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The Central Arctic Ocean Fisheries Agreement – Legislating for Resilience? An Analysis of the CAOF Agreement from a Socio-Ecological Systems Resilience Perspective

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Abstract

The Central Arctic Ocean is faced with the prospect of ice-free summers by the end of the century, and unregulated fisheries present a risk for its ecosystems and fish stocks. The 2018 Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (CAOFA) aims to prevent irreversible damage to yet unknown ecosystems caused by future fisheries. In this article, the merits of the CAOFA are subjected to a resilience-based analysis. The results of this analysis suggest that the CAOFA provides a significant amount of flexibility and supports iterativity, which enhances the resilience of the CAO as an emerging socio-ecological system. However, the Agreement also has significant shortcomings, lacking

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opportunities for the participation of non-State actors, and non-Parties in decision-making, as well as provisions guaranteeing equal access to resources for affected communities should a fishery be established. The analysis also identifies the law-science nexus as a key area of future research. Although the Agreement strongly relies on science and other forms of knowledge to map out the future of the CAO, and although socio-ecological resilience is a science-based concept, much ambiguity surrounds the role of science in the assessment of the implementation of the Agreement and future proceedings. Investigating the law-science nexus in more detail thus provides an opportunity to contribute to the growing body of knowledge on the CAOFA and to the larger law and resilience literature.

Keywords: CAOFA, Fisheries, Law-science nexus, Resilience, Arctic, Central Arctic Ocean, Participation, UNCLOS

1. Introduction

Climate change is leading to a warming of the Arctic at an alarming rate, currently around four times as fast as on the rest of the planet.[1] This warming process, the effects of which are already emerging today, will alter the environment in the terrestrial and the marine Arctic irreversibly.[2] One of the major changes is related to sea ice. While the Arctic

1. Mika Rantanen and others, 'The Arctic has warmed nearly four times faster than the globe since 1979' (2022) 3 Communications Earth & Environment 1, 6.

2. M. Meredith and others, 'Polar Regions' in H.-O- Pörtner and others (eds), *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate* (Cambridge University Press 2019) 205.

Ocean has been entirely covered by sea ice in the past, the sea ice cover is retreating at rapid speed, and estimates project a heightened likelihood of Arctic Ocean ice-free summers by the end of the century at the latest.[3]

An increase in open water also increases the prospect for different economic opportunities, such as shipping and fishing. Although there is currently very little information about the Central Arctic Ocean (CAO)'s ecosystems and their potential to support future fisheries,[4] northwards expansion of species' ranges and habitats due to global warming[5] may mean that some species will be populating the CAO to an extent that will enable commercial fisheries in the future.[6] Reduced, or completely disappeared, sea ice cover over the CAO due to climate change could open up the possibilities for new fishing grounds,[7] which are of interest to a variety of states. If they were to come into existence, these fishing grounds could generate income and contribute to food security, as blue food 'plays an increasing role in global nutrition systems.'[8] Hence, the

3. Thomas I Van Pelt and others, 'The missing middle: Central Arctic Ocean gaps in fishery research and science coordination' (2017) 85 Marine Policy 79 ; N. Abram and others, 'Framing and Context of the Report' in H.-O. Pörtner and others (eds), *The Ocean and Cryosphere in a Changing Climate: Special Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press 2019). See also Todd C Stevenson and others, 'An examination of trans-Arctic vessel routing in the Central Arctic Ocean' (2019) 100 Marine Policy 83, 83.

4. Pauline Snoeijs-Leijonmalm and others, 'Review of the research knowledge and gaps on fish populations, fisheries and linked ecosystems in the Central Arctic Ocean (CAO)' (2020), 45.

5. See e.g. Scott C Doney and others, 'Climate change impacts on marine ecosystems' (2012) 4 Annual review of marine science 11, 20; H.-O Pörtner and others, 'Summary for Policymakers' in H.-O Pörtner and others (eds), *Climate Change 2022: Impacts, Adaptation, and Vulnerability* (Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press 2022) 9.

6. Snoeijs-Leijonmalm and others (n 4) 11.

7. ibid., 7.

8. Michelle Tigchelaar and others, 'The vital roles of blue foods in the global food system' (2022) 33 Global Food Security 100637, 2.

future stocks in the CAO could economically benefit those able to access them, especially in view of declining stocks elsewhere.[9]

Large parts of the CAO are considered high seas, meaning that these waters fall under the freedom of the high seas as specified by Article 87 of the UN Convention on the Law of the Sea (UNCLOS), such as the freedom to fish, subject to conservation considerations.[10] Although a plethora of legislation applied to the CAO (such as rules under the UNCLOS, the UN Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA)[11] as well as the Ilulissat Declaration)[12] already before the Agreement, there was an important regulatory gap. There was no regional fisheries management organization (RFMO) to manage the hypothetical future fisheries in the high seas part of the CAO, which posed a threat of potential stock collapse.[13] Reminiscent of the collapse of the Bering Sea Pollock fisheries in the mid-1990s, the situation caused great concern among the scientific community,[14] resulting in a call for legislative action, aligned with the obligation of state

9. Erik J Molenaar, 'Participation in the central arctic ocean fisheries agreement', *Emerging Legal Orders in the Arctic* (Routledge 2019) 133; Beth Baker, 'Scientists Move to Protect Central Arctic Fisheries' (2012) 62 BioScience 852, 852; Elizabeth Mendenhall and others, 'Climate change increases the risk of fisheries conflict' (2020) 117 Marine Policy 103954, 2.

10. UN Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397.

11. Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks 2167 UNTS 3.

12. Valentin J Schatz, Alexander Proelss and Nengye Liu, 'The 2018 agreement to prevent unregulated high seas fisheries in the Central Arctic Ocean: A critical analysis' (2019) 34 The International Journal of Marine and Coastal Law 195, 201.

13. David Dubay, 'Round Two for Arctic Fishing?' in Myron H Nordquist and Ronán Long, *Marine Biodiversity of Areas beyond National Jurisdiction* (Brill Nijhoff 2021) 333.

14. Andrew J. Norris and Patrick McKinley, 'The central Arctic Ocean-preventing another tragedy of the commons' (2017) 53 Polar Record 43, 47.

parties to UNFSA to cooperate and act upon the emergence of possible new fisheries.[15]

Based on the conviction that fisheries management ought to take a precautionary and ecosystem-based approach,[16] the 'Arctic Five'[17] and a group of five other States,[18] most of which are also part of the UNFSA initiated a two-year negotiating process to prevent unregulated high seas fishing in the CAO. This process resulted in the 2018 Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (CAOFA), which entered into force in June 2021.[19] The CAOFA reflects the decision of the participating states to 'prevent the start of unregulated fishing' in the high seas area of the CAO.[20] Due to its sunset clause, it is currently only valid for a period of 16 years. After this period, the Agreement will continue to be in force for five-year periods, unless objected by any of the State Parties.

The Agreement has been described as a forerunner in legally adaptive, science-based governance of fisheries,[21] and as a 'landmark in both conservation and Arctic governance'[22] that is based on 'a commitment to legal and political stability and to wise stewardship.'[23] What previous

15. UNFSA, Article 6 (6).

16. Rosemary Rayfuse, 'The role of law in the regulation of fishing activities in the Central Arctic Ocean' (2019) 110 Marine Policy 103562, 2.

17. Canada, Denmark, Norway, Russia and the United States of America.

18. China, the European Union (EU), Iceland, Japan and Republic of Korea. See Molenaar (n 9) 133.

19. Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (Ilulissat, Oct 3 2018, entered into force Jun 25 2021). Notably, the Agreement does not apply to sedentary species, as these are jurisdictionally attached to the continental shelves. See art 1 (b) CAOFA and its reference to Article 77 UNCLOS.

20. ibid., Article 2.

21. Rayfuse (n 16).

22. Peter Harrison and others, 'How non-government actors helped the Arctic fisheries agreement' (2020) 2 Polar Perspectives, 12.

23. Alexander N Vylegzhanin, Oran R Young and Paul Arthur Berkman, 'The Central Arctic Ocean Fisheries Agreement as an element in the evolving Arctic Ocean governance complex' (2020) 118 Marine Policy 104001, 9.

research fails to address, however, is the contribution of the CAOFA to the socio-ecological resilience of the area it governs. This calls for a closer look at the CAOFA from a resilience perspective.

This paper aims to contribute to the growing body of law-and-resilience literature that assesses the role of law in (socio-ecological) systems' resilience. After a brief overview of what resilience thinking entails, and which factors contribute to the resilience from a legal perspective, this paper assesses the merits of the CAOFA from a resilience perspective. Next to this assessment, the paper offers a theoretical contribution to the law-and-resilience literature, in arguing that a vital step is lacking in resilience analysis so far: the connection between science and law-making. In order to assess to what extent law contributes to resilience of the system it intends to govern, it is important to understand the role science plays in law-making processes, and in the implementation and later workings of the laws created. The role of the law-science nexus in the law and resilience literature is currently only marginal, despite that fact that ample research has been conducted on the role of science in policy processes. It therefore becomes important to include the law-science nexus into legal resilience analyses, and to explore possible avenues for future research in this area.

2. Methodological Background

The CAOFA has two important components: The first is the precautionary approach underlying the Agreement, and the second is the strong focus on scientific research. While the CAOFA does not entail a moratorium on fishing *per se*,[24] Parties agree to abstain from commercial fishing

24. Schatz, Proelss and Liu (n 12) 222.

in the absence of the knowledge of the CAO's ecosystem's capacities to support commercial fisheries until a conservation mechanism has been established and is operative.[25] Although it may be argued that the threshold for such an Agreement was lower than in other areas, considering the (currently) low probability that commercial fisheries will ever be established,[26] the Agreement is a strong departure from other, more traditional ways of ocean management, as State Parties chose to regulate before initiating fisheries.[27]

2.1 Rationale Behind the Resilience-Focused Approach

While the Agreement aims to safeguard healthy marine ecosystems in the long term,[28] it does not refer to specific approaches that have the potential to contribute to ecosystem preservation. Ecosystem stewardship is an example of such an approach, which the Arctic Five expressly recognised in the Ilulissat Declaration. The term describes 'an action-oriented framework intended to foster the social–ecological sustainability of a rapidly changing planet',[29] which aims to achieve 'ecosystem resilience and human wellbeing.'[30] Reading Article 2 of the Agreement in light of its Preamble, as well as the obligations set forth in Part XII of UNCLOS,

25. CAOFA, Article, 3 (1) (a). Note that parties have reserved the right to commence 'negotiations on the establishment of one or more additional regional or sub regional fisheries management organizations' in Article 14(3) of the CAOFA.

26. ibid., Preamble.

27. Timo Koivurova, Pirjo Kleemola-Juntunen and Stefan Kirchner, 'Emergence of a New Ocean: How to React to the Massive Change?' in Ken S. Coates and Carin Holroyd (eds), *The Palgrave Handbook of Arctic Policy and Politics* (Springer 2020) 409, 420.

28. CAOFA, Article 2.

29. F. Stuart Chapin III and others, 'Ecosystem stewardship: sustainability strategies for a rapidly changing planet' (2010) 25 (4) Trends in ecology & evolution 241, 241.

30. F. Stuart Chapin III and others, 'Ecosystem stewardship: A resilience framework for arctic conservation' (2015) 34 Global Environmental Change 207, 2.

under the FAO Code of Conduct for responsible fisheries, and under the 2003 FAO technical guidelines for Responsible Fisheries Management[31] supports the use of the stewardship approach, as this entails understanding the Agreement in light of the obligations to protect the marine environment and respect ecosystem capacities, while nevertheless considering fish as a resource necessary for human wellbeing.

As resilience is conceptually included in the ecosystem stewardship approach, analysing the Agreement from a resilience perspective therefore has the benefit of contributing to answering the question whether the Agreement is indeed fit for purpose.

2.2 Socio-Ecological Systems and Resilience Theory

The core idea underlying resilience theory is systems' reaction to stresses.[32] In socio-ecological systems theory, these systems are a combination of social and ecological factors. In other words, they refer to a 'multi-scale pattern of resource use around which humans have organised themselves in a particular social structure.'[33] The CAO is in itself emerging as a socio-ecological system, as currently many players are organising around possibilities to exploit or protect its resources once the area becomes accessible. Such a systemic view of the CAO is supported by the preamble of the Agreement, in which State Parties not only regulate their own activities, but also recall the 'interests of Arctic Residents' (social side) in

31. FAO, 'FAO Technical Guidelines for Responsible Fisheries – Fisheries management 2: The ecosystem approach to fisheries' (Rome, 2003).

32. What the exact stress is depends on the system, but examples are climate change, or pollution.

33. Resilience Alliance 2015. Key concepts. Available at <http://www.resalliance.org/index.php/key_concepts> in Gloria Gallardo and others, 'We adapt… but is it good or bad? Locating the political ecology and social-ecological systems debate in reindeer herding in the Swedish Sub-Arctic' (2017) 24 Journal of political ecology 667, 670.

'long-term conservation and sustainable use […] and in healthy marine ecosystems'[34] (ecological side).

Based on this systemic view, resilience theory describes the way in which systems are able 'to cope with a hazardous event or trend or disturbance, responding or reorganising in ways that maintain [their] essential function, identity and structure as well as biodiversity in case of ecosystems.'[35] In the light of climate change, coping with disturbances appears to be necessary, and desirable.[36] According to Folke (*et al.*), 'resilience can be depicted as set of capacities that filter and direct development pathways determining whether systems adapt or transform in response to change.'[37]

Throughout the literature, resilience is described as a mix of persistence, adaptability, and transformability.[38] While persistence describes the system's ability to continue its functioning without significant deteriorations that may lead to a systemic shift,[39] adaptability (or adaptive capacity) describes a system's capacity to adapt to changing situations[40] in order to maintain vital elements. Notably, the definition of resilience has recently

34. CAOFA, Preamble.

35. H.-O Pörtner and others, 'Summary for Policymakers' (n 5) 5.

36. This is also reflected in the importance of the notion of 'Climate Resilient Development' in the most recent IPCC report. See R. Ara Begum and others, 'Point of Departure and Key Concepts' in H.-O. Pörtner and others (eds), Climate Change 2022: *Impacts, Adaptation, and Vulnerability* (Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press 2022) 135.

37. Carl Folke and others, 'Resilience and social-ecological systems: A handful of frontiers' (2021) 71 Global Environmental Change 1024000, 1.

38. ibid., 1.

39. Beth Schaefer Caniglia and Brian Mayer, 'Socio-Ecological Systems', *Handbook of Environmental Sociology* (Springer 2021) 527; Peter J Mumby and others, 'Ecological resilience, robustness and vulnerability: how do these concepts benefit ecosystem management?' (2014) 7 Current Opinion in Environmental Sustainability 22, 24.

40. F. Stuart Chapin and others, 'Resilience-based stewardship: strategies for navigating sustainable pathways in a changing world' in Carl Folke, Gary P. Kofinas and F. Stuart Chapin (eds), *Principles of ecosystem stewardship* (Springer 2009) 319, 335.

shifted, partly replacing the notion of persistence with transformability. Previously, transformability was considered as conflicting with resilience and adaptability, since transformation requires changes in systemic structures, which is at odds with the idea of persistence.[41] However, the current line of thought is that persisting and adapting is not enough, and that instead a combination of adaptation and transformation is needed.[42] In line with these developments, the analysis conducted in the following paragraphs focuses also on resilience as a form of adaptation and transformation, while not ignoring the fact that a certain basic amount of stability is needed to ensure the ongoing existence of the system under study.

Traditionally, the study of resilience takes a governance approach. Law is an element of governance and has, as such, gained more interest in relation to resilience in the last decade,[43] as it allows for the direction of human behaviour and, thus, influences resilience. This merits the consideration of the role of law in resilience separately. In order to give some context to the legal analysis, the background of operationalising socio-ecological systems resilience needs to be given first. This is followed by a translation of these criteria into legal terms, which form the basis for the analysis of the CAOFA.

2.3 Elements of Resilience

The definition of socio-ecological systems resilience necessitates the consideration of factors across various scales, and across the socio-ecological realm. For the sake of the analysis of the CAOFA, only factors

41. Brian Walker and others, 'Resilience, adaptability and transformability in social–ecological systems' (2004) 9 Ecology and society, 2.

42. Pörtner and others, 'Summary for Policymakers' (n 5) 5. Folke also refers to this as 'resilience for transformation' (Folke and others (n 37) 1).

43. Emilie Beauchamp and others, 'Twenty priorities for future social-ecological research on climate resilience' (2020) 15 Environmental Research Letters 105006, 5.

that impact the CAO directly in terms of fisheries will be taken into account.[44]

In order to strengthen socio-ecological resilience, factors related to ecosystems, as well as the social systems that surround and influence them, must be considered. From an ecological perspective, resilience relies mainly on biodiversity as well as adaptive capacity of the ecosystem itself.[45] To give a simple example: the higher the biodiversity, the more the pressure of natural selection is spread, which allows the system to remain stable and adaptive.[46] This also means that governance should be structured in order to foster ecological resilience.

Several system characteristics can contribute to the social side of socio-ecological resilience (flexibility, participation, diversity and redundancy, iterativity, and equal access to resources). These merit a brief description.[47] If a system is *flexible*, those who are affected by changes within (e.g. Arctic residents) can adapt more quickly to a changing situation. Thus, in order to govern towards resilience, resilience theory demands 'flexibility in social systems and institutions to deal with chang-

44. It needs to be noted in this regard that the recession of sea ice will also enable to other industrial activities on the CAO, such as shipping, which may also impact the resilience of the CAO and fisheries there. As the impact of these activities have not been considered within the CAOFA, the legal frameworks that apply to these activities have been omitted from this analysis.

45. Steve Carpenter and others, 'From metaphor to measurement: resilience of what to what?' (2001) 4 Ecosystems 765, 778.

46. ibid.; See also Owen L Petchey, Eoin J O'Gorman and Dan FB Flynn, 'A functional guide to functional diversity measures' (2009) Biodiversity, Ecosystem Functioning, & Human Wellbeing Naeem S, Bunker DE, Hector A, Loreau M, Perrings C, eds Oxford University Press, Oxford 49.

47. In socio-ecological systems literature, the individual criteria are more complex and multi-faceted. For the purpose of this paper, the explanation of the criteria has been limited to what is necessary in order to construct a legal analysis.

es.'[48] *Iterativity* is necessary in order to revisit decisions made based on new knowledge,[49] and to adopt new strategies based on new information.[50] Especially in cases such as the CAO, iterativity is important, since much is unknown about the area, and the effect of climate change in the present and future. An iterative framework also includes opportunities for social learning and the inclusion of different kinds of knowledge, both western and traditional ecological knowledge (TEK),[51] such as *Inuit Qaujimajatuqangit* (Inuit knowledge). Recognising the value of TEK is not only important from a decolonialist point of view, but also because it usually constitutes a body of knowledge that has co-evolved with the system over a long time and thus provides valuable information on system properties and resilience aspects.[52]

Systemic resilience also depends on actors' opportunities for *participation*, as effective and broad participation ensures all actors are heard and involved in decision-making processes.[53] To that end, it is also necessary to include a diverse array of stakeholders and allow for *diversity* in

48. Jonas Ebbesson, 'The rule of law in governance of complex socio-ecological changes' (2010) 20 Global Environmental Change 414, 414. See also Stephanie Domptail and Marcos H Easdale, 'Managing socio-ecological systems to achieve sustainability: A study of resilience and robustness' (2013) 23 Environmental Policy and Governance 30, 39.

49. Reinette Biggs and others, 'Toward principles for enhancing the resilience of ecosystem services' (2012) 37 Annual review of environment and resources 421, 434; Cristina Gonzalez-Quintero and V Sophie Avila-Foucat, 'Operationalization and measurement of social-ecological resilience: a systematic review' (2019) 11 Sustainability 6073, 7.

50. Catherine Blanchard, Carole Durussel and Ben Boteler, 'Socio-ecological resilience and the law: exploring the adaptive capacity of the BBNJ agreement' (2019) 108 Marine Policy 103612, 1.

51. Erik Gómez-Baggethun, Esteve Corbera and Victoria Reyes-García, 'Traditional ecological knowledge and global environmental change: research findings and policy implications' (2013) 18 Ecology and society: a journal of integrative science for resilience and sustainability, 72.

52. ibid., 73.

53. Brita Bohman, *Legal design for social-ecological resilience* (Cambridge University Press 2021) 68.

solutions to stressors that challenge resilience, which furthers *redundancy* of solutions at different levels to compensate for approaches that may be ineffective.[54] Lastly, from a more justice-focused point of view, *equal access to resources* also plays an important role in resilience to stressors. The more 'social, economic and other resources' communities have available to them, the better able they are to cope with stressors.[55] Importantly, this access to resources must be equal[56] to benefit the entire community.

The aforementioned criteria relate to adaptation and adaptive capacity. Since the consideration of transformation is still relatively recent, it can only be said that governance for resilience must support transformation, where necessary, and possibly stabilise new elements of the system, should they arise.[57]

Notably, all these elements must recognise that resilience is a multi-scalar, multi-nodular concept (also referred to as *panarchy*).[58] This means that processes can occur at different scales and paces simultaneously, which must be accounted for when governing for systemic resilience.

54. ibid., 66; 68.

55. James D Ford and Barry Smit, 'A framework for assessing the vulnerability of communities in the Canadian Arctic to risks associated with climate change' (2004) Arctic 389, 393.

56. Brita Bohman, 'Legitimacy and the role of law for social and ecological resilience' in Timothy Cadman, Margot Hurlbert and Andrea C. Simonelli (eds), *Earth System Law: Standing on the Precipice of the Anthropocene* (Routledge 2021) 148, 156.

57. Carl Folke, 'Resilience (republished)' (2016) 21 Ecology and Society, 5.

58. Tracy-Lynn Humby, 'Law and resilience: mapping the literature' (2014) 4 Seattle J Envtl L 85, 93; Ahjond S Garmestani and Melinda Harm Benson, 'A framework for resilience-based governance of social-ecological systems' (2013) 18 Ecology and Society 1, 3.

3. Evaluating Legislation from a Resilience Perspective

Much work has already been done on translating socio-ecological resilience criteria into legal terms.[59] This section therefore provides only a brief synthesis of the existing literature, before moving on to the analysis of the CAOFA.

Again, the analysis of transformation is brief. Faced with larger changes, it is essential that the legal framework is, to some extent, forward looking, and allows for (or at least does not hinder) transformation when necessary.

In order to preserve ecological adaptive capacity, and thus systemic resilience, it seems natural that the legal framework ought to respect and protect the characteristics of the ecosystems that it regulates. This can mean protecting biodiversity, or using the ecosystem approach in order

59. See e.g. Craig Anthony Arnold and Lance H Gunderson, 'Adaptive law and resilience' (2013) 43 Envtl L Rep News & Analysis 10426, for an overview of how adaptive law can strengthen resilience; See Olivia Odom Green and others, 'Barriers and bridges to the integration of social–ecological resilience and law' (2015) 13 Frontiers in Ecology and the Environment 332 for suggestions on the role of law in adaptive governance; See also Ahjond S Garmestani, Craig R Allen and Melinda H Benson, 'Can law foster social-ecological resilience?' (2013) 18 Ecology and Society; Marleen Van Rijswick and Willem Salet, 'Enabling the contextualization of legal rules in responsive strategies to climate change' (2012) 17 Ecology and Society 1; Joseph Wenta, Jan McDonald and Jeffrey S McGee, 'Enhancing resilience and justice in climate adaptation laws' (2019) 8 Transnational Environmental Law 89; Humby (n 58); Barbara A Cosens, 'Legitimacy, adaptation, and resilience in ecosystem management' (2013) 18 Ecology and Society; Ebbesson (n 48); Niko Soininen and Froukje Maria Platjouw, 'Resilience and adaptive capacity of aquatic environmental law in the EU: An evaluation and comparison of the WFD, MSFD, and MSPD' in David Langlet and Rosemary Rayfuse (eds), *The Ecosystem Approach in Ocean Planning and Governance* (Brill Nijhoff 2018); Bohman, *Legal design for social-ecological resilience*; Brita Bohman, 'The ecosystem approach as a basis for managerial compliance: an example from the regulatory development in the Baltic Sea Region' in David Langlet and Rosemary Rayfuse (eds), *The Ecosystem Approach in Ocean Planning and Governance: Perspectives from Europe and Beyond* (Brill Nijhof 2019).

to do justice to the system's interconnectedness with stakeholders and the wider environment.

Ideally, law includes enough flexibility to accommodate for changes and adaptation in the ecological and social realm. Flexibility can be substantial, for example, by including adaptive goals in the legal instrument[60] or using open-textured norms[61] that leave room for interpretation.[62] Flexibility can also be procedural, for example by using reflexive approaches that focus on mechanisms, instead of the desired outcome, to facilitate resilient outcomes[63] or allowing for evolution of the law in accordance with changes in substantive goals,[64] for example by virtue of amendments.[65]

However, flexibility comes with one caveat, namely that one of law's central roles is the provision of stability and legal certainty, while the characteristics of socio-ecological resilience demand a high degree of 'flexibility and responsiveness.'[66] The challenge of law is therefore to balance these two core values against one another. The assessment of any legal framework in a resilience context will need to consider this balance.

As the system that law aims to govern is connected to other systems on various scales within the *panarchy*, legislating for resilience (and consequently also analysing law from a resilience perspective) means recog-

60. Blanchard, Durussel and Boteler (n 50) 4.

61. Ebbesson, Cited in Blanchard, Durussel, and Boteler (n 50) 'Socio-ecological resilience and the law: exploring the adaptive capacity of the BBNJ agreement,' 4.

62. Brita Bohman, 'Adaptivity, Flexibility and Transformability' in Brita Bohman (ed), *Legal Design for Social-Ecological Resilience* (Cambridge University Press 2021) 82.

63. Garmestani and Benson (n 58) 11.

64. Ahjond Garmestani and others, 'Untapped capacity for resilience in environmental law' (2019) 116 Proceedings of the National Academy of Sciences 19899, 19901.

65. Bohman (n 62) 82.

66. David Langlet and Rosemary Gail Rayfuse, *The ecosystem approach in ocean planning and governance*, vol 87 (Brill Nijhoff 2019) 450.

nising this interconnectedness. One of the challenges in international law in that regard 'consists in including as many states as possible—if not all—covered by the social-ecological contexts, while not diluting the Agreement with the increase in the number of parties.'[67] Next to the ecosystem approach within law, a legal system that supports multilevel governance across different temporal and spatial scales fosters resilience from the *panarchy* point of view. This is because such a system can connect different levels and provides for redundancy of legal options, that can stand in for one-another should one fail to work. This is especially relevant since socio-ecological systems connect the social and ecological aspects, which entails that law needs to recognise feedbacks between the two, as well as the limitations within the ecosystem to support the social system's needs.[68]

Iterativity is somewhat connected to flexibility, in the sense that iterations contribute to generating the knowledge based on which adaptation of the legal framework occurs. In a legal context, iterativity 'encompasses those principles relating to the generation, processing and application of knowledge.'[69] More concretely, this includes a focus on learning,[70] which is connected to constant monitoring of the physical system that the legal system governs.[71]

In order to enhance participation, a legal framework should include participatory mechanisms at all stages of legal decision-making processes,

67. Jonas Ebbesson and Carl Folke, 'Matching Scales of Law with Social-Ecological Contexts to Promote Resilience' in Ahjond Garmestani and Craig Allen (eds), *Social-Ecological Resilience and Law* (Columbia University Press 2014) 265, 283.

68. Humby (n 58) 85.

69. Margot Hill Clarvis, Andrew Allan and David M Hannah, 'Water, resilience and the law: from general concepts and governance design principles to actionable mechanisms' (2014) 43 Environmental Science & Policy 98, 102.

70. Soininen and Platjouw (n 59) 26.

71. ibid., 27.

and across the various levels of the system.[72] A forum for participation could be, for example, the decision-making body of the legal instrument in question.[73] From a legal point of view, participation serves two aspects: enhancing justice[74] and ensuring legitimacy.[75] Effective participatory mechanisms ideally include a wide range of stakeholders to ensure all interests are effectively addressed. The justice aspect also ties in closely with the requirement of equal access to resources. Law regulating for resilience needs to recognise the need for an equal distribution of resources in the area it aims to govern, in order to ensure the social system's resilience.

Thus, in order for law to be conducive to resilience building, it needs to: (1) facilitate transformation when necessary, (2) protect the ecosystems that it covers to safeguard biodiversity, (3) allow for adaptability and flexibility while securing a certain amount of stability, (4) recognise and work towards connectivity across different scales, (5) be iterative, (6) include mechanisms for monitoring, (7) allow for participation on various stages of the decision-making processes by various interested parties, and (8) ensure justice and equal access to resources.

72. Wenta, McDonald and McGee (n 59) 112.

73. Siddharth Shekhar Yadav and Kristina Maria Gjerde, 'The ocean, climate change and resilience: Making ocean areas beyond national jurisdiction more resilient to climate change and other anthropogenic activities' (2020) 122 Marine Policy 104184, 6.

74. Wenta, McDonald and McGee (n 59) 100.

75. ibid., 109; Ebbesson and Folke (n 67) 273.

4. The CAOFA from a Resilience Perspective

Assessing whether the CAOFA is beneficial to socio-ecological resilience building in the Central Arctic Ocean requires a consideration of the various factors individually.

4.1 Transformation

As the Agreement was established to regulate commercial fisheries prior to knowledge of the ecosystem in the CAO, it can be said to actively support an ongoing process of transformation, from an ice-covered area to an area that may in the future be used for fisheries. The Agreement lays an important ground for future developments by regulating scientific monitoring, requiring Parties to establish first conservation mechanisms for exploratory fisheries, and preventing State Parties from establishing commercial fisheries before the creation of a fisheries management regime in the CAO following Article 5(1)(c)(ii) of the CAOFA. While Article 8 (1) (3) stipulates that parties shall deter activities of vessels of non-state parties, the strength of this provision (and possibly therefore also the Agreement's transformative potential) is limited due to the general freedom of the high seas established in Article 87(1)(e) of UNCLOS. Nevertheless, UNCLOS also sets forth the duty to cooperate to protect marine living resources under Articles 117 and 118, which may in turn strengthen the role that the Agreement will play in the future. Despite the prevalence of conditional rights to fishing under UNCLOS, the Agreement in itself therefore supports transformation, and already aims to create a framework for new elements, in the wake of the CAO's expected physical changes. Notably, this also implies that the Parties to the Agreement expect the ecosystem to change fundamentally, which makes a focus on stability unlikely, and supports a resilience analysis from a more dynamic, adaptive perspective, such as that conducted in the following paragraphs.

4.2 Ecosystem Protection to Safeguard Biodiversity

The CAOFA strives to recognise the role of 'healthy and sustainable' marine ecosystems in the Central Arctic Ocean, within a 'long-term strategy.'[76] Although it is unclear from the Agreement itself what that strategy entails, the Agreement is placed in and directly refers to the framework set out under UNCLOS and UNFSA (which emphasises the protection of marine ecosystems), as well as joint instruments adopted under the auspices of the UN.[77]

Due to its focus on the precautionary principle and an ecosystem-based approach to fisheries, the Agreement is unprecedented.[78] However, there is surprisingly little substantive protection for ecosystems and biodiversity in the text of the CAOFA itself. Arguably, biodiversity protection is implicitly safeguarded by Article 3(1) of the CAOFA, which makes the commencement of commercial fisheries contingent on conservation and sustainable management of fish stocks, which in turn relies on the ecosystem approach.[79] A similar and more direct notion can be found in Article 3(6), which requires State Parties and others to cooperate in the conservation and management measures of fish stocks across maritime zones to conserve them in their entirety. This arguably recognises the interconnectedness within ecosystems, and can be argued to also be beneficial to the protection of biodiversity.

76. CAOFA, Preamble.

77. See Vylegzhanin, Young and Berkman (n 23) 7. The effectiveness of these agreements in protecting biodiversity is, however, limited.

78. Nengye Liu, Alexander Proelss and Valentin Schatz, 'Regulating Exceptions for Research and Exploratory Fishing in Southern Ocean Marine Protected Areas: A Comparative Analysis on Balancing Conservation and Commercial Use' (2022) 53 Ocean Development & International Law 60, 81.

79. Rayfuse (n 16) 2.

However, currently, the only direct obligation to consider ecosystem impacts in activities that are being undertaken and are regulated by the CAOFA can be found in Articles 3(4) and 5(1)(d)(ii), which require Parties to forego scientific activities that undermine ecosystem protection, and limit the impact of exploratory fishing on stocks and ecosystems. Additionally, Article 5(1)(c) of the CAOFA stipulates that the distribution, migration, and abundance of fish in the area may require additional conservation and management measures in respect of those stocks. While this additional layer of protection may be beneficial for the protection of some species, it fails to recognise the importance of other species whose influence on the ecosystem is currently not known. Overall, this suggests that the role of the CAOFA in protecting biodiversity, and hence enhancing the adaptive capacities of the ecosystem is currently limited. One reason for this may be the very limited amount of direct involvement by environmental NGOs in the negotiation processes.[80] Another argument worth considering is that the CAOFA is only a first step towards a management of the fisheries in the CAO, and therefore cannot be analysed as critically as a future agreement with more substantive provisions on environmental protection or fisheries management. Yet, a third argument is that biodiversity concerns are already addressed through other agreements and institutional arrangements, such as the Arctic Council,[81] and that an inclusion of biodiversity into the CAOFA would lead to increased institutional fragmentation. However, considering the direct referral to marine ecosystems in the text of the Agreement, it is striking that direct biodiversity considerations are lacking in the Agreement itself. Thus, in

80. See Schatz, Proelss and Liu (n 12) 208.

81. It needs to be noted here that the general lack of stronger state commitments to address biodiversity protection in the High Seas is currently being addressed in the ongoing BBNJ processes. However, it is likely that fisheries will be excluded from the BBNJ treaty itself (see Article 8(2) of the most recent draft, available at <https://www.un.org/bbnj/sites/www.un-.org.bbnj/files/igc_5_-_further_revised_draft_text_final.pdf> accessed 31 December 2022).

order to fulfil the aims of the Agreement, and contribute to resilience, ecosystem protection will need to be considered, while taking into account other institutional arrangements and commitments of States under other international frameworks related to biodiversity.

4.3 Adaptive Capacity and Flexibility

The fact that the Agreement has little substantive content and merely sets out a framework of interim conservation measures and research efforts leaves much room for the implementation of other measures, which contributes to the adaptability of the Agreement. From the standpoint of adaptability, the possibility of legal evolution following advanced knowledge on the CAO also needs to be commended. Following Article 5(1)(a), State Parties meet and review the implementation of the CAOFA at least every two years, and consider whether or not the data gathered in the meantime allow for sustainable commercial fisheries (as stipulated in Article 5(1)(c)). Additionally, Article 5(1)(d) of the CAOFA allows the parties to amend the conservation and management measures from time to time, when necessary. This provides for flexibility as scientific knowledge progresses, and thus benefits adaptability.

Arguably, the distinction between majority and consensus votes mentioned in Article 6 can be understood as an opportunity to balance flexibility with stability. While only a majority vote is needed for decision-making in terms of procedure, consensus is needed for more substantial measures. This ensures that issues that Parties deem substantive are not taken hastily, which supports stability of regulation. Especially in scenarios where some States may be in favour of commencing fisheries, and others may be against it,[82] this mechanism could ensure the stabil-

82. Erik J Molenaar, 'The CAOF Agreement: Key Issues of International Fisheries Law' in Tomas Heidar (ed), *New Knowledge and Changing Circumstances in the Law of the Sea* (Brill Nijhoff 2020) 446, 462.

ity needed to protect ecosystems adequately. Yet, one could also argue that the same mechanism precludes flexibility to move forward in times of drastic change following global warming in order to, for example, establish more stringent regulations once the time comes to establish a regional fisheries management organisation or a marine protected area.[83]

4.4 Connectivity

When analysing adaptability and flexibility, a brief look at the capacity of the Agreement to recognise interconnectedness of the area across different spatial and temporal scales is necessary. This is because systems do not exist in isolation, and hence neither do adaptive processes governing them. The CAOFA seems to recognise temporal interconnectedness through the long-term approach to management mentioned in Article 2, as well as spatial interconnectedness of ecosystems to some extent through the requirement to protect fish stocks jointly in the high seas and coastal areas as stipulated by Article 3(6). Additionally, although the Agreement does not directly mention or support multi-level governance, the possibility to establish a fisheries management organisation under Article 5(1)(c) of the CAOFA exists, which could connect the Agreement to other fisheries management areas, benefitting multi-level governance approaches.

However, the number of Parties to the Agreement is quite limited. Notably, Finland and Sweden, both by definition Arctic states, are not listed as State Parties. This may negatively influence the spatial interconnectedness and larger ecosystem protection within the CAO, and therefore resilience. While this may limit the Agreement's power to establish

83. Problems with this approach are already visible, as demonstrated by the inability to establish marine protected areas under the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), due to a lack of consensus by state parties.

connectivity, this concern may be mitigated by general obligations to cooperate in protecting the marine environment as established by the surrounding legal framework. Article 192 of UNCLOS sets out State obligation to protect the marine environment, and following Article 197, States must do so in cooperation. Although it is beyond the scope of this paper to debate to what extent Article 192 of UNCLOS can further connectivity, it has been argued that Article 197 of UNCLOS can be read as an argument for pursuing a 'coherent and holistic approach'[84] which arguably indirectly would support the idea of connectivity. Additionally, State Parties to UNFSA would also have the duty to cooperate and strengthen existing RFMOs under Article 13 of the UNFSA, which would also apply to a potential CAO RFMO, if it were to be established.

4.5 Iterativity

Iterativity plays an important role in the CAOFA. First, the strong focus on science and monitoring in Article 4 puts forward the gathering and use of knowledge within the Joint Program on Scientific Research and Monitoring (JPSRM). Importantly, this is not only limited to scientific and technical knowledge, but also includes indigenous and local forms of knowledge.[85] The Agreement stipulates that Parties shall hold scientific meetings in order to review information, as well as adopt terms of reference for the functioning of joint scientific meetings.[86] These procedural rules have provisionally been developed within the first meeting of the Provisional Scientific Coordinating Group that took place in 2020. However, the Agreement remains silent on the role of scientific advice in

84. Erik J. Molenaar and Alex G. Oude Elferink, 'Marine protected areas in areas beyond national jurisdiction-the pioneering efforts under the OSPAR convention' (2009) 5(1) Utrecht Law Review 5, 10.

85. CAOFA, Article 4 (4).

86. ibid., Article 4(6).

decision-making surrounding the commencement of negotiations and establishment of fisheries management organisations under Article 5(1)(c)(ii). Article 5(1)(c) specifies that Parties should consider whether the conditions support commercial fisheries *'on the basis of scientific information and other relevant sources.'*[87] However, the Agreement does not define the extent to which the scientific advice should be followed, nor the weight that is given to the individual sources of scientific knowledge (joint program, national scientific programs, and 'other relevant sources').

The Agreement also does not detail the status of indigenous knowledge vis-à-vis western science and technology. The current draft terms of reference of the Provisional Scientific Coordination Group specify that future delegations are to be appointed by State Parties and are to include a mix of indigenous and non-indigenous scientists and knowledge holders.[88] This solution is also supported by the Inuit Circumpolar Council,[89] which had warned of a split between western and indigenous knowledge that would give indigenous knowledge a different status than western forms of knowing.[90] Nevertheless, the Agreement does not specify the normative weight of the individual knowledge types, which is especially interesting in the light of the fact that the delegations to the meetings of the JPSRM are appointed by the signatories. This could possibly lead to

87. Emphasis added.

88. PSCG On the Central Arctic Ocean, 'Report of the 1st meeting of the Provisional Scientific Coordinating Group (PSCG) of the Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean', retrieved from <https://apps-afsc.fisheries.noaa.gov/documents/Arctic_fish_stocks_fifth_meeting/13200_109215706.pdf>, 10, accessed 31 December 2022.

89. Letter from the President of the Inuit Circumpolar Council, Alaska, 2020. Available at <https://apps-afsc.fisheries.noaa.gov/documents/Arctic_fish_stocks_fifth_meeting/13200_109215706.pdf> accessed 31 December 2022.

90. ibid.

the fact that western knowledge is prioritised already by virtue of choosing the scientific delegation. Thus, although the Agreement is iterative in the sense that it supports the generation and use of new and different forms of knowledge, it remains silent on the extent to which the knowledge will be used.

4.6 Monitoring

Monitoring plays an important role in ensuring that the law is indeed fit for the intended purpose. Article 5(1)(a) provides for a regulatory monitoring process, in which the Parties are required to review the Agreement's implementation. Reading this together with the obligations under Article 4, it seems as if this also includes a review of the workings of the JPSRM itself. There are also monitoring requirements for State Parties regarding the use of exploratory fishing in Article 5(1)(d)(5). However, the CAOFA does not specify, what exactly these monitoring obligations entail, nor how they will take place. While the monitoring requirements of the Agreement therefore are conducive from a resilience point of view, it is questionable to what extent the monitoring effectively contributes to resilience-building, if the procedures are not specified.

4.7 Participation

There are three aspects of participation that need to be considered separately within the framework of the CAOFA: participation of third State Parties, participation of indigenous actors, and participation of other non-state actors (e.g. local communities).

The Agreement does not allow for the participation of non-party states in any capacity, which also significantly limits the reach of the CAOFA, as it is only upon binding State Parties. This means that in principle, the Agreement is limited to the Arctic Five plus five as mentioned in Article

9, with the only exemption being that other States can be invited to join the Agreement if they show 'real interest' in accession (Article 10(1)).

In the preamble, the Agreement does specifically reference the rights and interests of two non-State groups of people, namely indigenous people as well as 'Arctic residents.' The rights of indigenous peoples under the 2007 UN Declaration on the Rights of Indigenous Peoples (UNDRIP)[91] are also specifically mentioned. Especially relevant in relation to the CAOFA are Articles 18 (right to participate) and 19 (obligation to obtain free, prior and informed consent) of the UNDRIP. However, these rights seem to have only been realised indirectly, if at all, as there is no direct possibility for indigenous participation in the CAOFA's framework. Although there is recognition of indigenous forms of knowledge in Articles 4(4), 5(4)(1)(b) and (c), the decision as to whether indigenous parties can participate in decision-making processes lies at the hands of State Parties. The wording of Article 5(2) ('may') implies that it is in fact up to the parties to decide the extent of this participation. This is also reflected in the proposed rules of procedure of the JPSRM, which read that the delegations to the provisional scientific decision group include 'scientists and holders of indigenous and local knowledge *as the respective Signatory deems appropriate*.'[92] Hence, the CAOFA only contains an ambition to include indigenous knowledge, but only weak obligations considering the way in which this knowledge is gathered.[93]

Even more important, the Agreement contains little room for indigenous peoples or their representatives to participate in review, the decision

91. UN General Assembly, United Nations Declaration on the Rights of Indigenous Peoples: resolution / adopted by the General Assembly, 2 October 2007, A/RES/61/295.

92. SCG On the Central Arctic Ocean (n 88), 50 (emphasis added).

93. Valentin Schatz, 'Incorporation of Indigenous and Local Knowledge in Central Arctic Ocean Fisheries Management' (2019) 10 Arctic Review 130, 133; Nigel Bankes, 'Arctic Ocean Management and Indigenous Peoples: Recent Legal Developments' (2020) 11 The Yearbook of Polar Law Online 81, 114.

to take further steps, or the general decision-making processes under Articles 5 and 6. This means that although their knowledge is taken into account, they have no individual vote or other form of deciding power in the way fisheries are developed under the auspices of the Agreement, should this become a matter of discussion in the future. While Article 19 of the UNDRIP recognises the duty of States to obtain free, prior, and informed consent from indigenous peoples affected by their legislative or administrative measures, the CAOFA does not provide for such a mechanism at all. It would be interesting to see whether the obligation to obtain free, prior, and informed consent, as well as the inclusion and participation of indigenous peoples, is also taken into account when monitoring for implementation under Article 5(1)(a) of the CAOFA. As the Agreement only entered into force a year ago, this remains to be seen.[94]

The Agreement also does not provide any specific provisions to include other Arctic residents in decision-making beyond the opportunities that these residents have available through national means. This also means that participation is significantly limited in this regard.

4.8 Equality and Equal Access to Resources

There is little to say about justice and equality concerns from the perspective of the CAOFA, as it does not directly contain a right to equal access of resources in its provisions. A reason for this might be, similarly to biodiversity protection, the limited amount of participation of indigenous peoples during the negotiation process,[95] possibly affecting the negotiating leverage of indigenous groups during the CAOFA negotiations.

94. See also Malgosia Fitzmaurice and Mercedes Rosello, 'IUU Fishing as a Disputed Concept and Its Application to Vulnerable Groups: A Case Study on Arctic Fisheries' (2020) 22 International Community Law Review 410, 421.

95. See Schatz, Proelss and Liu (n 12) 208.

Despite this direct lack of rights to equal access to resources, a reference to the interests of small-scale fisheries and indigenous groups can be found in Article 24(2)(b) of the UNFSA. This provision requires State Parties to the UNFSA to consider the impacts of fisheries management under UNFSA on small-scale and artisanal fisheries as well as indigenous peoples of developing States, especially small-island developing States. However, consideration of impacts is no guarantee of actual equal access to resources – even less so considering the fact that the UNFSA covers only straddling and migratory fish stocks, and thus not discrete stocks, to which the CAOFA does apply also.[96] Therefore the only recourse to fair access of resources seems to be under Articles. 18 and 19 of the UNDRIP, as the application of these provisions would enable indigenous people to participate in resource distribution processes, and thus influence them.

The question of resource distribution would come into play in the moments in which the individual State Parties give licenses to fish on the CAO following the establishment of a regime under the processes of the CAOFA. Articles 18 and 19 of the UNDRIP require participation as well as free, prior, and informed consent of indigenous peoples on a national level. As the Agreement itself, despite the explicit reference to the UNDRIP in the preamble, lacks direct justice and fairness considerations in its wording, and does not contain explicit reference to the notion of free, prior and informed consent, incorporating these notions into a future management regime that deals with quota distribution would greatly benefit indigenous rights, and thus increase resilience.

96. CAOFA, Article 3 (6).

5. The Missing Piece: The Law-Science Nexus

Although the Agreement strongly builds on science and one of the main provisions and current effective programs is the JPSRM, there are several uncertainties regarding the role and value of scientific knowledge in the final decision-making processes. This leads to the final point of this analyses, namely the importance of the law-science nexus in resilience studies.

The role of science in decision-making has already been explored through the study of science-policy interfaces. These interfaces are 'relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making,'[97] as well as institutions that define and guide the linkage of science to policy through the individual actors in the respective domains.[98] Yet, the CAOF is a legal instrument, and law differs significantly from policy. Law is, for example, generally more formal and possibly also more focused on stability than policies.[99] Policies on the other hand have the advantage that they are more flexible and less formal, but also provide fewer substantive rights that can be claimed by those governed by them. This makes the study of the role of science in law-making as well as the implementation of law significantly different from the study of science in policy-making, and requires a new approach: the law-science nexus.

97. Sybille Van den Hove, 'A rationale for science–policy interfaces' (2007) 39 Futures 807, 815.

98. Thomas Koetz, Katharine N Farrell and Peter Bridgewater, 'Building better science-policy interfaces for international environmental governance: assessing potential within the Intergovernmental Platform for Biodiversity and Ecosystem Services' (2012) 12 International environmental agreements: politics, law and economics 1, 2.

99. Eva Erman, 'A function-sensitive approach to the political legitimacy of global governance' (2020) 50 British Journal of Political Science 1001, 1009.

Knowledge on the law-science nexus is in its infancy, despite vast knowledge on science-policy interfaces. Cosens describes the law-science interface in the context of natural resources disputes and litigation, arguing that a reform of the litigation system is needed to meet the shortcomings of law in addressing complex problems.[100] Platjouw, Steindahl, and Borch's research centres on the role of the AMAP as a scientific expert body in establishing the Minamata Convention.[101] Woker describes different aspects of the relationship between law and science (reference to science, influence of legal interpretation by scientific knowledge, and regulation of science).[102] Orangias focuses on the role of scientific bodies in treaty-making and the implications of this process for international law.[103]

From a resilience perspective, investigating questions relating to the inclusion of science into the framework post-implementation is relevant, as scientific knowledge is vital to the ongoing fit of law to the system it aims to regulate. While the significant role of science within the decision-making framework has been highlighted throughout this paper, it is unclear how this will play out in practice in the years to come. The fact that little is known on the law-science nexus from a scholarly perspective makes the developments in the CAO especially interesting, as they could provide an example based on which the current literature on law and

100. Barbara Cosens, 'Resolving conflict in non-ideal, complex systems: solutions for the law-science breakdown in environmental and natural resource law' (2008) Natural Resources Journal 257.

101. Froukje Maria Platjouw, Eirik Hovland Steindal and Trude Borch, 'From Arctic science to international law: The road towards the Minamata Convention and the role of the Arctic Council' (2018) 9 Arctic Review 226, 267.

102. Hilde J Woker, 'The Law-Science Interface in the Arctic: Science and the Law of the Sea' (2022) 13 The Yearbook of Polar Law Online 341.

103. Joseph Orangias, 'The Nexus between International Law and Science: An Analysis of Scientific Expert Bodies in Multilateral Treaty-Making' (2022) 1 International Community Law Review 1.

resilience can be expanded. As mentioned, the Agreement is silent on the exact role of scientific advice on the decision-making processes, and lacks explicit balance between the different scientific traditions that are to be included. Future research could therefore focus on evaluating to what extent scientific bodies are listened to, and what the role of science is in assessing effectivity of legal implementation. These and similar questions are especially relevant in the light of resilience to fast-moving and multi-level stressors, such as climate change.

6. Conclusion

This article demonstrates that while the CAOFA must be commended regarding its adaptive capacity and flexibility, substantive provisions are lacking when it comes to biodiversity protection and ecosystem protection across scales, especially regarding participation of non-State groups and equal access to resources. Several arguments have been put forward for why this may be the case, amongst which the argument that the CAOFA is only a first step towards a management of fisheries in the CAO, and therefore cannot be analysed as critically as an agreement with more substantive provisions on environmental protection or fisheries management. However, even if this were to be the case, the outcomes of this analysis still point towards factors that ought to be considered by State Parties in drafting subsequent agreements under the framework of the CAOFA.

The article furthermore highlights one of the important tensions in research on the role of law and resilience: the tension between flexibility and stability. The CAOFA is adaptive and flexible, as it has very few substantive requirements it needs to safeguard, and because few parties must be considered in decision-making processes. However, this comes at the

expense of stability and applicable rights or provisions for ecosystem protection, which are also needed to ensure resilience.

The analysis of the CAOFA points towards another element of resilience research that has, so far, been neglected in the law-and-resilience literature: the nexus between law and science. The Agreement strongly relies on science for decision-making moving forward, data sharing and inclusion of various forms of knowledge. Yet, questions remain regarding the extent that State Parties to the Agreement are required to consider and implement the scientific legal advice given by the JPSRM. Moving forward, research into this area will therefore not only be relevant from the perspective of supporting resilience in the CAOFA, but will also allow to contribute to developing the law-and-resilience literature. Although a CAO commercial fishery is unlikely to be established in the near future, the analysis suggests several opportunities, both for research, as well as for a potential regulatory framework surrounding future fisheries that merit consideration as the CAO becomes more and more accessible in the years to come.

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