “Part of what makes this attainable now is the digital transformation taking place in the food industry in general, and digital technologies are making new concepts attractive and possible also in aquaculture onshore, near shore and offshore.”

Ingunn sees DNV GL contributing in at least three ways to developments in offshore aquaculture: “Through our technical expertise across the offshore, maritime, aquaculture and other ocean industries; through our wide-ranging industry knowledge from the food & beverage industry, and through our digital competencies and services including Veracity.”

By Ole-Andreas Flagstad and Harald Tvedt

Ole Andreas Flagstad
A senior researcher in DNV GL’s central R&D unit, he is currently working full time on our Ocean Space programme. Holds an MSc in energy efficiency NTNU, Thermodynamics and a DEA from Université de Perpignan. He has participated in DNV GL’s executive technology programme, TopTech, at the University of California Berkeley.

Harald Tvedt
Harald has several years’ experience related to aquaculture. Currently working largely with environmental risk and oil spill response, Harald is still involved in aquaculture-related activities. He has a PhD in Marine Science from University of New Brunswick, an MSc in Aquaculture from College of Fishery Science, Tromsø, Norway and an engineering degree from Bergen College of Engineering.
“Our position paper on offshore aquaculture is the first delivery from our strategic research programme “Ocean Space”. As DNV GL we are closely connected with research and academia in this area, and are investing in building new knowledge and qualifying new technologies for a safe and sustainable food production in the aquaculture industry.”

IN OUR VIEW, KEY POINTS TO TACKLE INCLUDE:

Fish health
Success depends on having the knowledge and ability to ensure good fish health and fish welfare. New knowledge needs to be acquired in parallel with testing under real-life conditions. DNA-knowledge and new breeding technologies will be key in developing robust species that are suited to these new, more challenging and harsh environments - starting with the six species highlighted in our report: salmon, sea bream, barramundi, cobia, sea bass and Bluefin tuna.

Safety
There is growing recognition that the aquaculture industry needs to develop its safety regimes in tandem with moving into tougher conditions. This is not only relevant for people, but also applies to fish and structures. Extrapolating from knowledge obtained via the oil and gas sector is one aspect, another is to ensure seamless regulation regimes. Barrier management is an example of a method that is expected to become increasingly important as more proactive work has the potential to mitigate greater consequences when the industry moves further out.

Collaborative innovation
Novel concepts and technologies will provide the infrastructure and tools essential for the economic viability of large-scale offshore aquaculture. These innovations will also enable offshore aquaculture by mitigating offshore risks, for example by removing people from (parts of) operations.

Data-driven technologies are key: monitoring, automation, and analysis are aspects of digitalization that have the potential to transform the aquaculture industry, which is not immune to the digital disruption affecting other industries. Clean water is always needed, and improved recirculation technologies will further advance the industry, but which segments of aquaculture will gain most advantage from this progress remains to be seen.

Technology qualification and standards developments greatly help to progress and implement new concepts and technologies. As a trusted, independent technical advisor, DNV GL runs more joint industry projects in the industries it serves that any other organisation, and assists in this regard with offshore aquaculture - not least in aspects of digitalization, where our open industry data platform, Veracity, may play a role.

Says Lars Sørum, director of Food & Beverage in Region Northern Europe, DNV GL, “We are currently engaging ourselves with the industry and regulators to embark on a digital journey, starting from data maturity assessments and data quality management and evolving into Advanced Data Analytics for the aquaculture industry. Our pilot projects have shown that, done correctly, key risks like mortality and lack of feed efficiency can be managed.”

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Sustainability

Sustainability throughout the supply chain is required for public acceptance to grow. At one end, feed is a critical input factor and sourcing alternative protein production is a prerequisite for sustainable growth in aquaculture. At the consumer end, transparency tools and practices are required to communicate and verify the sustainability efforts performed. Certification regimes will contribute towards this by improving today’s standards and driving the industry forwards.

DNV GL is actively working with the food industry to ensure safe and sustainable food along the food supply chain.

Enabling regulatory environment

Going offshore with aquaculture is about pushing limits. Regulations from near-shore to full-offshore locations should be coordinated to establish a predictable and complete regime. National regulatory actors should cooperate and interact with relevant international bodies to develop one set of regulations covering structures, people, and fish. Good governance is the foundation for stable and long-term marine aquaculture growth.

Agenda 2030

We believe that making a success of aquaculture should be firmly part of the global development agenda. There are many ways in which the industry could make a real and permanent contribution to the realisation of the UN Sustainable Development Goals (SDGs). The relevance to Global goal #14 – “Life Below Water” is straightforward, as is the contribution to ending hunger (Goal #2). But potential for growing linkages between successful large-scale offshore aquaculture and smaller-scale, often remote community-based suppliers and customers should not be overlooked, and could be critical for the fulfilment of many of the targets under SDG #8 that relate to coastal communities and their sustaining ecosystems.