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# Defining the Blue Economy in an Arctic Fisheries and Aquaculture Context: International Insight<sup>1</sup>

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**Abstract.** The paper aims to show how the idea of the “blue economy” is conceptualized in the three main Arctic coastal regions: Northern Norway, Russia’s Arctic Zone, and Alaska (USA). This is done through examples of how fisheries and aquaculture function in these three regions and based on an analysis of their official policies. The purpose is to examine the modern organization of the management of the blue economy, identifying weaknesses and best practices in the three regions in question. An additional objective is to formulate conclusions and trace best practices, contributing to the development of a unified concept of “all-Arctic blue economy structure” and pave the way for the institutionalization of cross-border synergies.

**Keywords:** Arctic Ocean; Northern Norway; Arctic Russia; Alaska; fisheries;  
aquaculture; pan-Arctic blue economy

## Introduction

With the Arctic warming three times faster as compared to the rest of the planet, special attention has been recently devoted to the way Arctic littoral states are managing their resources, *inter alia* the oceanic ones. The ever-increasing pressure that the Arctic Ocean is currently experiencing make imperative the conceptualization of a common ground in blue governance among Arctic nations, and aspire for transnational collaboration among Arctic littoral states. Against this background, the blue economy has emerged as a concept that draws on the pre-existing state goals of sustaining economic development opportunities while maintaining ocean prosperity, ecosystem health and societal resilience. Indeed, defining the blue economy and putting

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together sustainability and profitability of northern economic ventures is an arduous task and needs rational economic management and ocean-centred objectives (Lee et al., 2020).

The idea of a blue economy was born soon after the 2012 «Rio+20» Conference on Sustainable Development (Silver et al., 2015). The concept co-emerged approximately at the same time with the United Nation's Sustainable Development Goals (SDGs) saw the light of day. Yet, while states have been long engaged with the theorization and implementation of the SDGs in their national policies (although at times unsuccessfully), the conceptualization and implementation of the blue economy in state strategies remains underdeveloped. While the conceptual focus of the SDGs is rather clear, in particular SDG #14 (life below water), which aims to conserve and sustainably use oceans, seas, and marine resources by conserving and restoring marine and coastal systems and developing capacity in marine science and technology transfer, the focus of the blue economy lacks conceptual clarity.

Most interpretations seek to associate the term “blue economy” with the multifaceted economic and social importance of the ocean (and, in some countries, certain coastal and inland waters), along five key components: ecosystem resilience, economic sustainability, community engagement, institutional integration, and technical capacity (Eikeset et al., 2018; Keen et al., 2018). It is overall understood as a concept grounded on ideas about sustainable economies used to denote an expansion of economic wealth derived from the oceans and coasts while maintaining or even improving the natural systems upon which economic systems depend. Others argue that the blue economy shares the idea that economic activities/growth are not antithetical to ecological conservation but are rather complementary, or even reinforcing (Boonstra et al., 2018), while elsewhere we have highlighted its focus on societal prosperity, as much as environmental needs (Tsiouvalas et al., 2022). Today, it remains unclear whether the blue economy is to be singularly understood as the domain of a particular set of actors, or as a short-hand reference to particular sets of governance mechanisms or ideologies (Silver et al., 2015).

To contribute to the effort of defining the blue economy, this article seeks to unfold how the blue economy idea is conceptualized

in the strategies of three Arctic littoral regions: Northern Norway, Arctic Russia and Alaska. By doing so, we first present a brief outlook of how fisheries and aquaculture operate in these three regions and subsequently delve into their most recent marine resource management strategies, seeking to understand how the blue economy is conceptualized in those three different Arctic regions.

### **Research Method and Case Study Selection**

With the Arctic being in the centre of global climate change, there is a strong and growing need for more knowledge and sharing experiences where policy initiatives have worked well and where they have not, supporting traditional resource utilization, developing new industries, and conserving biodiversity.

The Arctic is increasingly faced with challenges connected to urbanization, demographic trends and climate change (Raspotnik et al., 2020). Over the last two decades, retreating sea ice, changing distributions of natural marine resources, and demands for those resources have combined to create a perfect storm for increased economic interests in the Arctic region. With rapid changes underway throughout 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 (Larsen & Fondahl, 2015). 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 between the various industries involved (Raspotnik et al., 2021). The Arctic Ocean and its surrounding waters hold the potential to become a key region in contributing to these developments as three factors are currently transforming the Arctic with astonishing speed: climate change, technological advances, and the forces of (global) economic development. Although these factors individually and/or in combination are set to change the Arctic in the years and decades to come, change will affect the region and its inhabitants at different rates (Atkisson et al., 2018).

In today's Arctic context, the blue economy encompasses a large variety of sectors driving Arctic economies, onshore energy (focusing on its gradual decarbonization, employment of alternative

energy sources, energy savings), reduction in coastal emissions, waste disposal management, coastal tourism, creation of nature reserves and parks, food security and development of fishing, aquaculture, shipping, marine technology, tourism, offshore wind energy, mining, and marine biotechnology.

Energy production, fisheries and aquaculture development, Arctic shipping and maritime transportation as well as regional and international governance remain in the heart of blue economy models as conceptualized by most states<sup>2</sup>. Yet, not equal emphasis is placed on all of them among the Arctic nations, with traditional reliance of economic development on non-blue ways being at times pertinent.

In particular, we seek to understand how implementing management frameworks and policy formulation can help promote positive development and secure the potential for sustainable value creation and social development in the years ahead. To start with, we deemed crucial to see how the three regions themselves understand the blue economy and consequently implement it in their national policies.

The aim of this article is to bring together blue economy perspectives from three Arctic frontier regions and draw parallels on the blue economy between Northern Norway, Arctic Russia and Alaska.

Initially, an extensive literature search was conducted, tracing information from digital databases, such as Science Direct, Google Scholar, Research Gate, and others, putting though predominant emphasis on how formal documents of the three regions under investigation, such as official government and industry reports, currently conceptualize the blue economy.

An important step in such an undertaking is to give a descriptive overview of how fisheries and aqua-/mariculture are currently operating in the respective states and their Arctic regions. In that regard, a first research question was formulated: RQ1. *How have fisheries and aquaculture been developed in Northern Norway, Arctic Russia and Alaska?* Setting this scene, the article subsequently seeks to look at fisheries and aqua-/mariculture through the lens of the

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<sup>2</sup> DNV GL, (2019a) Sustainable Blue Economy in the Norwegian Arctic (Part 1: Status). Centre for the Ocean and the Arctic. URL: [https://www.havarktis.no/files/SustainableBlue-Economy-in-the-Norwegian-Arctic-Part-1-Status\\_FINAL.pdf](https://www.havarktis.no/files/SustainableBlue-Economy-in-the-Norwegian-Arctic-Part-1-Status_FINAL.pdf)

blue economy as conceptualized in the official (North) Norwegian, Arctic Russian, and Alaskan strategies, and thus address research RQ2. *What place does blue economy hold in the official fisheries and aquaculture policies of Northern Norway, Russia, and Alaska?* Subsequently, analysing the findings of the second question, an additional research question was determined: RQ3. *Could lessons distilled from each region's model be valuable for the respective other region in further enhancing their blue economies?* Section 4 presents a synthesis of the results generated in Section 3 and builds further on published literature to attempt to highlight potentials for the exchange of methods, information, and best practices that could contribute to a conceptualization of a common ground; in other words: a 'pan-Arctic blue economy strategy'.

The final conclusions could pave the road for future cross-border synergies and the development of a common definition of the blue economy in Arctic fisheries and aquaculture. In the aftermath of the current war in Ukraine, drawing such synergies may contribute to the amelioration of the relationships between Russia and the West, particularly with Norway, the collaboration with which has been extensive in the context of fisheries for the last few decades, especially through the joint management of North-East Arctic cod fisheries via the Joint Norwegian–Russian Fisheries Commission (Hønneland, 2012). Mindful that a post-war geopolitical and economic reality might alter existing economic policies and attitudes, engagement with such discourses extends beyond the scope of this study, with the data collection process for this article also having been completed prior to the beginning of the war.

## **The case of Northern Norway Fisheries and Aquaculture**

The area understood as Northern Norway consists of the two northernmost counties of Norway – Nordland and Troms and Finnmark (with the two latter merged as a single county on January 1, 2020) – and accounts for a substantial part of the whole Norwegian fisheries and aquaculture sector. Due to its access to high-yielding coastal and offshore sea areas in the Norwegian and Barents Sea that constitute an area more than five times larger than the land area, and the relatively warm impact of the Gulf Stream, Northern Norway's seafood industry

is traditionally the most important factor for the development of the region's (blue) economy. Those conditions, in combination with sound management and environmental consideration, determine Northern Norway's advantage in the development of its seafood industries.

Comprising one-third of Norway's land area, and home to just under 10% of its population<sup>3</sup>, Northern Norway accounts for a crucial and significant part of the national fisheries and aquaculture sector, contributing to the increased welfare of its inhabitants. In addition, both sectors combined have been responsible for a far greater part of the value creation in Nordland and Troms and Finnmark, compared to the national average (Hestvik Brækkan, 2020). It has been also acknowledged that the large fish stocks in these waters are currently being harvested within stable biological limits and managed in accordance with sustainable development objectives<sup>4</sup>.

The cornerstone of the Northern Norwegian fisheries sector has undoubtedly been the Barents Sea cod, the largest stock of Northeast Atlantic cod, referred to by the locals as *skrei*, or wandering cod (Christensen, 2009). Migrating from the northeast part of the Barents Sea along the Northern Norwegian coast down to Lofoten every winter, this distinct fish stock was a prerequisite for the largest and longest maintained fishery in Norway, the *Lofotfisket*, which has shaped the culture and economy of the local communities since the 10<sup>th</sup> century and yearly provides thousands of fishermen with seasonal occupation. Preserved by drying, cod was turned into a lasting and invaluable export product, stockfish, the target commodity of an export continuing into the present (Drivenes et al., 1994).

Other traditionally important species benefiting the communities of Northern Norway include pelagic fish species such as mackerel, Norwegian Spring-spawning herring, and capelin, all found in the coastal waters of the region, as well as the rest of the whitefish

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<sup>3</sup> Statistics Norway (SSB). (2021, August). URL: <https://www.ssb.no/befolkning/folketall/statistikk/befolkning>

<sup>4</sup> 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/meldst-10-2010-2011/id635591/>

species, such as coastal cod, saithe, and haddock. In addition, some small district communities have typically benefited from geographically confined fisheries, such as the shrimp fisheries in northern Troms and, in more recent times, the red king crab fisheries in eastern Finnmark. Native to the North Pacific, red king crab was brought experimentally to the Barents Sea by Soviet scientists during the 1960s and has been spreading along the Northern Norwegian coast gradually, with observations as far south as Lofoten in Nordland county<sup>5</sup>. It is currently classified as an invasive species of high risk and has been causing concern among fishermen with regard to environmental repercussions in the local ecosystem, specifically to the potential damage to the cod fish stocks<sup>6</sup>.

With the development of greater capacity and effectiveness, and an increased focus on sustainable fisheries, the fisheries sector in Northern Norway has overall transformed rapidly since the 1980s as a result of the decreased number of vessels, technical and regulatory changes, and the increasing value of the final products<sup>7</sup>. During 2019, 890,000 tons of wild capture fish were landed in the northernmost counties<sup>8</sup>, with an estimated value 13.3 billion NOK (\$1.5 billion), accounting for almost 38% of the landed amount on a national basis and importantly representing more than 54% of the value of the national total<sup>9</sup>. In addition, while the total volume of wild caught fish on a national basis has experienced an overall decrease of 25% during the last two decades, it has remained relatively stable in the North. Furthermore, the fisheries sector

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<sup>5</sup> Det Kongelige Fiskeri- og Kystdepartement. Forvaltning av kongekrabbe, St.meld. nr. 40 (2006–2007). URL: <https://www.regjeringen.no/no/dokumenter/stmeldnr-40-2006-2007/id480559/?ch=8>

<sup>6</sup> Det Kongelige Nærings- og Fiskeridepartement. Evaluering av forvaltningen av kongekrabbe, Meld. St.17 (2014–2015). URL: <https://www.regjeringen.no/no/dokumenter/meld.-st.-17-2014-2015/id2403472/>

<sup>7</sup> Fiskeridirektoratet. Økonomiske og biologiske nøkkeltal frå dei norske fiskeria – 2020/Economic and biological figures from Norwegian fisheries – 2020. URL: <https://www.fiskeridir.no/Yrkesfiske/Tall-og-analyse/Statistiske-publikasjoner/Noekkelallfor-de-norske-fiskeriene>

<sup>8</sup> Statistics Norway (SSB). Fiskeri (avslutta i Statistisk sentralbyrå). URL: <https://www.ssb.no/statbank/table/12847/tableViewLayout1/?loadedQueryId=10056240&timeType=top&timeValue=1>

<sup>9</sup> Statistics Norway (SSB). Fiskeri (avslutta i Statistisk sentralbyrå). URL: <https://www.ssb.no/statbank/table/12847/tableViewLayout1/?loadedQueryId=10056240&timeType=top&timeValue=1>

has had a crucial impact for value creation in related industries in the region, such as fish reception and processing facilities. Studies have shown that the additional value created from fisheries in Northern Norway was 5.9 billion NOK (\$686 million) during 2016, or corresponding to 42% of the national total (Breimo et al., 2018).

With the rapid development of sea-based aquaculture in the rest of Norway, fish farming was regarded as unfeasible in the North due to the colder climate and lower sea temperatures (Breimo et al., 2018). However, Northern Norway has proven to hold an advantage exactly due to the climatic conditions, especially in recent decades, as this prevents the development of parasites and diseases among farmed fish (Elde et al., 2018). The region currently stands for around 50% of the salmon produced on a national level, which has also been characterized by continuously increasing value. Prognoses have further shown that Northern Norway holds the potential to keep growing its aquaculture industry while offering employment opportunities in the related value chain (Tsiouvalas et al., 2022).

### **Conceptualizing the Blue Economy**

Keeping in mind the outstanding performance of Northern Norwegian fisheries and aquaculture, it is of paramount interest to see how the concept of blue economy infiltrates marine resource management. Norwegian Ministries have previously stated that the importance of the blue economy to Norway goes back centuries, while cooperation between businesses, research and education, employees and authorities has played an important role in the historical development of Norway as ocean-centred economic power<sup>10</sup>. Highly dependent on ocean-based industries, Norway has incorporated the further development of blue economy sectors as a key point in its 2019 Ocean Strategy, with a particular focus on also promoting sustainable blue development in the Norwegian Arctic (Norwegian Ministries, 2019). The strategy acknowledges the pivotal role of the blue economy throughout Norwegian history, while also recognizing the cooperation and exchange of knowledge between research institutions, businesses, and public sector as a

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<sup>10</sup> Norwegian Ministries. Blue Opportunities: The Norwegian Government's Updated Ocean Strategy. URL: <https://www.regjeringen.no/en/dokumenter/the-norwegiangovernments-updated-ocean-strategy/id2653026/>

crucial prerequisite for Norway's establishment as an ocean economy (Norwegian Ministries, 2019). It further sees that the "development of the oceans" is a vital basis for jobs, value creation and welfare throughout Norway, and can also be part of the solution to the world's environmental and climate-related challenges.

In its formal policy, major focus is placed on the strict regulation of Illegal, Unreported and Unregulated (IUU) fishing, acknowledging that there is a "blue shadow economy" on the horizon that is undermining a sustainable and fair blue economy throughout the world's oceans<sup>11</sup>. Norway has been leading the global fight against IUU fishing, and with its 'Blue Justice' initiative the Government is seeking to address the specific needs of developing countries in addressing fisheries crimes. The Norwegian Government further established the Centre for the Ocean and the Arctic in 2018 with a national mandate to compile, analyse, and communicate knowledge about the blue economy and the effects that regional and global processes may have on it. Thus far, the Centre has published a number of studies on the sustainable blue economy in the Norwegian Arctic as well as on the co-existence of the ocean-related economic activities on a national level<sup>12</sup>.

The sustainable harvesting of living marine resources and the application of the precautionary approach in fisheries are fundamental principles of management in the fisheries sector in Norway, with the preservation of the ecosystems' productivity and economic development in mind. Most of the fish stocks that fall under the Norwegian fisheries jurisdiction are shared and are governed through quota and access regulations based on the best available scientific advice. Importantly, while most commercially exploited fish stocks are currently fully utilized or overutilized globally<sup>13</sup>, it has been recognized that the economically (most) significant fish stocks

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<sup>11</sup> Norwegian Ministries. Blue Opportunities: The Norwegian Government's Updated Ocean Strategy. URL: <https://www.regjeringen.no/en/dokumenter/the-norwegian-governments-updated-ocean-strategy/id2653026/>

<sup>12</sup> DNV GL. Sustainable Blue Economy in the Norwegian Arctic (Part 1: Status). Centre for the Ocean and the Arctic. URL: [https://www.havarktis.no/files/SustainableBlue-Economy-in-the-Norwegian-Arctic-Part-1-Status\\_FINAL.pdf](https://www.havarktis.no/files/SustainableBlue-Economy-in-the-Norwegian-Arctic-Part-1-Status_FINAL.pdf);

DNV GL. Sustainable Blue Economy in the Norwegian Arctic (Part 2: Foresight for 2030 and 2050). Centre for the Ocean and the Arctic. URL: [https://www.havarktis.no/img/Sustainable-Blue-Economy-in-the-Norwegian-Arctic-Part-2-Foresight\\_red.pdf](https://www.havarktis.no/img/Sustainable-Blue-Economy-in-the-Norwegian-Arctic-Part-2-Foresight_red.pdf)

<sup>13</sup> FAO. The State of World Fisheries and Aquaculture 2018 – Meeting the sustainable development goals. URL: <http://www.fao.org/3/i9540en/i9540en.pdf>

in Norwegian waters are successfully managed within safe and sustainable limits<sup>14</sup>. In addition, IUU fishing of Northeast Atlantic cod in the Barents Sea has been completely eradicated<sup>15</sup>. In this area, Norway cooperates with neighbouring countries in the management process via regional fisheries management bodies such as the Joint Norwegian-Russian Fisheries Commission and the North-East Atlantic Fisheries Commission. The Norwegian Institute of Marine Research and the Norwegian Directorate of Fisheries are national institutions cooperating with the International Council for Exploration of the Sea for the assessment of stock sizes and quota advice, which are then proposed and implemented on a national level.

In addition, particular importance is put on the environmental impact of aquaculture, such as the negative pressure on wild salmon populations, the spread of salmon lice, and discharges, balanced against the significant economic and employment growth the sector provides, especially in small and sparsely populated regions. Enacted in 2020, the Norwegian government's 'traffic light system' management strategy for predictable and sustainable growth in the aquaculture sector divides the Norwegian coast into 13 production regions, each of which is assessed based on environmental indicators before production increases are granted<sup>16</sup>. The most topical factor in consideration is the impact of salmon lice on the wild salmon and trout population. According to this system, Northern Norway is divided into seven production regions (regions 7–13); currently, five of these regions have received the green light for an increase in production of up to 6%<sup>17</sup>.

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<sup>14</sup> 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/>

<sup>15</sup> Nærings- og fiskeridepartementet. Om ulovlig, urapportert og uregulert (UUU) fiske. URL: <https://www.regjeringen.no/no/tema/mat-fiske-og-landbruk/fiskeri-og-havbruk/1/fiskeri/ulovlig-fiske/om-ulovlig-urapportert-og-uregulert-uuu-fiske/id2579076/>

<sup>16</sup> Nærings- og fiskeridepartementet. Regjeringen skrur på trafikklyset i havbruksnæringen. URL: <https://www.regjeringen.no/no/aktuelt/regjeringen-skrur-pa-trafikklyset-ihavbruksnaringen/id2688939/>

<sup>17</sup> Nærings- og fiskeridepartementet. Regjeringen skrur på trafikklyset i havbruksnæringen. URL: <https://www.regjeringen.no/no/aktuelt/regjeringen-skrur-pa-trafikklyset-ihavbruksnaringen/id2688939/>

## The case of Arctic Russia

### Fisheries and Aquaculture

The Russian Arctic is an immense territory that stretches over 53% of the Arctic Ocean coastline (approximately 24,150 kilometres) and includes the whole of the Murmansk Region and the Nenets, Yamal-Nenets and Chukotka Autonomous Okrugs, the northern municipalities of the Arkhangelsk Region, the Komi Republic, Krasnoyarsk Territory and the Republic of Sakha (Yakutia), as well as the archipelagos and islands in the Russian portion of the Arctic Ocean<sup>18</sup>. Approximately two and a half million people reside in the Russian Arctic, accounting for nearly half of the total population living in the Arctic worldwide<sup>19</sup>. That said, it is of paramount importance for the economic development of the region the way marine resource management considers ecosystem needs and successful societal engagement.

Although the extraction of natural resources, primarily oil and natural gas, remains Russia's primary Arctic industry, fisheries and aquaculture are also significant, and constitute an integral part of the coastal communities of Arctic Russia, home of 41 legally recognized Indigenous communities ranging from the North to Siberia and the Far East<sup>20</sup>. The largest industries in Arctic Russia are fisheries, sea food production, shipbuilding, logistics, processing industry and tourism. A significant part of the Barents Sea and the waters of the Norway and Greenland seas have demonstrated strong interest in fisheries, while the East Siberian, Laptev, Kara, and Chukchi seas are rarely fished and poorly researched (Stupachenko, 2018).

Russia was in the top seven marine capture producers in 2018, accounting for almost 6% of total global capture production<sup>21</sup>, while much of this capture has been taking place in its Arctic waters. In the entire Russian Arctic, there are 289 known species of fish, with more than 80% of those being located in the Barents Sea

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<sup>18</sup> Arctic Council. The Russian Federation. Retrieved July 9, 2022. URL: <https://www.arctic-council.org/about/states/russian-federation/>

<sup>19</sup> The Arctic Institute. Russia. URL: <https://www.thearcticinstitute.org/countries/russia/>

<sup>20</sup> Ibid.

<sup>21</sup> FAO. The State of World Fisheries and Aquaculture 2020: Sustainability in action. URL: <https://doi.org/10.4060/ca9229en>

and Greenland seas. Russia's total annual catch in its Arctic region is about one million metric tons of cod, haddock, pollock, capelin, poutassou, herring, grouper, and mackerel<sup>22</sup>. That represents about 20% of the country's catch as a whole (Stupachenko, 2018). Other Arctic species (stocks that appear only in ice-laden waters and spawn at below-zero temperatures) targeted in Arctic Sea Russian fisheries are navaga and Arctic flounder (Stupachenko, 2018). These fisheries, along with freshwater and diadromous fisheries are also contributing to the subsistence of Russian Arctic Indigenous peoples (Troell et al., 2017).

Given that the Barents Sea is one of the most productive seas in the world, the economically most important species are the Northeast Arctic cod, haddock and capelin, the latter being the main prey species of cod. Russia and Norway share these fish stocks, through several decades of collaboration, since their maritime boundary delimitation, and co-manage stocks via the Joint Norwegian–Russian Fisheries Commission (Hønneland, 2012). The most important species for Russian fisheries, Atlantic cod accounts for 41% of landings from Arctic areas with and other species such as haddock (18%), herring (14%), mackerel (9%) and capelin (8%) following (Troell et al., 2017). In this context, Murmansk has traditionally been the port in Russia with the largest catch value, while during the period 2009–2012, the Murmansk region was on the first place in case of production of fish and processed and canned fish products in the North-West Federal District of the Russian Federation (Boboedova, 2014). Overall, fishing industry of the Murmansk region provides about 1/5 of harvested marine biological resources of the Russian Federation, and about 60% – in the North-West Federal District of the Russian Federation (Boboedova, 2014). When it comes to the three exclusively Russian Large Marine Ecosystems (Kara Sea, Laptev Sea, and East Siberian Sea), as well as the Russian part of the Chukchi sea, fish production is to great extent unreported, with limited sources and material published, while much of these fisheries is linked to subsistence activities for the local populations. It is often observed that there is a complete

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<sup>22</sup> FAO. Russian Federation: Review of the fishery sector. URL: <https://www.fao.org/3/aj279e/aj279e.pdf>

lack of data on marine fisheries in the Russian part of the Chukchi Sea (Heileman & Belkin, 2020).

The Russian government has previously identified aquaculture development as a top priority sector within the agriculture industry, and although being a relatively young sector and only contributing to 4% of the country's fish production, the sector is rapidly growing and predominantly focusing on salmon production (Stupachenko, 2020). Since 2018, aquaculture businesses acquired 14,600 hectares for potential development, two times more than over the last two decades (Stupachenko, 2020). Once again, in collaboration with its Nordic neighbour, several Norwegian suppliers of marine, fresh-water and land-based technology, equipment, nets, fish feed, software, genetics, services, etc. have been already involved in setting up marine and land-based sites for salmonids, having track record of sales in Murmansk, Karelia and other Russian regions (Stupachenko, 2020).

At a regional level aquaculture varies from district to district. In the North-Western Federal District, commercial aquaculture is nowadays developing, most prominently in commercial cages and pools, based on the cultivation of salmon and whitefish and mariculture<sup>23</sup>. The volume of commercial aquaculture production (commercial fish farming) in 2020 has been predicted to a bit less than 150 thousand tons. In the Ural Federal District, natural reservoirs are suitable for fish of the cold-water complex, and for the development of commercial aquaculture (commercial fish farming) on warm waters, where there are both natural geothermal sources and warm waters of power plants. The volume of commercial fish farming products in 2020 is expected to be increased to 9.2 thousand tons<sup>24</sup>. The variety of climatic conditions of the Siberian Federal District allows the development of both cold-water (whitefish, salmon) and warm-water (sturgeon, carp) fish farming. The volume of commercial aquaculture production (commercial fish farming) there meets much lower numbers and is estimated to approximately

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<sup>23</sup> Aquaculture in Russia. Northwestern Federal District. URL: <http://aquacultura.org/aquacultura/severozapadniy-fo/>

<sup>24</sup> Aquaculture in Russia. Ural Federal District. URL: <http://aquacultura.org/aquacultura/uralskiy-fo/>

11.1 thousand tons<sup>25</sup>. Finally, the Far Eastern Federal District has exceptional conditions, where the large-scale development of mariculture has been flourishing. The most promising types of cultivation are the Far Eastern trepang, seaside scallop, gray sea urchin, kelp, Pacific mussel, Pacific oyster. The volume of grown products by 2020 was estimated to around 17.4 thousand tons<sup>26</sup>. Positive experiences gained from the development of mariculture in the Russian Far East will be used as a model for an incentive framework for the Arctic. Overall Russia's Ministry for Development of the Far East is working out incentive measures to further boost aquaculture in the Russian north, claiming it is one of its greatest priorities (Stupachenko, 2020).

### **Conceptualizing the Blue Economy**

Fisheries and the blue economy are supported by several federal and regional programmes and strategies<sup>27</sup>. Like elsewhere in the Arctic, Russian state authorities have long now been familiar with the concept of sustainability, especially SDG #14. Yet, considering that Russia is in its very essence a Federal State, governance of fisheries and aquaculture is to a great extent decentralized, and thus the blue economy is differently perceived in different regions of its massive Arctic coast. It is thus interesting to investigate how authorities in coastal urban communities organize the emerging blue economy. There are 23 coastal cities in the Arctic region of the Russian Federation that are somehow involved in fisheries and aquaculture: Anadyr, Arkhangelsk, Belomorsk, Beringovskiy, Dikson, Dudinka, Egvekinot, Igarka, Kandalaksha, Khatanga, Mezen', Murmansk, Naryan-Mar, Novy Port, Onega, Pevek, Provideniya, Sabetta, Severodvinsk, Severomorsk, Tiksi, Varandei, and Vitino (Tianming et al., 2021). Since the Soviet era, these urban settlements were traditionally developed as strongholds in areas, such as extractive, machine- and ship-building industries,

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<sup>25</sup> Aquaculture in Russia. Siberian Federal District. URL: <http://aquacultura.org/aquacultura/sibirskiy-fo/>

<sup>26</sup> Aquaculture in Russia. Far East Federal District. URL: <http://aquacultura.org/aquacultura/dalnevostochniy-fo/>

<sup>27</sup> Submariner Network. The Submariner Network in Russia. Retrieved May 1, 2022. URL: <https://www.submariner-network.eu/country-profile-russia>

metallurgical production, and port services, while more recently they have expanded their interest to the sea and ocean living resources.

Harmonization of economic interests with environmental needs in exploitation of marine biological resources is very important to achieve sustainable economic development for Russian industries and require the incorporation of blue economy values. As Tianming et al. (2021) have previously observed, local authorities at the Arkhangelsk, Murmansk, and Severodvinsk have largely paid attention to discussions on the blue economy and sustainable development, having a proper implementation mechanism to include local stakeholders into the planning process, and have long now well-established cooperation with international partners. However, none of these regions have included the blue economy in its economic development plans and official strategies, while blue economy aspirations remain fragmented and spread across different documents. Big focus is for example placed on pollution, biodiversity conservation, environmental damage and climatic changes in the regions, but an integrated approach in fisheries and aquaculture planning that shares these values is so far absent (Tianming et al., 2021). For example, the authorities of Arkhangelsk are responsible for operating the national reserve “the Russian Arctic”, which among other priorities, aims to protect the unique marine biodiversity. Although such conservation schemes are successfully operating, there is a lack of cohesion between conservation and economic development efforts. Furthermore, many regions in Russia are not treating aquaculture as a priority, in contrast to the Western ones such as the Republic of Karelia, Murmanskaya oblast, and Arkhangelskaya oblast, which have used it as a sustainable economic development tool.

Furthermore, while coastal urban communities have at times affirmed the sustainable development concept and tried to apply it in their development strategies, these subnational actors are largely unfamiliar with the blue economy concept. Indeed, in central Arctic Russia and Far Northeast it should be also noted that Russian northern municipalities still lack distinct sustainable development strategies. For this reason, important economic, environmental, and social/human dimensions of sustainable development and blue economy strategies are often missing or not properly harmonized

with one another. Interestingly, the blue economy is more systematically utilized by subarctic Russian regions such as the Krasnodar Krai in the Black Sea (Damianova et al., 2020). Similarly, the Leningrad Oblast and the Kaliningrad Oblast in the Baltic Sea have been actively introducing the principles of the blue economy into their development programmes over the past few years and are participating in programmes to preserve the ecosystem of the Baltic Sea<sup>28</sup>.

Overall, while there are some traces of blue economy principles in Russian Arctic policymaking, a comprehensive conceptualization of the blue economy for the region is still missing both from federal and district strategies. At a federal level, in 2015, the Russian Federation adopted a new maritime doctrine, the main goal of which is to realize the state's maritime potential and to manage the sectors of the economy and science related to maritime activities. In 2017, marine biotechnology was also included in the state programme<sup>29</sup>. Both documents contain the key principles for developing a blue economy potential for Russia – discussing, *inter alia*, the introduction of innovations, the search for new territory for development, the development of human capital, the creation of new jobs, the efficiency and zero waste of production, the use of local resources, as well as the maximum implementation of the principles of the blue economy in the development programs of coastal territories (Submariner Network, n.d.). The implementation of these programmes will ensure the growth of regional indicators of the economy, an increase in the number of jobs, and the involvement of new, including secondary resources in the economy, but at the same time ensuring the economic interests of a society with a good environmental quality and sustainable biodiversity (Submariner Network, n.d.).

Although such expectations are pertinent at a federal level, the new Arctic 2035 policy for Russia devoted to its circumpolar regions omitted to address blue economy considerations in the context of Arctic fisheries and aquaculture. While focusing on improving living conditions in the Arctic, it predominantly relies on

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<sup>28</sup> Submariner Network. The Submariner Network in Russia. Retrieved May 1, 2022. URL: <https://www.submariner-network.eu/country-profile-russia>

<sup>29</sup> Ibid.

commercial projects to develop offshore oil and gas in the region, putting thus paramount attention to energy production (Kluge & Paul, 2020). As further observed by Tianming et al. (2021), the blue economy is not much discussed in Russian scholarship either, with most Russian scholars drawing on blue economy models applied elsewhere. When it comes to the Arctic region, such discussions predominantly address blue economy needs through conservation of biodiversity and prevention of marine pollution in the Arctic Ocean, without looking at the potential of fisheries and aquaculture development (Tsiouvalas et al., 2022).

## **The case of Alaska**

### **Fisheries and Mariculture**

When the United States purchased Alaska from Russia in 1867 for \$7.2 million, some thought that the US had acquired useless land (Barker, 2009). However, this “Seward’s Folly,” as it was initially characterized in reference to Secretary of State William Seward, soon proved to be a valuable purchase. With over 3 million lakes, 3,000 rivers, and 34,000 miles of coastline bordering three different seas (Arctic Ocean, Pacific Ocean, and Bering Sea), Alaska has been one of the world’s most biologically productive regions, producing a wide range of seafood products<sup>30</sup>. Being rich in all five species of Pacific salmon, four species of crab, many kinds of groundfish, shrimp, herring, sablefish, pollock, Pacific halibut, and others, Alaska has gradually emerged as a leading stakeholder in seafood markets across the globe.

However, the rapid development of Alaskan fisheries did not start before the mid-20<sup>th</sup> century, given that Alaska initially held limited interest for the United States due to its great size, remoteness, and challenging climate, which initially discouraged capital investments for development (Naske & Slotnick, 1994). Only after the Second World War and Alaska’s recognition as the 49<sup>th</sup> State of the US in 1959 did the region witness an accelerating growth of population and related developments in the fisheries sector, which soon became the state’s most profitable industry, surpassing the previously dominant mining sector. A milestone in this development was the

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<sup>30</sup> Resource Development Council for Alaska. (n.d.). Alaska’s Fishing Industry. URL: <https://www.akrdc.org/fisheries>

devolution of the Alaskan fisheries management to the State of Alaska in 1960 (Naske & Slotnick, 1994).

Since then, the State has assumed responsibility for fisheries management from the federal government, incorporating into commercial fishing the principle of sustained yield, an idea reaffirmed in Alaska's Constitution. Of great importance for the management of Alaskan fisheries was also the enactment of the 1976 Magnuson Stevens Act, establishing a 200-nautical-mile (nm) exclusive economic zone off the coast of the United States. As provided by the Act, the federal government exercises authority up to 200nm, while the State of Alaska establishes its own jurisdiction (and can enjoy the royalties of resource development) up to 3nm. These regulatory amendments provided a fertile ground for a decentralized and community-inclusive fisheries regime, which was gradually consolidated and became one of the world's most sustainable governance schemes.

Today, Alaska produces more than half of the fish caught in waters off the coast of the United States, having an average wholesale value of \$4.5 billion a year<sup>31</sup> that originates from commercial fisheries off Alaska in two major areas: the Bering Sea and Aleutian Islands, and the Gulf of Alaska (Björnsdóttir et al., 2021). In 2018, the seafood industry contributed more than \$172 million in taxes and fees to the State, municipalities, and a wide spectrum of state and federal agencies, providing numerous opportunities for the state's population<sup>32</sup>. Annual seafood harvest in Alaska consistently accounts for about 60% of total US seafood harvests, while more than 9,000 vessels are home-ported in Alaska, delivering fish to over 120 shoreside processing plants<sup>33</sup>.

The seafood industry of Alaska generates an average of \$5.6 billion per year for the State's economy, derived from a large variety of products<sup>34</sup>. Among all species in the Alaskan seafood industry, salmon has the greatest economic impact (jobs, income, and total

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<sup>31</sup> National Oceanic and Atmospheric Administration (NOAA). Alaska. URL: <https://www.fisheries.noaa.gov/region/alaska>

<sup>32</sup> Resource Development Council for Alaska. Alaska's Fishing Industry. URL: <https://www.akrdc.org/fisheries>

<sup>33</sup> Ibid.

<sup>34</sup> Alaska Seafood Marketing Institute. (2020). The Economic Value of Alaska's Seafood Industry (January 2020). URL: <https://www.alaskaseafood.org/resource/theeconomic-value-of-alaskas-seafood-industry/>

value), thanks to the abundance of wild salmon in Alaska's waters and the recent development of hatcheries and the sustainable management of salmon stocks. The increasing development of salmon fisheries started in the early 1970s, when the first modern hatchery program was initiated. Alaska's salmon hatchery program was designed to supplement and not replace sustainable natural production of wild salmon stocks and is still flourishing (Vercessi, 2013).

With finfish farming practices considered illegal, Alaska's hatcheries have only focused on supplementing wild stock production by incubating fertilized eggs and releasing progeny as juveniles (i.e., fry or smolt). Since 1974, the hatchery program has been expanding, authorizing private, non-profit corporations to operate salmon hatcheries<sup>35</sup>. Consequently, in the 1980s, Alaskan salmon already dominated markets both in the US and abroad, and Alaska accounted for nearly half of the global salmon supply. The hatchery program was intensified in the 1990s and remained the world's leading salmon industry until 1996, when salmon farming started to rapidly expand around the globe and surpassed wild salmon for the first time (Stopha, 2019). The Alaskan fishing industry responded to the competition by further improving fish quality, implementing intensive marketing efforts to differentiate Alaskan salmon from farmed salmon, and moving part of the processing sector to China. As observed by the Alaska Department of Fish and Game, by 2004, these efforts paid off through increasing demand and prices (Stopha, 2019). Still, Alaska's 29 hatcheries today account for just 12–15% of the global supply of salmon, and the state needs to find sustainable solutions to regain its role in the world's major salmon markets (Stopha, 2019).

The second most profitable fishery for the state and the largest single-species fishery, by volume, is Alaskan pollock. Pollock is the most abundant wild whitefish species on the planet and, together with the remaining groundfish fisheries, makes up more than 80% of Alaska's total catch accounts (Fissel et al., 2018). Pollock fisheries accounted for 44% of global supply in 2015, while in 2018 pollock

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<sup>35</sup> National Research Council. *Marine Aquaculture: Opportunities for Growth*. The National Academic Press. URL: <https://doi.org/10.17226/1892>

was the second most caught species in the world after Anchoveta<sup>36</sup>, and above skipjack tuna catches that stood in third place. In addition to pollock, Alaska's groundfish fisheries include five more major species-complexes: Pacific cod, sablefish, Atka mackerel, the flatfish complex, and the rockfish complex. By volume, the fisheries for Pacific cod succeed pollock with a retained catch of 298,000 metric tons in 2017 (Fissel et al., 2018). Halibut, black cod, and crab fisheries are also significant fisheries that in 2015 contributed 19% of total labour income and economic output<sup>37</sup>. Pacific halibut, however, is not a federally managed species like the rest of the groundfish, and it is subject to specific management under the Pacific Halibut Treaty between Canada and the United States (Clark & Hare, 2006). Alaskan king and snow crab successfully reached 29% of global supply for 2015, lacking, though, in comparison to foreign competitive industries, such as Canada and Russia.

Although fish farming in Alaska is prohibited by law, many species have been produced and sold from Alaskan mariculture operators over the last three decades. Since 1990, mariculture production has included several species, the most important being Pacific oyster, geoduck, blue mussel, green sea urchin, littleneck clam, and pink scallop (McDowell Group, 2017). Today, mariculture in Alaskan waters primarily revolves around oyster farming. As of 2020, the shellfish and aquatic plant farming industry in Alaska comprises 58 aquatic farms, 8 nurseries, and 4 hatcheries for a total of 70 permitted operations-42 in southeast Alaska, 22 in Prince William Sound and Kachemak Bay (Southcentral), and six around Kodiak (Pring-Ham, 2020). The overall sales of shellfish and aquatic plants for all permitted operations reached \$1.2 million in 2016 (State of Alaska, 2018). Approximately 29 (32%) of the aquatic farm operations sold over 1.32 million Pacific oysters, 42,695 pounds of Pacific geoduck, and 4,975 pounds of blue mussels, with a total farm

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<sup>36</sup> FAO. The State of World Fisheries and Aquaculture 2020: Sustainability in action. URL: <https://doi.org/10.4060/ca9229en>

<sup>37</sup> Alaska Seafood Marketing Institute. The Economic Value of Alaska's Seafood Industry (September 2017). URL: <https://www.alaskaseafood.org/resource/economicvalue-report-september-2017/>

gate value of \$1.23 million<sup>38</sup>, constituting, in addition to fisheries, a promising source of income<sup>39</sup>.

### Conceptualizing the Blue Economy

The realization that a blue economy potential is highly relevant for the sustainable future of Alaska extends beyond academic discussions and has been echoed by US authorities. Recently, NOAA affirmed<sup>40</sup> that Alaska's blue economy future looks bright through science-based sustainable management of wild-caught fisheries and mariculture-produced foods from the ocean<sup>41</sup>. NOAA's Blue Economy Strategic Plan further aspired towards the potential of a blue economy for the United States, laying out a roadmap for new ways to advance the US blue economy at a federal level<sup>42</sup>. The report, *inter alia*, highlights the need for advancing ecosystem-based fisheries management, combating IUU fishing, and fostering the development of sustainable aqua-/mariculture operations in the US, yet with only minimal references to Alaska and the particular socio-ecological conditions that characterize the State (National Oceanic and Atmospheric Administration (NOAA), 2021b). At State governance level, engagement with blue economy visions in Alaska is also absent from official policy documents and, at the time of writing, remains limited to university campaigns, such as the Alaska Blue Economy Center, established by the University of Alaska, Fairbanks.

Environmental sustainability and ecosystem protection goals are however high on the agenda of Alaskan fisheries and mariculture management and thus play a key role in their governance and regulation, although not framed through the blue economy lens. In that regard, the NOAA Alaska Fisheries Science Center (AFSC) has been monitoring the health and sustainability of fish, marine mammals, and their habitats across nearly 1.5 million square miles

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<sup>38</sup> State of Alaska. Alaska Mariculture Development Plan. URL: <https://www.afdf.org/wp-content/uploads/Alaska-Mariculture-Development-Plan-v2018-03-23-small-single-pg-view.pdf>

<sup>39</sup> Ibid.

<sup>40</sup> National Oceanic and Atmospheric Administration. Alaska's Blue Economy Includes Both Mariculture and Wild Caught Seafoods. URL: <https://www.fisheries.noaa.gov/feature-story/alaskas-blue-economy-includes-both-mariculture-and-wild-caught-seafoods>

<sup>41</sup> National Oceanic and Atmospheric Administration. NOAA Blue Economy: Strategic Plan 2021–2025. URL: <https://oceanservice.noaa.gov/economy/blue-economy-strategy/>

<sup>42</sup> Ibid.

of water surrounding Alaska, as well as implementing regulations adopted by the North Pacific Fishery Management Council, the major body in charge of developing management techniques, policies, and regulations related to federal fisheries outside 3nm. The AFSC has also developed the Economic and Social Sciences Research Program, which fosters economic and sociocultural information in order to assist the National Marine Fisheries Service in meeting its stewardship responsibilities. Significant research progress has also been made by the North Pacific Research Board, which was created in 1997 to recommend marine research activities to the US Secretary of Commerce. The Board's agenda includes, among other tasks, science planning, ecosystem information needs, coordination and cooperation between research programs, enhanced information availability, and public involvement in fisheries in the North Pacific, Bering Sea, and Arctic Ocean.

The state's goal for sustainable fishing is grounded on the combination of tough regulation, strict enforcement, close monitoring, and innovative technologies. The AFSC, the Alaska Regional Office, academia, and the commercial fishing industry have been long working with the NOAA's Fisheries Information System Program to develop innovative technologies for the effective and cost-efficient management and monitoring of US commercial fisheries. Of great importance was the 2018 introduction of electronic monitoring for catch estimation. The AFSC, together with the state's universities and commercial fishermen, have been working together to develop additional innovative monitoring tools able to identify and measure fish from digital images. By transitioning the former paper-based fish ticket system to an electronic reporting form, fisheries agencies have managed to improve the accuracy and timeliness of commercial landings data for several species in Alaska. Innovative technologies toward sustainability are also supported by private fishing corporations.

## **The results**

As promising starting points for future comprehensive and multidisciplinary research on the subject, the results of this article contribute to determining the crucial dimensions of fisheries and aqua-/mariculture in Northern Norway, Arctic Russia and Alaska,

paving the way for cross-regional collaboration in further pursuing the blue economy. Our interdisciplinary research overview has revealed how existing research within the different disciplines offers data, research foci, and insights about the status quo of fisheries and aqua-/mariculture among these three leading Arctic regions. It further generated insights about how authorities in the three regions understand the blue economy in the context of fisheries and aquaculture. From our descriptive synopsis, an overview of several thematic areas emerges, wherein the regions would benefit from an exchange of information, best practices, and technological improvements.

The literature review of the status quo of fisheries and aquaculture in the three Arctic regions in accordance with RQ1 provided a descriptive account of how marine resource management has been operating in Northern Norway, Arctic Russia, and Alaska, respectively. Keeping this illustration in mind, and drawing on state formal conceptualization of the blue economy as depicted in the region's fisheries and aquaculture strategies (RQ2), it is important to interweave these findings and compare different blue economy conceptualizations in order to draw synergies among the three Arctic regions.

When it comes to respective state instruments, the blue economy conceptualization is most prominent in Norwegian documents, with state authorities being aware of the need to merge economic development with blue aspirations, environmental protection, community engagement, research and education, and rather promotes an inclusive model of blue economy. This is well anchored in the 2019 Ocean Strategy, that places focus on sustainability and blue economy development in the Norwegian Arctic. The latter further affirms that the blue development of the oceans can be part of the solution to the world's environmental and climate-related challenges, and places focus on the elimination of IUU fishing. Sustainability and the precautionary approach also characterize the harvesting of living marine resources, which is well organized on the basis of quotas and through collaboration via Regional Fisheries Management Organizations (RFMOs).

The picture is rather different when it comes to the blue economy in Arctic Russia. Fisheries and aquaculture are supported by both

federal and regional programmes and strategies<sup>43</sup>, which however largely vary across the region. While recently the engagement with the idea of sustainable development has increased in official policy-making documents, the blue economy is barely mentioned in formal strategies. Another characteristic pertinent to this conceptualization is the fragmented nature of blue economy concerns and the lack of an integrated approach where economic development of fisheries and aquaculture is supplemented by environmental needs and societal engagement. Finally, the lack of published data or information about how fisheries and aquaculture operate in some Russian regions is also an indicator of fragmentation and lack of coherence when it comes to Arctic Russian marine resource management policies. Although blue economy realizations are more relevant at a federal level, the new Arctic 2035 policy for Russia demonstrates that the state's agenda for its Arctic regions predominantly relies on commercial projects, putting much attention to energy production and industrial development (Kluge & Paul, 2020). That said, the safest conclusion derived from this article's summary on the Arctic Russian model is that blue economy still remains highly underdeveloped with untapped potential.

In Alaska for comparison there is a more inclusive conceptualization of the blue economy in relation to fisheries and mariculture, much relied on science-based sustainable management. At a federal level, and similarly to Norway, much focus is placed on monitoring and combating IUU fishing. However, similar to Russia's federal Arctic policy, federal documents in the US are not putting emphasis on the blue economy development in Alaska, or particular focus on the socioecological morphology of the State. The status quo of the Alaskan model of fisheries and aquaculture development at State level demonstrates that the Alaskan conceptualization of the blue economy also remains underdeveloped: Alaska State policy has not yet initiated institutionalized dialogues on the blue economy (although focusing on sustainable development), with such endeavours remaining only localized or operationalized at the micro-level. Much like Russia, the blue economy is therefore less considered in formal documents.

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<sup>43</sup> Submariner Network. The Submariner Network in Russia. Retrieved May 1, 2022. URL: <https://www.submariner-network.eu/country-profile-russia>

A constructive exchange of best policy practices could offer the potential to further enhance the three regions' blue economy aspirations (RQ3). At a governance level, Alaskan and Arctic Russian fisheries management is strongly grounded on close cooperation between federal and state authorities, while in Norway, fisheries management remains highly centralized. Indeed, the US and Russia are federal states, while Norway is not; however, decision-making can be delegated to the regional level in non-federal states too. In Russia a gap remains in the way the blue economy is differently understood at both the federal and state level, with most efforts being localized and yet employed by local authorities, especially in the Northwest part of Russia.

New ground can also be broken at a sectoral level. As demonstrated above, all three regions are highly interested in the salmon industry, with salmon being an extremely profitable source of income and employment for both Northern Norway and Alaska. Although salmon farming is carried out in fundamentally different manners in these three areas, there is great potential for them to learn from each other's practices, with Alaska's successful development of hatcheries and sustainable management of salmon stocks and Northern Norway's highly profitable aquaculture. Salmon farming in Arctic Russia is rather new and developing, but offers high potentials for further expansion in accordance with the region's economic and socioecological needs. Drawing on best practices from Alaska's sustainable hatcheries, and Norway's highly profitable aquaculture, farming in Arctic Russia could also rapidly develop and soon render it a global stakeholder.

## **Conclusions**

An increasing amount of published literature has been devoted to promoting interdisciplinary research in the context of Northern Norway, Arctic Russia and Alaska fisheries and aqua-/mariculture. However, comprehensive studies, comparative assessments, and knowledge exchange concerning the blue economy's potential in the three regions is still lacking academic engagement. In this article, we sought to initiate a conceptual mapping of the current economic and environmental status of fisheries and aqua-/mariculture in the three case studies in the context of the blue economy, by first

focusing on how the three regions themselves tend to conceptualize the blue economy. Our effort has overcome a first stumbling block in the trans-border engagement of Arctic seafood industries and the conceptualization of the controversial and ambivalent definition and interpretation of the term 'blue economy' for Northern Norway's, Arctic Russia's and Alaska's seafood industries, making this knowledge available for relevant stakeholders and decision-makers.

Our investigation for the purpose of RQ1 on the status quo of fisheries and aqua-/mariculture in the three regions scene, demonstrated that despite their existing competitive interests in global seafood markets, Northern Norway, Arctic Russia and Alaska are (and will continue to be) commonly characterized by strong dependency on the ocean and its living resources. Thus, embracing blue economy at regional and state governance level may be key for all three regions to further develop the sectors for the purpose of economic growth in marine and coastal areas, improvement of human well-being, local engagement, and social equity, and reduction of environmental risks, being of paramount importance in light of a changing Arctic.

To engage with the blue economy though, foremostly the Arctic states themselves should intensify the utilization of the concept at policy-making level. That said, this article's inquiry subsequently looked at RQ2 on how fisheries and aqua-/mariculture are linked to the lens of the blue economy as depicted in core official (Northern) Norwegian, Arctic Russian, and Alaskan marine development strategies. Although some groundwork on the blue economy has been carried out at different levels by all three regions, a certain conclusion from this article is that the blue economy remains a concept underdefined in the three regions with much different conceptualizations by state and regional instruments, while at times, as the Russian model demonstrated, local authorities may not engage with the concept at all.

Interfacing fisheries and aqua-/mariculture development in light of the blue economy as suggested by RQ3 paves the way for future collaboration in many sectors: policy development, exchange of technologies, improving services, infrastructure and governance, environmental sustenance, and market best practices. Against this background, the three regions would benefit from an overall

toehold in exchange of information, best practices, and technological improvements. However, there are still many watersheds left on the path to a meaningful answer to the call for a pan-Arctic blue economy. Lessons distilled from this article's brief investigation of each region's blue economy model may be valuable for the respective other regions in further enhancing their blue economies. Bridging such lessons and conceptualizing a holistic blue economic development commonly understood by Arctic littoral states may overall pave the way for understanding the complex dynamics of the Arctic economies in light of ongoing changes and eventually lead to a pan-Arctic conceptualization of a blue economy framework.

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