

UDC: 341.225(739.8)(481.7)(045)

DOI: 10.37482/issn2221-2698.2021.42.122

The Blue Economy in the Arctic Ocean: Governing Aquaculture in Alaska and North Norway*

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Abstract. In the Arctic, the concept of the blue economy is increasingly dominating discussions on regional development. This entails utilising the region's ocean-based resources in a sustainable way — both from a global and local level, as well as from an environmental and economic perspective. A crucial aspect in this development is how blue activities are regulated. The UNCLOS-regime plays a vital part in providing the mechanisms and procedures for states to manage marine resources more broadly. However, the predominant mode of governance for Arctic maritime activities will remain unilateral management by each of the coastal states. Thus, the national and local legal and political framework needs to be mapped. In this article we will explore and explain how aqua-/mariculture is governed in the United States (Alaska) and Norway (North Norway). This will be done by examining how parameters for blue economic projects are defined and determined at the international, regional, national and local governance level. Thus, our article will illustrate the complexity behind the blue economy. There is no such thing as one blue economy and no such thing as one Arctic, but it is still possible to find common ground and avenues for knowledge and best practice exchange. By this we will bring the academic and political discussions about the blue economy on the right track.

Keywords: *blue economy, Arctic, law of the sea, aquaculture, mariculture, sustainable development, governance.*

Introduction

Over the last two decades, retreating sea ice, changing distribution of marine natural resources, and demand for the same resources have combined to create a 'perfect storm' for increased economic interests in the Arctic region. With the rapid changes underway across the Circumpolar North, questions are being asked about both the sustainability and profitability of northern economic ventures, together with conditions for local and regional development [1, Nymand Larsen J., p. 4]. Today's political Arctic agenda is not only occupied by questions on how to sustainably manage regional resource exploitation and extraction but increasingly also on how to best govern emerging disputes among the various industries involved.

It comes an allegedly new concept, involving every aspect of national and global governance, economic development, environmental protection, sustainability and international communication: *blue economy* [2, Wenhai L., Cusack C., Baker M., Tao W., Mingbao C., Paige K., Xiaofan

* For citation: Raspotnik A., Rottem S.V., Østhagen A. The Blue Economy in the Arctic Ocean: Governing Aquaculture in Alaska and North Norway. *Arktika i Sever* [Arctic and North], 2021, no. 42, pp. 122–144. DOI: 10.37482/issn2221-2698.2021.42.122

Z., Levin L., Escobar E., Amon D., Yue Y., Reitz A., Neves A.A.S., O'Rourke E., Mannarini G., Pearlman J., Tinker J., Horsburgh K.J., Lehodey P., et al., p. 3]. Recently, the term 'blue economy' has come into widespread use to describe sustainable uses of ocean resources — an allegedly new catchphrase aiming to combine the apparently antithetic context of the oceans being areas of both growth and development, as well as threatened and vulnerable spaces in need of protection. The blue economy basically constitutes an evolution of ideas about sustainable economies, used to denote an expansion of economic wealth derived from the oceans and coasts in such a way as to maintain or improve the natural systems that various economies depend on [3, Voyer M., Quirk G., McIlgorm A., Azmi K.].

Although increasingly invoked by stakeholders and international organisations, as well as by national, regional and local governments to tackle both ocean-related opportunities and challenges, the clarity of both the term and concept remain vague, as do the steps required to achieve a balance of ecological and economic concerns in the practice of sustainable exploitation. While the term 'blue economy' has been globally embraced, it lacks substance and is often used by a broad variety of stakeholders who all attempt to sustainably manage the exploitation of a global marine environment under increased pressure. In addition, the similar term 'blue growth' increasingly shapes global policy processes that 'purportedly aligning the concerns of coastal communities, the environment and investors all at once' [4, Barbesgaard M., p. 145]. With the blue economy gradually moving from a 'largely discursive construct towards practical applications', also debates over the legitimacy of particular manifestations of the idea increase [5, Voyer M., van Leeuwen J., p. 102].

As the blue economy provides for many different and often conflicting meanings, it is necessary to delineate — step-by-step and case by case — every potential pillar of the blue economy to eventually unravel the mystery of what the blue economy is and could be. Particular ambiguity concern the implications of the term's vagueness on matters of ocean governance [6, Hadjimi-chael M.], relating to questions of the geographic (e.g. how does the concept interact with land-based management systems) or the sectoral scale of the concept (e.g. which industries are considered *blue*, which one not and how are marine interactions between various stakeholders governed) [3, Voyer M., Quirk G., McIlgorm A., Azmi K., p. 599]. Similarly, the concept's questioned legitimacy is debated on three levels — at the scale of an individual project or activity, of an entire sector or use, or at the overall conceptual level [5, Voyer M., van Leeuwen J., p. 102].

These on-going debates form the departure for the analysis on hand. However, by providing an overview mapping of the current status of regulations and systems governing the blue economy in Alaska and North Norway and analysing related consequences for intra-Arctic cooperation, we will add another missing puzzle to global *blue* discussions. An overview and analysis of this kind is a precondition for identifying areas for improvements; be they a lack of adequate regulations in certain areas, inconsistencies between or within current regulations, or a lack of consistent implementation and uniform enforcement of rules. In the following, we will provide a case

study on the current governance architecture for the blue economy, in the context of aqua- and mariculture in Alaska and North Norway. We then employ a comparative methodology based on these specific case-studies, in order to draw wider lessons concerning the blue economy in an Arctic context. We will start by briefly discuss the term/concept 'blue economy' as an emerging idea of how to sustainably — from both an ecological and economic understanding — manage and use the world's oceans and its resources. Then we turn to an analysis of the existing legal and policy frameworks at national, regional and international levels in order to unravel some complexity behind the blue economy in one specific case study.

The Blue Economy: A New Sustainable Catchphrase?

The global oceans are not only vital for human wellbeing as climate-regulator and oxygen producer (through the plants such as phytoplankton, kelp, and algal plankton that live in it), they also provide invaluable ecosystem services, contribute to global food security, and offer opportunities for economic growth and development¹. Valued at 1,5 trillion USD in 2010 — about 2,5% of the world's gross economic value — the economic value of the ocean outputs could be doubled by 2030, reaching over 3 trillion USD and approximately employing 40 million full-time jobs².

Over the past two decades, the 'blue economy' has slowly but steadily emerged as both a term and a concept to embrace the manifold economic opportunities associated with the ocean, while at the same recognising, accounting and — in some cases — addressing related threats of climate change, overfishing, pollution or habitat destruction [3, Voyer M., Quirk G., McIlgorm A., Azmi K., pp. 595–596]. Most often, the 2012 UN Conference on Sustainable Development (Rio +20) and its explicit focus on ocean-related challenges is considered the catalyst for a broader use of this relatively new term in the global environmental governance arena [7, Silver J.J., Gray N.J., Campbell L.M., Fairbanks L.W., Gruby R.L., p. 136]³. Essentially, the 'specification of 'blue' makes explicit the focus on oceans, as opposed to land-based resources' [8, Keen M.R., Schwarz A.M., Wini-Simeon L., p. 334]. As such, the term blue economy emphasis the multifaceted economic and social importance of the ocean (and inland waters) [9, Eikeset A.M., Mazzarella A.B., Davíðsdóttir B., Klinger D.H., Levin S.A., Rovenskaya E., Stenseth N.C., p. 178].

The blue economy is subject to multiple interpretations because of the coverage of activities, geographical locations and sectors involved. Thus, prior to the attention on the blue economy, or as part of it, is the question of what is the 'ocean economy'. Basically, ocean economic activities can be distinguished between established and emerging marine industries. As well as the traditional indus-

¹ OECD work in support of a sustainable ocean. URL: <https://www.oecd.org/ocean/OECD-work-in-support-of-a-sustainable-ocean.pdf> (accessed 29 February 2020).

² OECD, The Ocean Economy in 2030. URL: <http://dx.doi.org/10.1787/9789264251724-en> (accessed 29 February 2020).

³ The term blue economy emerged before and during Rio +20 in four prominent discourses on human-ocean relations, all representing different ways of approaching the ocean and its economic use: the ocean as natural capital; the ocean as good business; the ocean as integral to Pacific small island developing states; and the ocean as small scale fisheries livelihoods [7, Silver J.J., Gray N.J., Campbell L.M., Fairbanks L.W., Gruby R.L., pp. 143–149]

tries of shipping, capture fisheries, tourism, and marine recreation; there is now large-scale industrial activity associated with exploitation of offshore oil and gas, the harnessing of marine renewable energy, and aquaculture-based food production, as well as emerging new activities, such as ocean mining and marine biotechnology [10, Rayner R., Jolly C., Gouldman C., p. 2]. The blue economy, however, both encompasses ocean-based industries and the natural assets and ecosystem services that the ocean provides (for example, fish, shipping lanes, and CO₂ absorption) [10, Rayner R., Jolly C., Gouldman C., p. 2].⁴

Table provides an overview of the various blue economy sectors and activities.

Table 1

*Taxonomy of Blue Economy Sectors and Activities*⁵

Sector	Activity
Fishing	Capture fishery, Aquaculture, seafood processing
Marine Biotechnology	Pharmaceuticals, chemicals, seaweed harvesting, seaweed products, marine derived bio-products
Minerals	Oil and gas, deep-sea mining (exploration of rare earth metals, hydro-carbon)
Marine Renewable Energy	Offshore wind energy production, wave energy production, tidal energy production
Marine manufacturing	Boat manufacturing, sail making, net manufacturing, boat and ship repair, marine instrumentation, aquaculture technology, water construction, marine industrial engineering
Shipping, Port & Maritime Logistics	Ship building and repairing, ship owners and operators, shipping agents and brokers, ship management, liner and port agents, port companies, ship suppliers, container shipping services, stevedores, roll-on roll-off operators, custom clearance, freight forwarders, safety and training
Marine Tourism & Leisure	Sea angling from boats, sea angling from the shore, sailing at sea, boating at sea, water skiing, jet skiing, surfing, sail boarding, sea kayaking, scuba diving, swimming in the sea, bird watching in coastal areas, whale/dolphin watching, visiting coastal natural reserves, trips to the beach, seaside and islands
Marine Construction	Marine construction and engineering
Marine Commerce	Marine financial services, marine legal services, marine insurance, ship finance & related services, charterers, media & publishing
Marine ICT	Marine engineering consultancy, meteorological consultancy, environmental consultancy, hydro-survey consultancy, project management consultancy, ICT solutions, geo-informatics services, yacht design, submarine telecom
Education and research	Education and training, R&D

Today, the blue economy basically constitutes an evolution of ideas about sustainable economies used to denote an expansion of economic wealth derived from the oceans and coasts in such a way as to maintain or improve the natural systems upon which economic systems depend. As such, the very essence of a blue economy internalises the common understanding of sustainable development to meet the needs of the present without compromising the ability of fu-

⁴ OECD, *The Ocean Economy in 2030*. URL: <http://dx.doi.org/10.1787/9789264251724-en> (accessed 29 February 2020).

⁵ Roy Al *Blue Economy in the Indian Ocean: Governance Perspectives for Sustainable Development in the Region*. 2019. URL: <https://www.orfonline.org/research/blue-economy-in-the-indian-ocean-governance-perspectives-for-sustainable-development-in-the-region-47449/> (accessed 01 January 2020).

ture generations to meet their own needs. Essentially, it shares the idea that economic activities/growth are not antithetical to ecological conservation and sustainability but are rather complementary, or even reinforcing [11, Boonstra W.J., Valman M., Björkvik E., p. 341].

Although increasingly conceptualised in these multidimensional sustainable terms of growth and conservation, and accordingly invoked by governments, international organisations and relevant stakeholders to tackle both ocean-related opportunities and challenges, the clarity of the term/concept, as well as the implementation steps to achieve an ecologic-economic balance of sustainable maritime exploitation remain vague [8, Keen M.R., Schwarz A.M., Wini-Simeon L., p. 333]. Moreover, while some focus on the economic pillar of the term, e.g. with regard to the development of an innovative (marine) economy [12, Pauli G.A.], others tackle the management aspect and broadly focus on the sustainable development perspective and related blue growth considerations [8, Keen M.R., Schwarz A.M., Wini-Simeon L.; 13, Lillebø A.I., Pita C., Garcia Rodrigues J., Ramos S., Villasante S.; 14, Sarker S., Bhuyan M.A.H., Rahman M.M., Islam M.A., Hossain M.S., Basak S.C., Islam M.M.].

Generally, most definitions today emphasize environmental sustainability, economic growth and social equity, driven by an integrated oceans governance approach and technological innovation [3, Voyer M., Quirk G., McIlgorm A., Azmi K., p. 598]. This 'all-in-approach' has led to the blue economy being considered a rather fluffy concept — employed differently in different contexts and by different actors, depending on the respective need and economic activity; (too) often used to discursively support certain economic sectors, development initiatives, or conservation programs [7, Silver J.J., Gray N.J., Campbell L.M., Fairbanks L.W., Gruby R.L., p. 153]. Although the term closely interacts with other ocean governance tools such as marine spatial planning or ecosystem-based management, the blue economy essentially lacks established frameworks, guidelines or toolkits through which objectives can be developed, action plans implemented and assessment and monitoring programs devised [3, Voyer M., Quirk G., McIlgorm A., Azmi K., p. 599].

The very absence of both a clear definition, as well as related implementation frameworks and strategies, has led many international actors to progress with a broad range of actions all subsumed under a blue economy umbrella [15, Winder G.M., Le Heron R., p. 5]. Thus, the precise nature of the 'blue economy' and its related development strategies remain vague and basically a piecemeal process dependent on both the narrator of the blue economy development story and its related interests, as well as the economic sector and geographical location under analysis. Accordingly, the blue economy and framed development strategies (often) depict a competition among different users of the oceans in the production, distribution, and consumption of ocean-related projects [2, Wenhai L., Cusack C., Baker M., Tao W., Mingbao C., Paige K., Xiaofan Z., Levin L., Escobar E., Amon D., Yue Y., Reitz A., Neves A.A.S., O'Rourke E., Mannarini G., Pearlman J., Tinker J., Horsburgh K.J., Lehodey P., et al., p. 1].

As there is no common international agreement on what the blue economy could mean — either in principle or in practice — the eventual interpretation and implementation of what will be considered sustainably blue will operate within mismatches of the scale, power relations, objectives, values and worldviews of the actors involved [16, Garland M., Axon S., Graziano M., Morrissey J., Heidkamp C.P.; 5, Voyer M., van Leeuwen J., p. 102]. This might lead the blue economy to remain as an extension of a ‘new’ extractivism in ocean and coastal zones in which ad hoc planning authorities, poorly developed planning practices and overlapping, missing or fragmented jurisdictions compromise prospects for good governance in the name of a new *sustainable* oceans’ management approach.

Given this inherent terminological ambiguity, one wonders how the evolution of a new management and governance concept — the blue economy — can help improve the coexistence of industries in the *blue* space, such as aquaculture/mariculture, and thus provide a blueprint for dealing with competing interests, as these are only likely to increase in years to come. In order to unravel some of the inherent ambiguities of the term/concept ‘blue economy’, it is necessary to illustrate — step-by-step and case-by-case — every little aspect of the blue economy. In the following, we will provide an overview of the governance aspects of Arctic aqua- and mariculture, particularly in Alaska and North Norway. A detailed analysis of these elements allows for a better comparison of related challenges and opportunities and thus constitutes one piece of the blue economy puzzle. This will illustrate the complexity of the blue economy — as we showcase how there is no such thing as *one* blue economy and no such thing as *one* Arctic — and its relevance for specific parts of the Arctic.

Governing Blue Arctic Aquaculture/Mariculture

The Arctic is the ideal case to examine how a new concept with practical consequences — the blue economy — is being utilised and implemented. As a *blue* region, the Arctic has only recently risen to the foreground of the respective littoral states’ economic agendas. Always of importance to Arctic inhabitants (indigenous and non-indigenous alike), large-scale industrial ventures in the North have emerged over the last decades, in tandem with high prices for raw materials and the increased melting of the Arctic sea-ice. Moreover, marine resource activities such as aquaculture or fisheries have rapidly expanded in recent years, as Arctic fish stocks have expanded and/or ventured further north, while the global demand for fish products has skyrocketed. Consequently, the ‘blue economy’ has found its way into broader public debate over the past few years.⁶

Here we focus on a specific blue sector, namely aquaculture/mariculture⁷ — an industry that has undergone major global expansion over the past decades, often referred to as ‘blue revo-

⁶ Winther J.-G., Dai M., Douvère F., Fernandes L., Halpin P., Hoel A.H., Juinio-Meñez M.A., Li Y., Morrissey K., Rist T., Scarano F.R., Trice A., Unger S., Whitehouse S. Integrated Ocean Management. URL: www.oceanpanel.org/blue-papers/integrated-ocean-management (accessed 20 May 2020).

⁷ The word ‘aquaculture’ is normally used to describe the art, science and business of producing aquatic plants and animals; often also referred to as ‘mariculture’ [17, Roderburg J., p. 161]. However, globally, it is difficult to distinguish

lution' [17, Roderburg J., p. 161]. Fish farming is the fastest growing food producing sector, accounting for half of world seafood consumption⁸. Currently, three global developments increasingly affect aquaculture/mariculture in the Arctic and related economic considerations: climate change, technological development and global economic demand⁹. However, these changes have varying impacts on the region's blue economy due to the simple fact that the Arctic is not simply the Arctic but consists of many Arctics¹⁰. Thus, also the manifold blue economies of the Arctic vary with culture, bathymetry, politics, geology, currents and several other variables, which in turn create different levels of importance for the governance of economic activities.

In the following section, we examine the governance structures on various levels of relevance to the Arctic, starting with the international level, before turning to two parts of the Arctic that are markedly different while they also share many similarities concerning their dependence on, and potential for, blue economic activities, especially with regard to aqua-/mariculture: Alaska and North Norway¹¹.

International Law

As of today, no specific international aqua-/mariculture legislation exists. However, several legal instruments are directly or indirectly relevant for the development of the sector. First and foremost, all activities at sea are determined by the provisions of the United Nations Convention on the Law of the Sea (UNCLOS). Aquaculture is not outlined in UNCLOS, but its provisions on the protection and preservation of the oceans is broad and thus also include several aspects of aquaculture/mariculture.

First, we need to distinguish between the areas where fish farming can take place. Coastal states have sovereignty in the twelve nautical mile zone of the territorial sea, and this is where most aquaculture sites are. Thus, legislation concerning the sector is mainly national law. Second-

between mariculture and coastal aquaculture production with mariculture – as a broad term – generally referring to the cultivation of a wide variety of species of aquatic organisms, including both plants and animals. According to the UN's Food and Agriculture Organization (FAO), marine aquaculture (= mariculture) is practised in the sea, in a marine water environment, coastal aquaculture is practised in completely or partially human-made structures in areas adjacent to the sea, such as coastal ponds and gated lagoons, see FAO, *The State of World Fisheries and Aquaculture 2018 - Meeting the sustainable development goals*. URL: <http://www.fao.org/3/i9540en/i9540en.pdf> (accessed 29 February 2020). For this article, we use the term 'aquaculture' when discussing the North Norwegian case and 'mariculture' when referring to Alaska.

⁸ FAO, *The State of World Fisheries and Aquaculture 2018 - Meeting the sustainable development goals*. URL: <http://www.fao.org/3/i9540en/i9540en.pdf> (accessed 29 February 2020).

⁹ Raspotnik A., Østhagen A. and Colgan C.S., *Discussing the Blue Arctic Economy: A Case Study of Fisheries in Alaska and North Norway*. URL: http://www.research.kobe-u.ac.jp/gsics-pcrc/pdf/PCRCWPS/PCRC_12_Raspotnik.pdf (accessed 01 May 2020).

¹⁰ Despite often being publicly considered a homogeneous region, the Arctic entails many different regions: Arctic sub-zones that vary greatly in their physical geography, accessibility, climate and population [21, Raspotnik A., p. 36].

¹¹ Neither Norway nor the United States have distinct programs specifically targeted at promoting the concept of the blue economy; however, both countries are leaders in developing measurement of ocean economic activities [22, Colgan C.S.], see also Raspotnik A., Østhagen A. and Colgan C.S., *Discussing the Blue Arctic Economy: A Case Study of Fisheries in Alaska and North Norway*. URL: http://www.research.kobe-u.ac.jp/gsics-pcrc/pdf/PCRCWPS/PCRC_12_Raspotnik.pdf (accessed 01 May 2020).

ly, however, fish farms could be expected to be set up in offshore waters, in the Exclusive Economic Zone (EEZ) or in the high seas. Here states do not have complete sovereignty, but have the right to control and exploit natural resources and gives coastal states jurisdiction and sovereign rights over environmental matters, economic activity and scientific research.

In UNCLOS Art. 60 a coastal state is given the right to construct 'installations and structures'. Although this term is not defined, aquaculture facilities are likely to qualify as structures in this context [17, Roderburg J., p. 169]. Furthermore, in its continental shelf zone coastal states are not granted an exclusive right to build structures. Thus, one could argue that other states may set up aquaculture sites without the coastal states' permission. While due regard shall be paid to the interest of other states, one could also argue that the construction of aquaculture sites constitutes a part of the freedom of the high seas. UNCLOS also addresses environmental law by underscoring the importance of securing the seas from pollution and conserve them as a source of food. However, the requirements set by UNCLOS are often described as weak leaving legislative gaps, also in the aquaculture sector. The expansion we have seen in this sector since states agreed on UNCLOS in 1982 has revealed gaps in the legal regime [17, Roderburg J., p. 174].

Moreover, the expansion in international environmental regulation has had consequences for the aquaculture industry. The 1992 Rio Conference on Environment and Development is considered a watershed event in international environmental politics. It was during this period the UN-appointed World Commission on Environment and Development launched the versatile concept of sustainable development, a term that also play an important role in the debate on the growth in aquaculture. At the 1992 summit the Convention on Biological Diversity (CBD)¹² evolved, which relates to elements of aquaculture, e.g. the introduction of alien species and other externalities. Furthermore, as part of the implementation of the CBD the Jakarta Mandate of 1995 calls for sustainable aquaculture operations, including the use of local rather than alien species in fish farming¹³. The work under CBD has continued having aquaculture on its agenda, but without leading to legal binding regulations in this issue area.

Additionally, also the UN's Food and Agriculture Organization (FAO) has played an important role as knowledge sharer and by formulating international rules and standards on aquaculture. In 1997, the Code of Conduct for Responsible Fisheries (hereinafter, the Code)¹⁴ included a section on aquaculture. The intention was to create a template for domestic regulations. The Code is, however, voluntary and does not create any legal obligation. Moreover, FAO has also drafted technical guidelines for aquaculture development and certification [24, FAO]¹⁵. Over the past decades, also intergovernmental organizations have addressed aquaculture planning. In that regard, Regional Fisheries Bodies (RFBs) have an important role to play, e.g. the North Atlantic

¹² Convention on Biological Diversity. URL: <https://www.cbd.int/> (accessed 28 October 2020).

¹³ The Jakarta Mandate. URL: <https://www.cbd.int/doc/publications/jm-brochure-en.pdf> (accessed 28 October 2020).

¹⁴ Code of Conduct for Responsible Fisheries. URL: <http://www.fao.org/3/v9878e/v9878e00.htm> (accessed 28 October 2020).

¹⁵ FAO International Guidelines. URL: <http://www.fao.org/fishery/code/guidelines/en> (accessed 28 May 2020).

Salmon Conservation Organization (NASCO). It has among others adopted measures to protect wild stocks from the effects of aquaculture, for example by pushing member states to implement action plans to reduce the escape of farmed fish¹⁶. Yet, similar to the work of FAO, these guidelines are not mandatory. The Convention for the Protection of the Marine Environment of the North East Atlantic (OSPAR Convention) has also initiated measures affecting aquaculture. The most important is PARCOM Recommendation 94/6 on 'Best Environmental Practice for the Reduction of Inputs of Potentially Toxic Chemical from Aquaculture Use'¹⁷. Moreover, several other international arrangements have direct or indirect relevance for the aquaculture sector, e.g. World Trade Organization, World Organisation of Animal Health, Convention on International Trade in Endangered Species of Wild Fauna and Flora and Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean.

Turning to the Arctic specifically, it is worth mentioning that the Arctic Council (AC) is yet to develop guidelines and best practices on aquaculture, but measures have been discussed. The AC is, however, engaged in numerous projects, directly or indirectly concerning the use of Arctic waters and thus aquaculture¹⁸. For Norway, the economic arrangement with the EU — the Agreement on the European Economic Area (EEA) — imposes several legal obligations. In that regard, legislation on veterinary inspection, aquatic animal health and food hygiene being to most important regarding aquaculture. Lastly, certification of aquaculture products has played an increasingly prominent role in 'governance' of this increasingly important industry. As such, *Friend of the Sea* runs a certification programme for sustainable aquaculture and in 2011 the World Wildlife Fund launched *The Aquaculture Stewardship Council* which created an eco-label for farmed seafood.

National and Local Framework Alaska

In Alaska, mariculture is a relatively new but developing sector [25, State of Alaska]. While fish farming in Alaskan waters is prohibited, the farming industry of aquatic plants and shellfish has been thriving and rapidly increasing, with the State of Alaska having set up a process for the permitting of aquatic farms [18, Kim J.K., Stekoll M., Yarish C., p. 451]. For 2016, the overall sales of shellfish and aquatic plants for all permitted operations, including seed suppliers totalled 1,2 million USD. Approximately 29 (32%) of the aquatic farm operations had sales and sold over 1,32 million Pacific oysters, 42,695 lbs of Pacific geoduck, and 4,975 lbs blue mussels, with a total farm gate value of 1,23 million USD. Although for several years there has been interest in seaweed farming, commercial-scale farming of seaweeds has only occurred relatively recently [18, Kim J.K.,

¹⁶ North Atlantic Salmon Conservation Organization. URL: <http://www.nasco.int/> (accessed 28 October 2020).

¹⁷ PARCOM Recommendation 94/6: <https://rod.eionet.europa.eu/obligations/478/legislation> (accessed 28 October 2020).

¹⁸ Arctic Council – Ocean: <https://arctic-council.org/en/explore/topics/ocean/> (accessed 28 October 2020).

Stekoll M., Yarish C., p. 453], however gaining more and more momentum¹⁹. As such, the 2014 Alaska Mariculture Initiative aims to grow a 100 million USD industry in the next 20 years²⁰.

Mariculture in the United States is regulated at both the federal and state level. The federal government regulates aquaculture activities that involve the trade of goods and services between the states, or foreign trade. The Food and Drug Administration (FDA) of the Department of Health and Human Service (DHHS), the Department of Agriculture (USDA), and the Environmental Protection Agency, are the leading agencies that regulate aqua-/mariculture at the federal level. FDA is responsible for protecting public health by ensuring among other things the security of human and veterinary drugs and the safety of US's food supply. The USDA, working on food, agriculture, natural resources, rural development, has set up Regional Aquaculture Centers (RACs), which support aquaculture research aiming to enhance viable and profitable U.S. aqua-/mariculture production. The Environmental Protection Agency's mission is to protect human health and the environment by implementing U.S. law by writing regulations and setting national standards that states enforce through their own regulations. Other agencies and programs at the federal level involved in aqua-/mariculture activities include the National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce, the Joint Subcommittee on Aquaculture, the Center for Veterinary Medicine (within FDA), the Animal and Plant Health Inspection Service (within USDA), and the U.S. Fish and Wildlife Service (FWS) of the Department of the Interior. Especially, NOAA also has a number of important roles, including both NOAA Fisheries, Coastal Management, and Sea Grant.

In federal waters, fish farming is technically not banned, but rather the federal political and regulatory obstacles are too high for fish farming to have developed to date almost anywhere in U.S. offshore waters. The development of aqua-/mariculture in the United States has been greatly hampered by the lack of an 'enabling regulatory framework' which makes it extremely difficult or impossible to get permission to start a fish farm anywhere in U.S. federal waters [19, Knapp G., Rubino M.C.]. On the federal level, regulations rarely address aqua-/mariculture directly, however, and more detailed legislation exists at the state level. For example, acts like the Federal Water Pollution Control Act, the Food, Drug & Cosmetic Act, the Animal Drug Availability Act, and the Magnuson-Stevens Fisheries Conservation Act do not address aqua-/mariculture specifically, but provide the regulative framework for food safety, veterinary medicines, coastal zone management, and other activities related to it²¹. Additionally, it is most often the state that monitors and enforces both federal and state aqua-/mariculture regulations. Generally, federal regulations only become applicable within the state when aquaculture activities involve interstate modes of transport, or interstate waters. The state owns tidal and submerged land up to three miles away

¹⁹ Welch L. Interest in growing seaweed in Alaska is gaining momentum. URL: <https://www.adn.com/business-economy/2019/12/10/interest-in-growing-seaweeds-in-alaska-is-gaining-momentum/> (accessed 01 January 2020).

²⁰ Welch L. Interest in growing seaweed in Alaska is gaining momentum. URL: <https://www.adn.com/business-economy/2019/12/10/interest-in-growing-seaweeds-in-alaska-is-gaining-momentum/> (accessed 01 January 2020).

²¹ FAO Fisheries and Aquaculture Department, National Aquaculture Legislation Overview: United States of America. URL: http://www.fao.org/fishery/legalframework/nalo_usa/en (accessed 28 May 2020).

from any given shoreline. There is, however, a growing pressure to promote aquaculture in federal waters²².

Many would claim that Alaska's coastal areas make it a perfect place for mariculture. However, Alaska has banned fish farms, and Pacific oysters, littleneck clams, and mussels make up most Alaska's aquatic farm products. Furthermore, Alaska's mariculture industry is rather young and small. In 1988, the Aquatic Farm Act was signed into law authorizing the commissioner of the Alaska Department of Fish and Game (ADF&G) to issue permits for the construction and operation of aquatic farms and hatcheries. Within ADF&G, the Division of Commercial Fisheries, Aquatic Farming carries out the statutory and regulatory responsibilities of the department relating to aquatic farming in Alaska. Further complicating this issue is the fact that while net-pen farming (like Norwegian salmon aquaculture) is banned, a specific exception is made to allow a very extensive of salmon hatcheries which release salmon smolt into the ocean, the returns of which account for a very significant share of total Alaska 'wild' salmon catches (as high as 30–40% in some years). This very important salmon hatchery system, or in effect a salmon ranching industry, was initially developed by the State but subsequently taken over by regional private non-profit associations, financed by taxes on fishermen and a right to harvest part of the returning hatchery system. This salmon ranching industry is in effect halfway between a wild fishery and aquaculture.

Furthermore, several agency authorizations are mandatory to site, construct, and operate an aqua-/mariculture site. An aquatic farm applicant can fill out one Joint-Agency Aquatic Farm Program Application. This application makes available information for every agency that has authority to supervise aspects of the aquaculture project. The process goes through several steps. First, the Alaska Department of Natural Resources Division of Mining, Land, and Water (DNR/MLW) when receiving a proposal will review it, make preliminary decisions, and provide a public review and comment period. If approved the proposed project is issued a ten-year aquatic farm site lease. Secondly, once an aquatic farm site lease agreement is complete and approved, the ADF&G can issue permits, including an Operation Permit. Furthermore, for aquatic farms located in a critical habitat area such as a state game refuge or game sanctuary, the ADF&G Habitat Division must issue a Special Area Permit. The purpose is to protect essential fish and wildlife habitat.

After going through this process and receiving State agency authorizations, an operator must make a request to the U.S. Army Corps of Engineers for setting up aqua-/mariculture sites within the navigable waters of the US. Finally, the Department of Environmental Conservation must do a survey including Water quality classification; shellfish harvester permit, processing, and shipper permits; paralytic shellfish poisoning testing; export certifications, and authorizations for dive boats to be used for shellfish harvesting. Others and more specific permits may also be need-

²² Resneck J. Alaska wary of federal push for marine aquaculture. URL: <https://www.alaskapublic.org/2018/09/06/alaska-wary-of-federal-push-for-marine-aquaculture/> (accessed 01 January 2020).

ed, as for instance a stock transport permit when transferring aquatic farm stock to, from, or between an aquatic farm, hatchery, or nursery site, an aquatic stock acquisition and transport permit to collect wild stock from outside an aquatic farm site, and an approval as a seed distribution source to distribute shellfish seed to a permitted aquatic farm, nursery, hatchery within Alaska or for export.

North Norway

Norway is the world's largest producer and exporter of salmon with salmon being the most important product in Norwegian fish farming. While it was rapidly growing in the southern parts of Norway, aquaculture was seen as mostly inapplicable to the climatic conditions in North Norway, mainly due to the low sea water temperature. However, North Norway has turned out to benefit exactly from these circumstances, as they limit the development of salmon lice and other diseases, and stands currently for between 40% and 50% of the farmed fish produced on a national level²³. With farmed salmon constituting traditionally more than 90% of the production, followed by trout and other species, aquaculture in North Norway is projected to have the highest potential for growth, compared to the rest of the production regions in the Nordic country²⁴.

In 2018, the landed value of the production from Norway's (then) three northernmost counties (Finnmark, Nordland and Troms) was 28 billion NOK, reflecting a rapid increase for the last 10 years. The region's contribution to the national value creation from aquaculture is estimated to have grown from 28% and 1,1 billion NOK during 2008, and despite significant variations, it grew up to 42% during 2016 and additional created values were estimated to be 13,2 billion NOK during 2016²⁵. With regards to the economic significance, it has to be pointed out that although the seafood with aquaculture origin represents around 1/3 of the seafood produced in North Norway, the sector has been responsible for the greatest part of the value created in the seafood industry as a whole, and estimated almost three fourths of the export value²⁶.

²³ Elde S., Kvalvik I., Nøstvold B.H., Rødbotten R., Dalmannsdottir S., Halland H., Uleberg E., Reykdal Ó., Árnason J., Pálsson P.G., Halldórsdóttir R., Hilmarsson Ó.P., Þórðarson G., Valsdóttir Þ., Knudsen R., Natcher D., Sidorova D. The Arctic as a Food Producing Region. Phase 1: Current status in five Arctic countries. URL: <https://nofima.no/en/pub/1581246/> (accessed 30 June 2018).

²⁴ DNV GL. Sustainable Blue Economy in the Norwegian Arctic (Part 1: Status). 2019. URL: https://www.havarktis.no/files/Sustainable-Blue-Economy-in-the-Norwegian-Arctic-Part-1-Status_FINAL.pdf (accessed 01 May 2019).

²⁵ Breimo G., Leitet M., Høyli R., Stoud Myhre M., Richardsen R. Havnæringene i nord: Næringsutvikling og verdiskaping frem mot 2040. 2018. URL: <https://sintef.brage.unit.no/sintef-xmlui/handle/11250/2600772> (accessed 24 December 2018).

²⁶ Elde S., Kvalvik I., Nøstvold B.H., Rødbotten R., Dalmannsdottir S., Halland H., Uleberg E., Reykdal Ó., Árnason J., Pálsson P.G., Halldórsdóttir R., Hilmarsson Ó.P., Þórðarson G., Valsdóttir Þ., Knudsen R., Natcher D., Sidorova D. The Arctic as a Food Producing Region. Phase 1: Current status in five Arctic countries. URL: <https://nofima.no/en/pub/1581246/> (accessed 30 June 2018).

One of the most important factors for the growing value of Norwegian farmed seafood has been the safety of production and the reputation both locally and internationally²⁷, not least because of the cooperation of the businesses with research institutions for increased fish welfare and quality as food. Reduced use of medication, vaccine development and stricter monitoring have been in the focus of the aquaculture research and innovation. The Norwegian aquaculture governance regime is based on the Aquaculture Act (2005, No. 79). The Act covers aquaculture of any aquatic organism and regulates both aquaculture carried out for scientific or educational purposes and commercially. It regulates areas such as land use and coastal area management, emission and pollutants, animal health and genetic effects of escaped fish on wild populations. The Ministry of Trade, Industry and Fisheries (MTIF) oversees the administration of the Act and the Directorate of Fisheries is responsible for enforcing it. The regime can be described as a multilevel management system and several sector-based ministries and directorates (e.g. coastal, environment, food and agricultural, fisheries and transport) are involved and decision-making authority is divided between three levels of administration: national, county and municipal. The management system can be divided in three: planning, operation (production) and food safety²⁸. The first step when planning for a new fish farming site is to get a permit through an allocation round. Aquaculture cannot be carried out without a licence. The power to grant licenses is vested in MTIF, who has delegated this power to the Directorate of Fisheries. The Aquaculture Act also regulates the use and access to land and water for aquaculture. A licence to operate may not be given in contravention of land use plans. The municipalities must implement a land use plan, including relevant use within internal waters bordering the municipality. The municipalities, thus, have the power to facilitate (or not) the establishment of new aquaculture sites.

Furthermore, a license may not be granted if the applicant does not get a permit from the National Coastal Administration pursuant to the Act relating to harbours, fairways, etc. Moreover, a permit for abstraction of watercourse may be required from the Water Resources and Energy Directorate pursuant to the Act relating to watercourses and ground water. This is, however, primarily relevant for land-based hatchery production. The Directorate of Fisheries can limit the number of licenses out of environmental considerations. The most pressing concern over the last several years has been the negative impact on wild salmonids caused by lice infection pressure from the salmon farms, as well as interbreeding due to escape of cultured salmon into the wild. A short description of regulation efforts regarding these issues can thus tell us something about how aquaculture is regulated in (North) Norway [20, Vormedal I., Skjærseth J.B., pp. 9–11].

The fish-farming industry is governed by a permit system that allows companies to produce fish at specific sites. Permits are subject to a maximum allowed biomass (MAB). The MAB is higher

²⁷ Norwegian Ministry of Climate and Environment, Oppdatering av forvaltningsplanen for det marine miljø i Barentshavet og havområdene utenfor Lofoten (Melding til Stortinget 10, 2010-2011). URL: <https://www.regjeringen.no/no/dokumenter/meld-st-10-2010-2011/id635591/> (accessed 01 January 2019).

²⁸ FAO Fisheries and Aquaculture Department, National Aquaculture Legislation Overview: Norway. URL: http://www.fao.org/fishery/legalframework/nalo_norway/en (accessed 29 May 2020).

in North Norway than in southern and western part of the country. These permits are, as previously mentioned, distributed by the MTIF through allocation rounds. Companies compete to comply with the criteria for new permits. The Fisheries Directorate then distributes to successful firms, for a fixed price. Permits can also be subject to open or closed auction (the latter requiring pre-qualification), and issued to the highest bidders [20, Vormedal I., Skjærseth J.B., pp. 9–11]. Awareness of the environmental impacts of fish farming has grown, with growing public concerns that the proliferation of sea lice is threatening the survival, of wild salmon populations. The Norwegian government has faced criticism for having prioritized growth over the protection of wild salmon²⁹. Growing resistance to medical treatments and increasing stocking density, have increased sea-lice proliferation. In response, the government begun to enact increasingly stricter sea-lice regulation from 2012, all farms were now obliged to keep adult female lice per fish levels below 0.5. These regulations were made stricter in 2013, and in 2015, after heated debate over whether further growth in salmon aquaculture was environmentally justifiable, the government made capacity increases conditional on a use of max. 2 medicinal delousing treatments per production cycle and a sea-lice limit of 0.2.

Moreover, a new category of ‘Development Permits’ was introduced for large-scale and capital-intensive demonstration projects, that would develop radical innovative environmentally technology. Furthermore, a new lice management and growth regime — the Traffic Light System (TLS) — was implemented in 2017 through the new ‘production-area regulation’. Norway was divided into 13 production areas, where the sea-lice pressure in the commons are monitored. An ‘unacceptable’ impact in a production area means a red light for area, leading to a reduction of production capacity up to 6%. With ‘moderate’ impact (amber light), increased production volume will not be allowed. If the impact is deemed acceptable, the area is given the green light for growth. Most ‘green’ areas are in North Norway, where the sea-lice problem is less severe. However, there is an exception to the rule, firms within amber or red zones can increase capacity if they can enforce sea-lice levels below 0.1, and maximum 1 medicinal treatment per production cycle. Subsequently, sea-lice standards have become significantly more stringent after 2012 [20, Vormedal I., Skjærseth J.B.].

After receiving a licence and starting production several acts relating to e.g. disease control, animal welfare, feed and drugs, fish movement and water and wastewater are of relevance. Important here and showing the power of the county in this management system is that according to the Pollution Control Act, disposal or discharge of waste is prohibited unless permission by law or through a permit given by the County Governor. Furthermore, several requirements connected to water quality and surveys shall be carried out by the operator. Breeding of alien species is regulated as well and prohibited unless a specific permit has been granted. This is also regulated under

²⁹ Vormedal I., Larsen M.L., Flåm K.H. Grønn vekst i blå næring? Miljørettet innovasjon i norsk lakseoppdret. URL: <https://www.fni.no/getfile.php/1310934-1571995826/Filer/Publikasjoner/FNI-Report-2019-03-Vormedal-Larsen-Flam-Gronn-vekst-i-bla-naering-miljoettet-innovasjon-i-norsk-lakseoppdrett.pdf> (accessed 28 May 2020).

the Food Safety Act. Under the Aquaculture Act, regulations related to preventing fish from escaping and recapturing of escaped fish, floating aquaculture installations must be certified in compliance with Norwegian Standard NS 9415 or comparable international standards. Regulations adopted under the Food Safety Act concern several aspects of aquaculture production, e.g. movement of fish, disease prevention and control, importation of aquatic animals, the use of veterinary drugs, feed, food safety in general and animal welfare. The Act Relative to Prevention of Cruelty to Animals has also several legal implications for the operating of aquaculture facilities regarding animal welfare.

Alaska and North Norway — Similarities and Differences

Internationally, and as of today, no international aquaculture specific legislation exists. However, several legal instruments are directly or indirectly relevant for the development of the sector. First and foremost, all activities at sea are determined by the provisions of international law. Aquaculture is not outlined in UNCLOS, but its provisions on the protection and preservation of the oceans is broad and thus also include several aspects of aquaculture. Coastal states have, however, sovereignty in the twelve nautical mile zone of the territorial sea, and this is where most aquaculture sites are. Thus, legislation concerning the sector is mainly national law. There are however several agreements and guidelines that are of relevance in the sector, but none of them regulate coastal aquaculture directly. Exchanging best practices on broader issues of aquaculture could, however, be done in regional bodies like the AC and by looking at the potential for a certification program on sustainable Arctic aquaculture.

If specifically looking at our case at hand, aqua-/mariculture in Alaska and North Norway, it becomes obvious that both are set in very different economic and legal contexts. Both regions represent vastly different regulatory and political approaches to aqua-/mariculture, which have resulted in aquaculture becoming a major industry and global leader in Norway, while remaining insignificant in Alaska. Moreover, Alaska's wild salmon fisheries are very abundant and healthy while Norwegian commercial wild salmon fisheries are insignificant. Alaska has banned fish farms and Norway is a world leading producer and exporter of salmon. There is, however, a growing pressure to promote fish farming in federal waters outside Alaska. At time of writing mussels, clams and oysters make up the bulk of aquaculture production in Alaska.

However, there are some similarities in the two sectors. Alaskan fisheries management is divided between the federal and state governments, with federal government having responsibility for three nautical miles out from shore and state governments within three nautical miles. The joint responsibility is coordinated through the North Pacific Fishery Management Council which includes representatives of federal and state governments as well as industry. In contrast, Norway does not operate a management level below the national one. Although the Norwegian system is more complex, both regimes can be described as multilevel management systems where different levels of administration are involved. Several agency authorizations are needed to get a licence to

start up with production and aquaculture is regulated at the national (federal) and local (state) level. Regulations are e.g., related to food safety, environmental issues, use of medicines and coastal state management. In Alaska, several fees must be payed when applying to set up an aquaculture site. In Norway a company may only be subject to market and research fees in connection to export. Fees that are financing the Norwegian Seafood Council and the Fishery and Aquaculture Industry Research Fund. In general, an aquaculture company operating in Norway is subject to corporate income tax (22%) following ordinary tax principles. But a company may also be subject to municipal property tax. There is, however, an ongoing debate in Norway on the aquaculture tax regime³⁰. In Alaska, the federal income tax is 21% but companies will also be subject to state taxes.

Towards a Sustainable Governance Framework for Blue Arctic Aquaculture?

In conclusion, as the blue economy provides many different pathways to enabling further expansion of ocean-based industries, delineations of the concept, as well as a mapping of relevance practices across national contexts, are needed. This article has provided an initial comparative outlook at one specific industry under that framework: aqua- and mariculture in North Norway and Alaska.

The blue economy is obviously a complex concept that a) lacks a consensus definition and b) requires multifaceted understanding of interacting ecological and socioeconomic systems. Because there is no single definition, the precise nature of the 'blue economy' will only emerge from the way in which the term is conceived and implemented in specific locations and situations. Thus, any blue economy is essentially a very regionalised one and there is no such thing as *one* blue economy. However, one thread that is likely to be consistent across all the places where the definition evolves is that the blue economy represents a new and different way of using the ocean. The key to any blue economy is found in changing the way in which we use the ocean. Change, particularly at so large a scale as human-ocean interactions, is extraordinarily difficult. Therefore, the blue economy needs to be thought of as much as a process as an outcome. Yet, how is such regionalised blue economy process currently governed in Alaska and North Norway with regard to aqua-/mariculture? And what does the mapping of specific aqua-/mariculture legislation — both international and national/regionally — reveal about the concept of the blue economy and related discussion on sustainable development, environmentally and economically?

In this article, we provided a point of departure for *blue* discussions by mapping the current status of regulations and systems governing the blue economy in Alaska and North Norway. An overview of this kind is a precondition for identifying areas for improvements; be they a lack of adequate regulations in certain areas, inconsistencies between or within current regulations, or a lack of consistent implementation and uniform enforcement of rules. The current process towards

³⁰ Norges offentlige utredninger (NOU), Skattlegging av havbruksvirksomhet: Utredning fra utvalg oppnevnt ved kongelig resolusjon 7. september 2018. Avgitt til Finansdepartementet 4. november 2019.

a regionalised blue economy relevant to Alaska and North Norway (but also other areas of the world) can be described in very general terms as having four phases: attention, planning, focused and broad implementation³¹.

Basically, a general commitment to the blue economy must be narrowed to the specific economic sectors ecosystems where attention will be focused. This planning stage identifies sectors such as fisheries, minerals, transportation, tourism, energy, and the very specific context of coastal regions. Such a planning process will focus on identifying the ways in which economic activity and ecosystems interact with one another both positively and negatively and which actions are likely to expand the former and reduce the latter. Planning, as one of the four phases, can take many forms, but also includes some assessment of the governance structures available.

Furthermore, best practices applied by each state in fisheries management and policy could provide with key lessons for the future. For instance, both Alaska and (North) Norway are global players in the salmon industry. Salmon production is an extremely profitable source of income and employment for both regions. Keeping in mind that the salmon industries in Alaska and Norway are carried out in a fundamentally different manner, there is great potential for them to learn from each other's practices, with Alaska's successful development of hatcheries and sustainable management. In some aspects, Alaska and North Norway are two competitive regions in the global market. However, they share one major common characteristic: a high dependency on the Arctic Ocean and its resources. Subsequently, transnational and multi-sectoral approaches in (fisheries) management, science, policy, industry and business connecting across disciplines are imperative for the future of the region.

As such, social development in the Arctic is characterized by generally growing, often highly innovative Arctic cities and thinning-out rural areas that face demographic and resource challenges. However, both regions have maintained management models and practices in order to promote local socioeconomic growth, that can be worth exchanging. Alaska's several community-based fisheries, such as the Tamgas Creek Hatchery, and initiatives such as the Community Development Quota or the Local Fish Fund program of the Alaska Sustainable Fisheries Trust, aiming to protect and support local fishing businesses and revitalize fishing communities in Alaska, could be inspiring for similar approaches in Norway. Meanwhile, the established management regime of the red king crab in Finnmark could serve as an example for maintenance of a small-scale fishery for the benefit of the local communities while preventing ecological impacts on the native ecosystem, with reported increased appeal and value of the end product.

As northern waters are set to change more rapidly than any other part of the world, the (sustainable) exploitation of ocean resources is also likely to expand. Unpacking the complexities, challenges and best practices to governance of this emerging blue economy — across regional and

³¹ Raspotnik A., Østhagen A. and Colgan C.S. Discussing the Blue Arctic Economy: A Case Study of Fisheries in Alaska and North Norway. URL: http://www.research.kobe-u.ac.jp/gsics-pcrc/pdf/PCRCWPS/PCRC_12_Raspotnik.pdf (accessed 01 May 2020).

national contexts and sectors — will thus be a continuously worthwhile (academic) endeavour. As we have showcased, there is no such thing as *one* blue economy and no such thing as *one* Arctic. Yet, it is still possible to find common ground and avenues for knowledge and best practice exchange. By this we will bring the academic and political discussions about the blue economy on the right track.

Acknowledgments and funding

This research was funded by one grant provided by the Norwegian Ministry of Foreign Affairs: AlaskaNor — Opportunities for Blue Growth in Alaska and North Norway; agreement number: QZA-18/0178. For more information, see www.alaskanor.com.

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Received on November 19, 2020