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Addressing the Ocean-Climate Nexus in the BBNJ Agreement: Strategic Environmental Assessments, Human Rights and Equity in Ocean Science

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Abstract

The Agreement on Marine Biodiversity of Areas beyond National Jurisdiction (BBNJ Agreement) opens a new path in international law towards addressing issues at the ocean-climate nexus, as well as considering implications for the protection of human

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rights and achieving equity among States in the context of ocean knowledge production and environmental management. Based on an interdisciplinary reflection, the new international obligations on strategic environmental assessments (SEAs), and new institutional arrangements, are identified as crucial avenues to addressing climate change mitigation and ensuring fair research partnerships, mutual capacity-building and technology co-development between the Global North and South. SEAs can also support integrated implementation of other parts of the BBNJ Agreement and contribute to the broader effectiveness of the general provisions of the United Nations Convention on the Law of the Sea on the protection of the marine environment, within and beyond national jurisdiction.

Keywords

marine biodiversity – areas beyond national jurisdiction – strategic environmental assessment – ecosystem services – climate change – research – equity – ecological connectivity

Introduction[1]

This article offers an interdisciplinary assessment of international obligations under the Agreement on Marine Biodiversity of Areas beyond National Jurisdiction (BBNJ Agreement) to address the ocean-climate nexus, taking into account implications for the protection of human rights and for addressing equity issues among States. To that end, we focus on the interpretation and application of the new obligations on strategic environmental assessments (SEAs) in the light of the current state of ocean science on climate mitigation and other ecosystem services provided by the deep ocean. In particular, we recommend implementing SEAs at the regional level through fair research partnerships, mutual capacity-building and technology co-development between the Global North and South. This argument is developed on the basis of the

1 This article draws from research undertaken by the authors under the One Ocean Hub, which is a collaborative research programme for sustainable development funded by United Kingdom Research and Innovation (UKRI) through the Global Challenges Research Fund (GCRF) (Grant Ref: NE/S008950/1). The authors would like to thank Charlotte Salpin, Mitchell Lennan and Professor David Freestone for their useful feedback on earlier versions of this article. Any errors are the authors' own.

human right to science[2] and its benefits to the protection of other human rights, including the human right to a healthy environment,[3] as well as in terms of effectiveness of the general provisions of the UN Convention on the Law of the Sea (LOSC) on the protection of the marine environment, within and beyond national jurisdiction.[4]

First, the BBNJ Agreement is introduced in the context of Global North-South dynamics in ocean research and governance, when reflections are offered on the objectives of the Agreement in the light of ecological connectivity and human rights. Then the role of BBNJ, with a focus on deep-sea ecosystems[5] in the global carbon cycle, is explained, together with its relevance for the protection of human rights; there reflections are offered on the references to climate change in the BBNJ Agreement. Against this background, the article focuses on the importance of the new provisions on SEAS, particularly at the regional level, to fill key knowledge gaps and ensure ecologically meaningful management of BBNJ, including for the purposes of climate change mitigation. Bringing together insights from deep-sea biodiversity and fisheries sciences, social

2 Based on earlier arguments explored in E Morgera, 'The relevance of the human right to science for the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction: A new legally binding instrument to support co-production of ocean knowledge across scales' in V De Lucia, L Nguyen and AG Oude Elferink (eds), *International Law and Marine Areas beyond National Jurisdiction: Reflections on Justice, Space, Knowledge and Power* (Brill, Leiden, 2022) 242–274; and other international law scholarship on the relevance of the human right to science for international environmental law: AM Hubert, 'The human right to science and its relationship to international environmental law' (2020) 31(2) *European Journal of International Law* 625–656. See also J Peel, 'The "rights" way to democratize the science–policy interface in international environmental law? A reply to Anna-Maria Hubert' (2020) 31(2) *European Journal of International Law* 657–664.

3 United Nations General Assembly (UNGA) Res 76/300 (28 July 2022), The Human Right to a Clean, Healthy and Sustainable Environment, UN Doc A/RES/76/300.

4 See the request for an advisory opinion to the International Tribunal on the Law of the Sea (ITLOS) to clarify international obligations under the United Nations Law of the Sea Convention (LOSC) to prevent, reduce and control pollution of the marine environment in relation to the deleterious effects that result or are likely to result from climate change, and protect and preserve the marine environment in relation to climate change impacts. 'The ITLOS Receives a Request for an Advisory Opinion from the Commission of Small Island States on Climate Change and International Law', ITLOS/Press 327 (12 December 2022).

5 The deep sea comprises both benthic and pelagic systems deeper than 200 metres, so it overlaps in great part with the high seas and the deep seabed that comprise the areas beyond national jurisdiction (ABNJ) under the LOSC (n 10 below). That said, some areas of the deep sea lie within national jurisdiction (Synchronicity Earth, 'High and deep seas' (*Synchronicity Earth Insight*, 2018) available at https://www.synchronicityearth.org/wp-content/uploads/2018/02/Synchronicity-Earth-High-Deep-Seas-Insight.pdf; all links cited in this article have been lasted accessed on 15 June 2023). Note also that deep-sea research does not take into account the superficial layer (epipelagic systems) of the high seas.

sciences and international law scholarship, the article formulates recommendations on the interpretation and implementation of the new provisions on SEAs to support fair research partnerships, based on mutual capacity-building and technology co-development between the Global North and South.

In this article, fair research partnerships refer to processes that adequately consider contexts, respect diversity of knowledge, embrace mutual learning, address existing power dynamics, co-develop objectives, co-design studies and commit to transparency.[6] This is crucial to consider, as 'partnerships between institutions in the Global North and the Global South have been beleaguered by structural inequalities and power imbalances, and Northern actors [such as donors and researchers] have been criticised for perpetuating paternalistic or neo-colonial behaviours'.[7] In this connection, while the BBNJ Agreement refers to 'developed' and 'developing' States, including previously agreed language such as 'least developed' countries, 'small island developing States' and 'landlocked developing countries',[8] we prefer to use the terms 'Global South' and 'Global North' to emphasise the relevance of colonialism, colonial legacies and current equity disparities between these countries on the basis of history, environmental justice and other social sciences literature.[9]

The conclusion frames our findings in terms of the human right to science as a lens to understand the limited effectiveness thus far of the general provisions of the LOSC on the protection of the marine environment and

6 J Fransman *et al.*, *Promoting Fair and Equitable Research Partnerships to Respond to Global Challenges* (Rethinking Research Collaborative, 2018) available at https://rethinkingresearchpartnerships.files.wordpress.com/2018/10/fair-and-equitable-partnerships_research-report-public.pdf; S Voller *et al.*, 'What makes working together work? A scoping review of the guidance on North–South research partnerships' (2022) 37(4) *Health Policy and Planning* 523–534.

7 Voller *et al.* (n 6), at p. 523.

8 Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction, UN Doc A/CONF.232/2023/4 (19 June 2023, not yet in force) [BBNJ Agreement]; see also M Strand, 'Coloniality and othering in DFID's development partnership with South Africa' (2022) 29(3) *South African Journal of International Affairs* 365–386, discussing the continued coloniality and othering in perpetuating binaries of 'developing' vs 'developed' discourse in bilateral partnerships and global politics.

9 In this article, we refer to the Global North and Global South, where the former speaks to previous colonial powers, often high-income countries and situated in the northern hemisphere, such as countries in Europe and North America. The latter speaks to former colonised low- and middle-income countries and regions often situated in the southern hemisphere, such as countries in South America, Africa and Asia. We recognise that these terms and categorisations are contentious and limited; however, they are deemed relevant for the purpose of the arguments in this article. See UNGA, *Report of the Special Rapporteur in the Field of Cultural Rights, Alexandra Xanthaki, Development and Cultural Rights: The Principles*, UN Doc A/77/290 (15 August 2022).

scientific cooperation, within and beyond national jurisdiction, in the face of climate change.

Background to the BBNJ Agreement

Marine areas beyond national jurisdiction (ABNJ) (the high seas and the Area)[10] represent '4 billion years of evolution'[11] and 'contain 90% of the total biomass of the global ocean', encompassing a 'wide range of ecological processes and dynamics, from large-scale migrations by hundreds of species to low-productivity, highly stable [compared to shallow water environments] deep-sea benthic ecosystems rich in biodiversity'.[12] Marine ecosystems in ABNJ are inextricably connected to human well-being. The benefits for people[13] arising from deep-sea environments, the focus here, can flow from the availability of biotic and abiotic resources extracted at source, for example, fish for food, minerals and metals for manufacturing.[11] Benefits in coastal regions can also be linked to essential life history stages for species that intersect with deep-sea environments, for example, migration routes.[14] Historical and cultural benefits can be both spatial, such as wrecks, and also diffuse, such as spiritual connections.[15] Deep-sea ecosystems, as a whole, support broad-scale ecosystem processes and functions such as climate regulation, which takes place at such vast scales that their importance for human well-being cannot be underestimated.[16] Given that the deep sea is also relatively unexplored, when

10 United Nations Convention on the Law of the Sea (Montego Bay, 10 December 1982, in force 16 November 1994) 1833 *UNTS* 396, Parts VII and XI [LOSC]. Definitions of the high seas and the Area are found in Articles 86 and 1(1) respectively.

11 A Rogers *et al.*, 'Marine genetic resources in areas beyond national jurisdiction: Promoting marine scientific research and enabling equitable benefit-sharing' (2021) 8 *Frontiers in Marine Science* 667274, doi: 10.3389/fmars.2021.667274.

12 G Crespo *et al.*, 'Beyond static spatial management: Scientific and legal considerations for dynamic management in the high seas' (2020) 122 *Marine Policy* 104102, at pp. 1–2.

13 Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis* (Island Press, Washington, DC, 2005) available at https://www.millenniumassessment.org/documents/document.356.aspx.pdf.

14 CT Perry *et al.,* 'St. Helena: An important reproductive habitat for whale sharks (*Rhincodon typus*) in the Central South Atlantic' (2020) 7 *Frontiers in Marine Science* doi: 10.3389/fmars.2020.576343.

15 PJ Turner *et al.*, 'Memorializing the Middle Passage on the Atlantic seabed in areas beyond national jurisdiction' (2020) 122 *Marine Policy* 104254, doi: 10.1016/j.marpol.2020.104254.

16 E Popova *et al.*, 'Ecological connectivity between the areas beyond national jurisdiction and coastal waters: Safeguarding interests of coastal communities in developing countries' (2019) 104 *Marine Policy* 90–102, doi: 10.1016/j.marpol.2019.02.050.

compared to shallower systems, there are considered to be unknown potential future benefits from deep-sea biodiversity, such as novel drug discovery. On the whole, the deep-sea ecosystem services are known to include food provision, human health, historical and cultural heritage, and climate regulation,[17] all of which support essential aspects of human well-being.

For more than twenty years,[18] diplomats at the United Nations (UN) in New York and, to a more limited extent, civil society[19] have been debating the need for a new international instrument to ensure better protection of marine biodiversity of ABNJ, with fair and equitable sharing of the benefits arising from the use of marine genetic resources (MGRs) of ABNJ being one of the most controversial aspects.[20] MGRs possess unique characteristics that may lead to significant innovations in the pharmaceutical, food and renewables sectors,

17 AR Thurber *et al.*, 'Ecosystem function and services provided by the deep sea' (2014) 11 *Biogeosciences* 3941–3963, doi: 10.5194/bg-11-3941-2014; G La Bianca *et al.*, 'A standardised ecosystem services framework for the deep sea' (2023) *Frontiers in Marine Science* 1–16, doi: 10.3389/fmars.2023.1176230; M Strand *et al.*, 'Reimagining ocean stewardship: Arts-based methods to "hear" and "see" Indigenous and local knowledge in ocean management' (2022) 9 *Frontiers in Marine Science* 1–19, doi: 10.3389/fmars.2022.886632.

18 UNGA Res 59/24 (17 November 2004), Oceans and the Law of the Sea, UN Doc A/RES/59/24, para 73, establishing an Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction. See official documentation of the Working Group at http://www.un.org/Depts/los/biodiversityworkinggroup/biodiversityworkinggroup.htm. See also C Salpin, 'Marine genetic resources of areas beyond national jurisdiction' in E Morgera and K Kulovesi (eds), *Research Handbook on Natural Resources and International Law* (Edward Elgar, Cheltenham, 2016) 411–431; A Broggiato *et al.*, 'Fair and equitable sharing of benefits from the utilization of marine genetic resources in areas beyond national jurisdiction: Bridging the gaps between science and policy' (2014) 49 *Marine Policy* 176–185, doi: 10.1016/j.marpol.2014.02.012.

19 E Morgera *et al.*, 'Participation at BBNJ negotiations matter' (One Ocean Hub and MARIPOLDATA blog, 11 April 2022) available at https://oneoceanhub.org/participation-at-bbnj-negotiations-matters/; M Strand *et al.*, 'Advancing participation in the conservation & sustainable use of marine biodiversity of areas beyond national jurisdiction' (One Ocean Hub Policy Brief, August 2022) available at https://oneoceanhub.org/publications/policy-brief-advancing-participation-in-the-conservation-sustainable-use-of-marine-biodiversity-of-areas-beyond-national-jurisdiction-bbnj/.

20 For example, D Tladi, 'Conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction: Towards an implementing agreement' in R Rayfuse (ed), *Research Handbook of International Marine Environmental Law* (2nd ed, Edward Elgar, Cheltenham, 2017) 259; L de La Fayette, 'A new regime for the conservation and sustainable use of marine biodiversity and genetic resources beyond the limits of national jurisdiction' (2009) 24 *International Journal of Marine and Coastal Law* (*IJMCL*) 221–280.

among others.[21] However, only a handful of countries – primarily in the Global North – and very few companies within them,[22] have been able to file patents related to MGRs.[23] In contrast, the vast majority of Global South countries are not part of these biodiscovery efforts and are greatly underrepresented in marine taxonomic research.[24] Persisting gaps in scientific capacity are casting doubt on the adequacy of past and current approaches to implementing long-standing international commitments, such as those under the LOSC on scientific cooperation.[25] Thus, the implementation of the BBNJ Agreement presents a critical opportunity to build equitable relationships for long-term outcomes and change the course of capacity-building by strengthening the international legal framework, including on funding, information sharing, monitoring and decision-making.[26]

Research and innovation on MGRs are clear examples of widespread inequalities in deep-sea research. This arises from the fact that there are a limited number of countries that can afford the costs and risks of deep-sea research and can therefore control who has access to that source of knowledge.[27] This lack of access is particularly felt in the Caribbean,[28] Africa and Oceania.[29] In addition, in the context of the increasing reliance on sequencing technologies and bioinformatics, 'the capacity to undertake genomic research … is inequitably distributed among countries'.[30] Thus a call has been made to urgently

21 P Oldham *et al.*, *Valuing the Deep: Marine Genetic Resources in Areas Beyond National Jurisdiction* (Defra, London, 2014); D Leary *et al.*, 'Marine genetic resources: A review of scientific and commercial interest' (2009) 33(2) *Marine Policy* 183–194.

22 A 'single corporation registered 47% of all marine sequences including in gene patents, exceeding the combined share of 220 other companies (37%)'. See R Blasiak *et al.*, 'Corporate control and global governance of marine genetic resources' (2018) 4(6) *Science Advances* eaar5237, doi: 10.1126/sciadv.aar5237.

23 Only 10 countries account for 90 per cent of patents related to marine genetic resources (the United States, Japan, certain European Union countries, Switzerland and Norway). See S Arnaud-Haond, J Arrieta and C Duarte, 'Marine biodiversity and gene patents' (2011) 331 *Science* 1521–1522, doi: 10.1126/science.1200783.

24 A Broggiato *et al.*, '*Mare Geneticum*: Balancing governance of marine genetic resources in international waters' (2018) 33 *IJMCL* 3–33, at pp. 15–16.

25 LOSC (n 10), Articles 242–244.

26 H Harden-Davies *et al.*, 'How can a new UN ocean treaty change the course of capacity building?' (2022) 32 *Aquatic Conservation: Marine and Freshwater Ecosystems* 907–912.

27 Broggiato *et al.* (n 24), at p. 15–16.

28 K Hassanali, 'CARICOM and the blue economy: Multiple understandings and their implications for global engagement' (2020) 120 *Marine Policy* 104137.

29 R Wilson 'Surveying the sea' in H Smith, JL Suarez de Vivero and TS Agardy (eds), *Routledge Handbook of Ocean Resources and Management* (Routledge, Abingdon, 2015) 462.

30 R Blasiak *et al.*, 'The ocean genome and future prospects for conservation and equity' (2020) 3 *Nature Sustainability* 588–596, at p. 588.

'promote inclusive and responsible research and innovation that addresses equity differentials and fosters capacity and access to technology, while facilitating the realisation of commitments to conserve and sustainably use the ocean's genetic diversity'.[31]

To some extent, the fundamental contribution of the study of MGRs of ABNJ to 'increasing humankind's knowledge about nature'[32] is captured under the specific objectives of the MGR-related Part of the BBNJ Agreement, whereby Parties shall be guided by 'the generation of knowledge, scientific understanding and technological innovation, including through the development and conduct of marine scientific research *as fundamental contributions* to the implementation of the agreement'.[33] It is also reiterated that 'activities with respect to [MGRs]' are 'particularly for the benefit of advancing the scientific knowledge of humanity and promoting the conservation and sustainable use of marine biodiversity, taking into particular consideration the interests and needs of developing States'.[34] This combined objective is attainable through the knowledge of deep-sea and coastal ecosystems and their connectivity, which in effect allows for enhanced understanding of the need for, and effectiveness of, conservation and sustainable use approaches in ABNJ, as well as in areas within national jurisdiction due to the ecological connectivity of the ocean. This ecological connectivity is due to oceanographic processes and the movement of migratory species,[35] with cold-water coral studies also demonstrating the connectivity between ABNJ and areas within national jurisdiction. For example, *Desmophyllum pertusum* (previously *Lophelia pertusa*), one of the most common species of habitat forming cold-water corals that grows predominantly in the North Atlantic Ocean, has been found to form reefs

31 J Lubchenco and PM Haugan, 'The ocean genome: Conservation and the fair, equitable and sustainable use of marine genetic resources' in J Lubchenco and PM Haugan (eds), *The Blue Compendium* (Springer, Cham, 2023), at p. 93.

32 R Wolfrum, 'Concluding remarks' (2009) 24(2) *IJMCL* 343–346, at p. 346.

33 BBNJ Agreement (n 8), Article 7(c) (emphasis added). Article 6(3), the more general provision on international cooperation on marine scientific research, is quite weak: 'Parties shall promote international cooperation in marine scientific research and in the development and transfer of marine technology consistent with the Convention in support of the objectives of this Agreement'.

34 *Ibid*., Article 9(5).

35 E Popova *et al*., 'So far, yet so close: Ecological connectivity between ABNJ and territorial waters' (International Institute for Environment and Development Policy Brief, 2019) available at https://pubs.iied.org/17500iied; accessed 26 July 2021; S Yadav and K 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, 64–65.

worldwide.[36] However, climate change 'impacts on both ocean circulation and the global distribution of species', which can affect the ecological connectivity of species that spend considerable time in ABNJ and are culturally and economically important to many Global South countries. As examples, 14 marine species (including sharks, leatherback turtles, seals, albatross, shearwaters and whales), spend up to three-quarters of their annual cycle in ABNJ.[37] Ecological connectivity implies that coastal areas can also be affected by decisions on and processes related to ABNJ, and in fact countries in the Global South have already been currently characterised by the strongest connectivity to ABNJ. This interconnectedness means that any negative impacts arising from uses of ABNJ will affect the 'coastal populations of marine species, and ultimately change the structure of coastal ecosystems' in countries with the poorest and most vulnerable populations within the shortest time frames (e.g., Tanzania, Somalia, Liberia, Tuvalu, Vanuatu and the Solomon Islands).[38] These changes, in turn, have impacts on the communities in these countries that depend on the ocean for their food, livelihoods and culture.[39]

Within this context, the UN Special Rapporteur on Human Rights and the Environment, David Boyd, has recommended since 2020 that the BBNJ Agreement include 'appropriate consideration of human rights'[40] as part of the broader international recognition of the dependence of everyone's basic human rights on healthy biodiversity and ecosystems.[41] This is in acknowledgement that the poorest and most vulnerable communities, including children, women, Indigenous and Afro-descendant peoples,[42] are the first, hardest and

36 K Georgoulas, S Hennige and YC Lee 'Smoothed particle hydrodynamics for modelling cold-water coral habitats in changing oceans' (2023) 192 *Journal of Sea Research* 102358.

37 AL Harrison *et al.*, 'The political biogeography of migratory marine predators' (2018) 2 *Nature Ecology and Evolution* 1571.

38 Popova *et al.* (n 35). For a discussion on ecological connectivity and references to 'adjacency' during the BBNJ negotiations, see J Mossop and C Schofield, 'Adjacency and due regard: The role of coastal States in the BBNJ Treaty' (2020) 122 *Marine Policy* 103877.

39 N Bennett *et al.*, 'Environmental (in)justice in the Anthropocene ocean' (2022) 147 *Marine Policy* 105383; N Bennett *et al.*, 'Ocean defenders and human rights' (2022) 9 *Frontiers in Marine Science* 1–11, doi: 10.3389/fmars.2022.1089049.

40 UNGA, *Report of the UN Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment D Boyd*, UN Doc A/75/161 (15 July 2020), para 88(j).

41 UNGA, *Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment J Knox*, UN Doc A/HRC/34/49 (19 January 2017).

42 A Malinde and SN Lancaster, 'Decolonising tenure rights in the CARICOM & OECS Caribbean: [Re]-assessing the role of international legal instruments' (2022) 12(2) *Asian Journal of International Law* 1–45.

longest affected by biodiversity loss and climate change. It is therefore significant that the BBNJ Agreement makes both explicit and implicit reference to human rights. Its preamble and one of its general principles refer to respecting, promoting and considering the 'rights of Indigenous Peoples or of, as appropriate, local communities'.[43] In addition, the Agreement contains obligations to conduct environmental impact assessments (EIAs) and monitoring economic, social, cultural and human health impacts of any activities in ABNJ which they permit, or in which they engage, in order to determine whether these activities are likely to pollute or have adverse impacts on the marine environment.[44] It also specifically foresees a role for area-based management measures (ABMTs) to support food security and other socioeconomic objectives, including the protection of cultural values.[45]

Due to inequities in ocean science, however, States with limited knowledge of deep-sea ecosystems are less able to take ecologically sound decisions on BBNJ, as well as to sustainably manage deep marine spaces within national jurisdiction,[46] which limits their ability to protect ocean-dependent human rights. As a consequence, the equity and capacity gap in deep-sea knowledge production not only affects the opportunities of countries in the Global South to influence the further development of the law of the sea[47] and the direction of international cooperation on BBNJ, but also the protection of their ocean-dependent communities' human rights to food, livelihoods and culture that may be affected by ecological connectivity with ABNJ.[48]

Against this background, it is welcomed that the preamble of the BBNJ Agreement recalls[49] the 'importance of contributing to the realisation of a just and equitable international economic order which takes into account the interests and needs of humankind as a whole', and emphasises the need for ocean

43 BBNJ (n 8), Article 5(j); see also UNGA, *Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment: Framework Principles on Human Rights and the Environment J Knox*, UN Doc A/HRC/37/59 (24 January 2018), Principle 15 [Framework Principles]; E Morgera, 'Under the radar: Fair and equitable benefit-sharing and the human rights of Indigenous peoples and local communities connected to natural resources' (2019) 23 *International Journal of Human Rights* 1098–1139, doi: 10.1080/13642987.2019.1592161.

44 BBNJ (n 8), Article 35.

45 *Ibid*., Article 17(d).

46 Popova *et al.* (n 35).

47 LOSC (n 10), Article 238; see also N Matz-Lück, 'Article 238' in A Proelss (ed), *United Nations Convention on the Law of the Sea: A Commentary* (Hart, Munich, 2017) 1609.

48 Morgera (n 2), at p. 265.

49 LOSC (n 10), preambular para 5.

stewardship in 'maintaining the integrity of ocean ecosystems'.[50] Preambular language plays a role in the interpretation of the operative provisions of the instrument. In addition, the general principles of the BBNJ Agreement include equity, precaution, an ecosystem approach and an integrated approach to ocean management, and an approach that 'builds ecosystems resilience … and also maintains and restores ecosystem integrity'.[51] The reference to the ecosystem approach actually covers all of the other general principles, as elaborated on under the ecosystem approach taken by the 196 Parties to the Convention on Biological Diversity (CBD). Under the CBD, the ecosystem approach is about integration,[52] thereby challenging the long-embedded sectoral and fragmented approach to environmental law-making and implementation at national and international levels.[53] In addition, under the CBD, the ecosystem approach entails adaptive management and a precautionary approach, integration of 'Western' and Indigenous and local knowledge,[54] equity and appropriate representation of community interests in decision-making processes.[55] It also calls for taking into account the limits of ecosystem functioning[56] and promoting connectivity.[57] The question of other knowledge systems that could contribute to integrated ocean governance internationally and at the country level has not been raised to a significant level in previous studies on ocean science. But it has become crucial now that the BBNJ Agreement provides for the respectful integration of Indigenous and local knowledge in its decision-making processes, subject to international human rights safeguards.[58]

The practice of the ecosystem approach, however, across the Global North and South continues to be sectoral, and inadequately considers aspects such as equity, sociocultural diversity, and social-ecological systems approaches to ocean and environmental management.[59] Much therefore remains to be done, at the level of implementation, to put in place an ecosystem approach that

50 BBNJ Agreement (n 8), preambular para 11.

51 *Ibid*., Article 5(g).

52 CBD Decision V/6, Annex, para 1 and Principle 5.

53 F Platjouw, 'The Need to Recognize a Coherent Legal System as an Important Element of the Ecosystem Approach' in C Voigt (ed), *Rule of Law for Nature: New Dimensions and Ideas in Environmental Law* (Cambridge University Press, Cambridge, 2013) 158–174.

54 CBD Decision V/6 (2000), Ecosystem Approach, Annex, Part B, Principle 11.

55 CBD Decision VII/11 (2004), Ecosystem Approach, Annex I, Table 1, Principle 1.

56 CBD Decision V/6 (n 54), Annex, Part B, Principles 5–6.

57 *Ibid*., Annex, Part B, Principle 1.

58 BBNJ Agreement (n 8), Articles 7(i)–(j).

59 See N Bennett, 'Navigating a just and inclusive path towards sustainable oceans' (2018) 97 *Marine Policy* 139–146; RL Stephenson *et al*., 'The quilt of sustainable ocean governance: Patterns for practitioners' (2021) 8 *Frontiers in Marine Science* 630547; N Bennett,

truly supports integrated and adaptive management, on the basis of different knowledge systems, and contributes to the protection of relevant human rights.

The Role of the BBNJ Agreement in the Global Carbon Cycle

The BBNJ Agreement includes several references to climate change. In its preamble, it recognises 'the need to address, in a coherent and cooperative manner, biodiversity loss and degradation of ecosystems of the ocean, due to, in particular, climate change impacts on marine ecosystems, such as warming and ocean deoxygenation, as well as ocean acidification, pollution, including plastic pollution, and unsustainable use'.[60] In addition, the BBNJ Agreement includes among its general principles reference to '[a]n approach that builds ecosystems resilience, including to adverse effects of climate change and ocean acidification, and also maintains and restores ecosystem integrity, including the carbon cycling services that underpin the ocean's role in climate'.[61] This is a significant recognition, compared to the LOSC, as among the many benefits to human well-being, the ocean plays a fundamental role in climate regulation. However, the ocean-climate nexus acts as a negative feedback loop, whereby climate change progression, moderated by carbon uptake by the ocean, compromises the ocean's continued ability to regulate global climate.[62] The role of the ocean in climate regulation and the global carbon cycle is the product of complex interactions among and between biological and abiotic components operating at a range of temporal and spatial scales. These components and the resilience imparted by their complexity and diversity mean that there is a buffer or lag in an ecosystem's ability to withstand degradation and subsequent reduction in ecosystem service provision.[63]

The contribution of the ecosystems in ABNJ to climate regulation cannot be distinguished or separated from that of the global ocean, as the global transport of heat and drawdown of carbon is fundamental to this ecosystem service. However, the spatial extent of deep seas in area and volume (when compared

'Mainstreaming equity and justice in the ocean' (2022) 9 *Frontiers in Marine Science* 873572; Strand *et al.* (n 14).

60 BBNJ Agreement (n 8), preambular para 3.

61 *Ibid.*, Article 5(g).

62 RJ Roland Holst, 'Law in context: Change in practice' in RJ Roland Holst (ed), *Change in the Law of the Sea* (Brill Nijhoff, Leiden, 2022) 247–308.

63 B Worm, 'Impacts of biodiversity loss on ocean ecosystem services' (2006) 314 *Science* 787; GM Mace, 'Approaches to defining a planetary boundary for biodiversity' (2014) 28 *Global Environmental Change* 289.

to terrestrial, coastal and shelf systems) means that the potential contribution of ecosystems in ABNJ to climate regulation is abundant.[64] Despite the vast international legal scholarly and policy debate on human rights and climate change,[65] however, engagement with the law of the sea has been limited, and only scant attention has been paid to the contribution of the BBNJ Agreement to the climate-human rights debate.[66] The UN Special Rapporteur on Climate Change and Human Rights, Ian Fry, however, made some connections in his 2022 report on loss and damage, noting that higher ocean temperatures cause coral reef bleaching, which impacts the human right to food for those who depend on coral reef ecosystems as a food source.[67] While the Rapporteur did not engage with ocean acidification and other issues at the ocean-climate nexus,[68] he did underscore the need to 'develop international legal measures to address the permanent loss of land and *ocean* territories and their associated *ecosystems, livelihoods, culture and heritage*'.[69] These remarks allude to the risks arising from climate change for a broader set of marine ecosystem services on which the human rights to livelihoods and culture depend.

Engaging more systematically with the science on deep-sea ecosystem services and climate change is thus essential both for effective protection of the marine environment and the human rights that depend on it. Climate regulation by the deep sea is linked to nutrient cycling and involves biogeochemical processes that transport organic materials from ocean surface to deeper

64 N Hilmi *et al.*, 'The role of blue carbon in climate change mitigation and carbon stock conservation' (2021) 3 *Frontiers in Climate* 710546; LA Levin, 'IPCC and the deep sea: A case for deeper knowledge' (2021) 3 *Frontiers in Climate* 720755.

65 For example, S Duyck, S Jodoin and A Johl (eds), *Routledge Handbook of Human Rights and Climate Governance* (Routledge, Abingdon, 2018); Human Rights Council (HRC) Resolution 7/23 (28 March 2008), Human Rights and Climate Change; HRC Res 50/9 (7 July 2022), Human Rights and Climate Change; and the establishment of the UN Special Rapporteur on Climate Change and Human Rights through HRC Res 48/14 (8 October 2021), Mandate of the Special Rapporteur on the Promotion and Protection of Human Rights in the Context of Climate Change.

66 E Johansen *et al.* (eds), *The Law of the Sea and Climate Change* (Cambridge University Press, Cambridge, 2020).

67 UNGA, *Report of the Special Rapporteur on the Promotion and Protection of Human Rights in the Context of Climate Change, Promotion and Protection of Human Rights in the Context of Climate Change Mitigation, Loss and Damage and Participation*, UN Doc A/77/226 (26 July 2022), para 49.

68 M Lennan *et al.*, 'Reflections on the report of the UN Special Rapporteur on Climate Change and Human Rights focused on loss and damage' (One Ocean Hub blog post, 2022) available at https://oneoceanhub.org/reflections-on-the-report-of-the-un-special-rapporteur-on-climate-change-and-human-rights-focused-on-loss-and-damage.

69 UN Doc A/77/226 (n 65), para 92(f).

layers.[70] Carbon dioxide (CO_2) and methane in the atmosphere are dissolved in surface waters in the upper ocean and transported to depth through global ocean circulation patterns. In addition, carbon from marine organisms in surface waters sinks and accumulates in the deep sea.[71] Here, some of this carbon is ingested by marine organisms on the seafloor,[72] while some is sequestered or stored in sediments through burrowing and bioturbation.[73]

Dissolved organic carbon is nearly equal to atmospheric CO_2 and the majority of this is found at depths ~1000 metres where this carbon remains out of contact with the atmosphere for thousands of years.[74] Researchers have found that although rates of carbon sequestration in deep sediments are much lower than in shallow water habitats such as seagrasses, salt marshes and mangroves, these environments play an important role in storing carbon because they cover such vast areas.[75]

Deep-sea ecosystems also present novel and unique opportunities that are still being discovered,[76] including new ecosystems, genetic resources, and unique ecological processes and functions that may contribute to climate change mitigation.[77] Whilst the evidence linking deep-sea living and non-living components, the services they provide and associated benefits lags behind the development of similar ecosystem service frameworks for terrestrial

70 KL Smith *et al.*, 'Climate, carbon cycling, and deep-ocean ecosystems' (2009) 106 *Proceedings of the National Academy of Sciences* 19211.

71 S Beaulieu and K Smith, 'Phytodetritus entering the benthic boundary layer and aggregated on the sea floor in the abyssal NE Pacific: Macro- and microscopic composition' (1998) 45 *Deep Sea Research Part II: Topical Studies in Oceanography* 781–815.

72 L Lauerman *et al.*, '234Th and 21Pb evidence for rapid ingestion of settling particles by mobile epibenthic megafauna in the abyssal NE Pacific' (1997) 42 *Limnology and Oceanography* 589–595.

73 M Miatta and P Snelgrove, 'Sea pens as indicators of macrofaunal communities in deep-sea sediments: Evidence from the Laurentian Channel marine protected area' (2022) 182 *Deep Sea Research Part I: Oceanographic Research Papers* 103702.

74 D Hansell *et al.*, 'Dissolved organic matter in the ocean: A controversy stimulates new insights' (2009) 22 *Oceanography* 202–211; Hilmi *et al.* (n 64).

75 T Luisetti *et al.*, 'Quantifying and valuing carbon flows and stores in coastal and shelf ecosystems in the UK' (2019) 35 *Ecosystem Services* 67–76; TB Atwood *et al.*, 'Global patterns in marine sediment carbon stock' (2020) 7 *Frontiers in Marine Science* 165.

76 See, for example, Blasiak *et al.* (n 30); R Harbour *et al.*, 'Benthic and demersal scavenger biodiversity in the eastern end of the Clarion-Clipperton Zone: An area marked for polymetallic nodule mining' (2020) 7 *Frontiers in Marine Science* 458.

77 Deep-Ocean Stewardship Initiative (DOSI), 'The full value of marine genetic resources (MGR)' (DOSI Policy Brief, 2018) available at https://www.dosi-project.org/wp-content/uploads/2018/05/027-DOSI-MGR-1.pdf.

and coastal ecosystems, we know that these ecosystems are of major global importance and progress in this regard is underway.[78]

The definition of 'cumulative impacts' in the BBNJ Agreement, for the purposes of environmental impact assessments, includes 'the combined and incremental impacts resulting from different activities, including known past and present and reasonably foreseeable activities, or from the repetition of similar activities over time, and the *consequences of climate change, ocean acidification and related impacts*'.[79] One way of informing decision-making in this regard is using appropriately designed, purpose-fit ecosystem models of historic periods to understand observed ecosystem dynamics and responses to past changes in ocean use and altered climatic conditions, and to examine cumulative impacts of multiple drivers on ecosystems.[80] These kinds of models can then be run in simulation mode to explore possible future ecosystem dynamics and elicit potential societal implications under projected climate scenarios or shared socioeconomic pathways.[81] It is imperative that uncertainties surrounding possible trajectories and interactions of multiple drivers are acknowledged through considering projections across different types of ecosystem models that describe different ecosystem processes and that are based upon different sets of model assumptions. A key challenge in developing these kinds of ecosystem models to inform decision-making in ABNJ is the limited knowledge of how ecological functional groups and thus ecosystem structure and functioning are likely to respond physiologically and behaviourally to altered environmental conditions due to climate change. In that connection, the BBNJ Agreement includes among the types of capacity-building and technology transfer reference to building knowledge of '[s]tressors on the ocean that affect marine biological diversity of areas beyond national jurisdiction,

78 LaBianca (among the authors) is developing an integrated ecosystem service assessment in Atlantic case studies. For literature published at the time of writing, see LaBianca *et al.* (n 14); L Skein *et al.*, 'Scoping an integrated ecosystem assessment for South Africa' (2022) 9 *Frontiers in Marine Science* 975328; D Pedreschi *et al.*, 'Operationalising ODEMM risk assessment for integrated ecosystem assessment scoping: Complexity vs. manageability' (2023) 9 *Frontiers in Marine Science* 2766.

79 BBNJ Agreement (n 8), Article 17(c) (emphasis added).

80 LJ Shannon *et al.*, 'Exploring temporal variability in the Southern Benguela ecosystem over the past four decades using a time-dynamic ecosystem model' (2020) 7 *Frontiers in Marine Science* 540; K Ortega-Cisneros *et al.*, 'Supporting marine spatial planning with an ecosystem model of Algoa Bay, South Africa' (2022) 44 *African Journal of Marine Science* 189–204.

81 D Tittensor *et al.*, 'Next-generation ensemble projections reveal higher climate risks for marine ecosystems' (2021) 11 *Nature Climate Change* 973–981.

including the adverse effects of climate change such as warming and deoxygenation, as well as ocean acidification'.[82]

Understanding ecological connectivity and its role in climate change regulation is nascent. Critical to this understanding is knowledge of genetic variation between organisms, how they are interrelated and the impact of changing environmental conditions on genetic variation of biodiversity and associated ecosystem processes. Molecular genetic approaches are an increasingly important component of ocean science that provides this foundational biodiversity information to guide the use of conservation tools and actions, including those relating to climate change mitigation and adaptation. For example, study of phenotypic plasticity provides insight into the adaptation potential of species to climate change, supporting adaptive management and sustainable use of biodiversity that evolves with a changing planet.[83] In some cases, molecular genetic approaches are the only means of obtaining this information. However, while molecular-based assessments offer vast potential, they require extensive sampling of the ocean genome, at high cost, to develop genetic diversity datasets or baselines.[84]

The Need to (Re)Direct International Scientific Cooperation

The ability of deep-sea ecosystems to support climate regulation depends on the health and functionality of the constituent parts, but we need to advance knowledge and understanding of these ecosystems to enable their sustainable use. The BBNJ Agreement aspirations for the 'responsible use of the marine environment, maintaining the integrity of ocean ecosystems and conserving the inherent value of biodiversity of areas beyond national jurisdiction' in a 'coherent and cooperative manner', with particular attention to 'ecosystems resilience … to adverse effects of climate change and ocean acidification, and … ecosystem integrity, including the carbon cycling services that underpin the ocean's role in climate',[85] thus rests on advancements in scientific knowledge.

In-depth understanding of how organisms respond to different forms of disturbance is needed if we are to succeed in '[p]rotect[ing], preserv[ing], restor[ing] and maintain[ing] biodiversity and ecosystems, including with a

82 BBNJ Agreement (n 8), Annex II, para IV (emphasis added).

83 MW Kelly *et al.*, 'Limited potential for adaptation to climate change in a broadly distributed marine crustacean' (2012) 279 *Proceedings of the Royal Society B* 349.

84 Blasiak *et al.* (n 30).

85 BBNJ Agreement (n 8), Article 7(g).

view to enhancing their productivity and health, and strengthen resilience to stressors, *including those related to climate change, ocean acidification and marine pollution*'.[86] Evidence-based decision-making will be limited and provisions on ABMTs unsuccessful in achieving these goals without essential knowledge on species taxonomy (what animals are present), distribution, abundance, biomass, behaviour, life history traits (e.g., how long animals live), interactions with each other and the environment, population connectivity, responses of organisms to changes in environmental conditions, and understanding of overall consequences of all of these interactions for determining ecosystem functioning.

For some deep-sea areas, there is some ecological understanding of species distribution and species interactions; however, in most deep-sea areas of ABNJ, we have little to no knowledge on these most fundamental aspects of biodiversity. For example, in the Clarion-Clipperton Fracture Zone, arguably one of the most well studied areas of ABNJ in the central eastern Pacific, there remain large knowledge gaps limiting the ability for evidence-based decision-making regarding the ecological impacts of deep-sea mining activities.[87] These include gaps in baseline knowledge on the aspects mentioned above, how these patterns vary both spatially and temporally and how this translates to the benefits that ecosystems provide. These knowledge gaps, particularly at a foundational level where it is not known what is where, do not preclude precautionary action, but they prevent the strategic (informed) protection of a network of areas that supports critical ecosystem services implicated in climate regulation. This also weakens the effectiveness of ABMTs in providing reference zones to further knowledge of the impacts of climate change, as study sites cannot be strategically chosen. This lack of knowledge compounds the need for a reversal of the burden of proof within economic decision-making within these important environments, where the onus is on those set to put pressure on the system to evidence the significance (or insignificance) of their associated impact.

Due to the high costs of ocean research, particularly in deep and open ocean ecosystems (€800k to €1.7M per expedition and €30–40M for a basin-scale programme), there is a pressing need for international cooperation and funding to support ocean science[88] that can underpin the implementation of the

86 *Ibid.*, Article 17(c) (emphasis added).

87 DJ Amon *et al.*, 'Assessment of scientific gaps related to the effective environmental management of deep-seabed mining' (2022) 138 *Marine Policy* 105006.

88 J Roberts *et al.*, 'A blueprint for integrating scientific approaches and international communities to assess basin-wide ocean ecosystem status' (2023) 4 *Communications Earth & Environment* 12.

BBNJ Agreement. In their recent review, Howell *et al.* highlight the need for a coordinated international effort to expand deep-sea biological observations and sampling in all ocean basins, but specifically focusing on underexplored regions.[89] Key questions to be addressed are: (i) What is the diversity of life in the deep ocean? (ii) How are populations and habitats connected? (iii) What is the role of living organisms in ecosystem function and service provision? and (iv) How do species, communities, and ecosystems respond to disturbance?[90] In addition to addressing these questions, we need to consider how to reshape research efforts driven by donors and the academic research community in the Global North in ways that genuinely develop partnerships with scientists and Indigenous and local knowledge holders in the Global South.

Some critical insights have been identified by deep-sea researchers collaborating across the Global South and North. An interdisciplinary review in South Africa underscored that research institutions without offshore vessels 'struggle to obtain access to ship and deep-sea sampling technology' and that disparity in access to deep-sea research vessels and technology has implications for access to international research cruises both within and beyond areas of national jurisdiction.[91] In addition, limited field experience in deep-sea research precludes researchers in the Global South from participating in deep-sea research conferences, thereby making it difficult for these researchers to 'catch up with global standards'.[92] A regional review of Atlantic Ocean research highlighted that to overcome disparities in research and equipment capacity, detailed research co-design between the North and South Atlantic must include shared access to offshore vessels, data, training, supporting infrastructure, effective capacity-building and wider engagement.[93] Barriers created by limitations in funding structure, travel restrictions or, more recently, pandemic-related regulations pose challenges in overcoming disparities in capacity between the Global North and South and hamper our (by necessity, transdisciplinary) understanding of ecosystem resilience and the combined pressure of climate change and human activities.[94]

89 K Howell *et al.*, 'A blueprint for an inclusive, global deep-sea ocean decade field program' (2020) 7 *Frontiers in Marine Science* 999.

90 K Howell *et al.*, 'A decade to study deep-sea life' (2021) 5 *Nature Ecology & Evolution* 265–267.

91 K Sink *et al.*, *Challenges and Solutions to Develop Capacity for Deep-sea Research and Management in South Africa* (South African National Biodiversity Institute, South Africa, 2021) 18, available at https://oneoceanhub.org/publications/challenges-and-solutions-to-develop-capacity-for-deep-sea-research-and-management-in-south-africa/.

92 *Ibid.*, at p. 19.

93 Roberts *et al.* (n 88).

94 *Ibid.*

The Role of SEAs in Addressing Knowledge and Capacity Gaps

While it would be intuitive to look into the provisions of the BBNJ Agreement focused on capacity-building and technology transfer to address knowledge gaps in an equitable way, we suggest reflecting first on the opportunities of tackling these challenges as part of new international provisions on SEAs. The SEA process within the BBNJ Agreement could ensure sustainability of ocean ecosystems in ABNJ by transforming the reactive approach to conservation and sustainable use, which often underpins the use of EIAs to a more proactive one.[95] In effect, the BBNJ Agreement includes as an objective to

> [b]uild and strengthen the capacity of Parties, particularly developing States Parties, in particular the least developed countries, landlocked developing countries, geographically disadvantaged States, small island developing States, coastal African States, archipelagic States and developing middle income countries, to prepare, conduct and evaluate environmental impact assessments and strategic environmental assessments in support of the objectives of this Agreement.[96]

It then establishes an obligation for Parties, individually or through international cooperation, to '*consider conducting* [SEAs] for plans and programmes relating to activities under their jurisdiction or control, to be conducted in ABNJ, to assess the potential effects of that plan or programme, as well as alternatives, on the marine environment'.[97] While this obligation does not go as far as requiring States to conduct SEAs, it arguably requires States to assess the need for a SEA and discuss such need with domestic actors, as well as with other States bilaterally or mini-laterally,[98] and/or within relevant regional and global bodies. The obligation could also be interpreted to extend to having to

95 K Hassanali and R Mahon, 'Encouraging proactive governance of marine biological diversity of areas beyond national jurisdiction through strategic environmental assessment (SEA)' (2022) 136 *Marine Policy* 104932.

96 BBNJ Agreement (n 8), Article 27(f).

97 *Ibid*., Article 39(1) (emphasis added).

98 Consider, for instance, opportunities for international collaboration on this as part of bilateral or minilateral development cooperation agreements, or trade and investment agreements that contain environmental protection and sustainable development clauses. For a general background, see G Marín Durán and E Morgera, *Environmental Integration in the EU's External Relations: Beyond Multilateral Dimensions* (Hart, Munich, 2012); S Jinnah and E Morgera, 'Environmental provisions in American and EU free trade agreements: A preliminary comparison and research agenda' (2013) 22 *Review of European Community and International Environmental Law* 324–339.

articulate reasons for not conducting such assessments when domestic actors or other States may instead recommend one. It should be possible to identify instances in which a State has not complied with this obligation, and where States should be held accountable. This includes if States do not respond at all or provide no reason for refusing to consider suggestions from civil society, intergovernmental organisations or other States pointing to the need for such assessments.

In addition, a significant innovation of the BBNJ Agreement is allocating a power to the BBNJ Conference of the Parties (COP) to 'conduct [SEAs] of an area or *region* to *collate and synthesize the best available information about the area or region, assess current and potential future impacts and identify data gaps and research priorities*'.[99] This is notable for two reasons. First, it creates a multilateral avenue for taking action on SEAs when individual States may not be willing or able individually to do so. In that connection, the possibility of decisions by voting under the COP provides an opportunity to go ahead with a SEA against the will of certain States.[100] Second, it seems to respond to a recommendation made by the research community that 'regional environmental assessments', as part of SEAs, are necessary to fill knowledge gaps to ensure ecologically meaningful management of BBNJ, as discussed below.[101]

All these provisions are notable for introducing the concept of SEAs into the law of the sea, which is required under the CBD in terms of 'introduc[ing] appropriate arrangements to ensure that the environmental consequences of [each Party's] programmes and policies that are likely to have significant adverse impacts on biological diversity are duly taken into account'.[102] Consensus-based guidance from the CBD process on SEAs in the marine context includes stakeholder engagement and transparency, technical assessment,

99 BBNJ Agreement (n 8), Article 39(2) (emphasis added).

100 *Ibid.*, Article 47(5).

101 K McQuaid *et al.*, 'The need for strategic environmental assessments and regional environmental assessment in ABNJ for ecologically meaningful management' (One Ocean Hub Policy Brief, 2022) available at https://oneoceanhub.org/publications/policy-brief-the-need-for-strategic-environmental-assestements-and-regional-environmental-assessment-in-abnj-for-ecologically-meaningful-management/.

102 Convention on Biological Diversity (Rio de Janeiro, 5 June 1992, in force 29 December 1993) 1760 *UNTS* 79, Article 14(b) [CBD]. The Article qualifies this obligation with 'as far as possible and as appropriate', which can be interpreted as a reference to different capacities of CBD Parties and their dependence on scientific, financial and technological cooperation with developed countries (Articles 18, 20). See E Morgera, *Biodiversity as a Human Right and its Implications for the EU's External Action* (Report to the European Parliament, 2020) available at https://www.europarl.europa.eu/RegData/etudes/STUD/2020/603491/EXPO_STU(2020)603491_EN.pdf.

information sharing, and monitoring and evaluation after the policy or plan has been adopted.[103] This terminology should be interpreted in accordance with international human rights standards,[104] such as procedural ones on 'information, participation and remedy'[105] and the substantive standard to prevent 'unjustified, foreseeable infringements of human rights' that could arise from any decisions on biodiversity.[106] These clarifications have been developed in the context of the international human right to a healthy environment, with particular attention to biodiversity, thereby shedding light on a State's minimum conduct that is often unaddressed in international biodiversity law.[107] These developments are now reflected in the 2022 Global Biodiversity Framework, which aims to inspire all action, including international and regional cooperation, on biodiversity for the next decade.[108] These clarifications also seem relevant for the BBNJ Agreement provisions on human rights of Indigenous peoples and other communities, as well as its implicit references to everyone's economic, social and cultural human rights, particularly the human right to health.[109]

That said, the BBNJ Agreement provision on SEAs is quite short, which is a result of the fact that the BBNJ negotiations mainly focused on EIAs. Further, there had been divergence on whether to include provisions on SEAs at all, as well as on what should be included in SEAs in terms of the scope, level of assessment, responsible Parties, triggers, and role of a governing body in review and monitoring, amongst others.[110] However, for small island developing States and coastal least developed countries with a high ocean-to-land-area

103 CBD, Marine and Coastal Biodiversity: Revised Voluntary Guidelines for the Consideration of Biodiversity in Environmental Impact Assessments and Strategic Environmental Assessments in Marine and Coastal Areas, UN Doc UNEP/CBD/COP/11/23 (21 August 2012), Annex, Part II, para 14.

104 See, albeit with specific focus on the deep-seabed, E Morgera and H Lily, 'Public participation at the International Seabed Authority: An international human rights analysis' (2022) 31(3) *Review of European, Comparative & International Environmental Law* 374–388.

105 Framework Principles (n 43), Principle 11, para 33(a), making reference also to Principles 4–10.

106 Knox (n 41), para 34.

107 E Morgera, 'Dawn of a new day? The evolving relationship between the Convention on Biological Diversity and international human rights law' (2018) 54 *Wake Forest Law Review* 691–712.

108 CBD Decision 15/4, Kunming-Montreal Global Biodiversity Framework, UN Doc CBD/COP/DEC/15/4 (19 December 2022).

109 BBNJ Agreement (n 8), Articles 35, 31(1)(b).

110 N Craik and K Gu, 'Strategic environmental assessment in marine areas beyond national jurisdiction: Implementing integration' (2022) 37 *IJMCL* 189–216.

ratio – the so-called large ocean States[111] in the Caribbean, Pacific and the Indian Ocean – a significant proportion of the population live on the coast and rely on the ocean economically, socially and culturally.[112] Given these inherent characteristics and the vulnerability of these Global South States, it is imperative that the implementation of the BBNJ Agreement take a proactive approach to ecosystem function conservation as a foundation for sustainability.[113] The BBNJ Scientific and Technical Body is expected to elaborate guidelines on how to undertake SEAs, which will then be adopted by the COP.[114] Notably on the ocean-climate nexus, while EIAs are expected to address cumulative impacts, including climate change,[115] it will be extremely challenging to effectively address cumulative impacts given their narrower focus and reactive approach.

Rather, there is a need for SEAs as proactive and future-thinking assessments to better understand ecosystems and their services, as well as possible risks and cumulative impacts. As argued elsewhere,[116] SEAs can also complement prevailing practice in project-level EIAs that do not include consideration of relevant historical context,[117] and rather consider long-term implications of ocean management taking into account cumulative impacts (including from climate change). SEAs also involve consideration of broader human rights implications for local coastal communities, including women and children, small-scale fishers, Indigenous and local knowledge holders, and can better recognise and integrate Indigenous and local knowledge in their assessments.[118]

From an ocean science perspective, SEAs that include environmental assessment at a regional level can provide a proactive, rather than reactive, vision and mechanism to support conservation of biodiversity in ABNJ.[119] This would particularly (i) advance ocean science, (ii) ensure strategic decisions on cumulative impacts to enable more effective implementation of all other elements

111 C Frazão Santos *et al.*, 'A sustainable ocean for all' (2022) 1 *Ocean Sustainability* 2.

112 Popova *et al.* (n 35).

113 Hassanali and Mahon (n 95), at p. 2.

114 BBNJ Agreement (n 8), Articles 38(1)(g).

115 *Ibid.*, Articles 33(2).

116 J Nakamura, D Diz and E Morgera, 'International legal requirements for environmental and socio-cultural assessments for large-scale industrial fisheries' (2022) 31(3) *Review of European, Comparative & International Environmental Law* 336–348.

117 N Craik, 'The duty to cooperate in the customary law of environmental impact assessment' (2020) 69 *International and Comparative Law Quarterly* 239, at p. 460.

118 Nakamura, Diz and Morgera (n 116), at p. 11. On SEAs and human rights, see also Craik and Gu (n 110), at p. 213. On the relevance for children, see S Shields *et al.*, 'Children's human right to be heard at the ocean-climate nexus' (2023) 38(3) *IJMCL*. On the relevance for fishers, see J Nakamura *et al.*, 'International legal responses for protecting fishers' fundamental rights impacted by a changing ocean' (2023) 38(3) *IJMCL*.

119 See generally Hassanali and Mahon (n 95).

of the BBNJ Agreement, and (iii) contribute to climate change mitigation.[120] Global scale mapping of marine habitats[121] should be followed by zoning in regions based on ecological function, importance and uniqueness.[122] These assessments should then be carried out for each region (prioritised based on vulnerability and potential for use), and used to inform the development of marine spatial plans or other types of planning processes, including for ecologically connected networks of marine protected areas and other types of ABMTs as well as EIAs.

It is interesting to note here, however, that the BBNJ Agreement only foresees the relevance of SEAs for EIAs, but not explicitly for the implementation of other parts of the Agreement.[123] That, however, does not necessarily exclude the relevance of results of SEAs for the implementation of other parts of the Agreement based on the principles of an ecosystem approach,[124] precautionary approach[125] and integrated approach to ocean management,[126] and an approach that 'builds ecosystems resilience … and also maintains and restores ecosystem integrity and functioning', including for the purposes of addressing the ocean-climate nexus.[127]

As mentioned above, the reference to the COP power to conduct an SEA 'in a region' can arguably be interpreted as the opportunity to mandate regional SEAs to provide baseline environmental information that supports a proactive approach by collating existing information and providing a framework to support the generation of new knowledge. The target of assessment in regional SEAs is the environment and trends, including effects of climate change and other cumulative impacts. Regional SEAs can include measurements of all aspects of the environment, from biological to oceanographic, hydrographic and physical conditions, as well as ecosystem services. Regional SEAs can also include the identification of environmental knowledge gaps and, in some cases, the design and implementation of research programmes to address these knowledge gaps.[128] This would not be unprecedented. In ABNJ, a regional

120 McQuaid *et al.* (n 101).

121 For example, K Howell, 'A benthic classification system to aid in the implementation of marine protected area networks in the deep/high seas of the NE Atlantic' (2010) 143 *Biological Conservation* 1041; L Watling *et al.*, 'A proposed biogeography of the deep ocean floor' (2013) 111 *Progress in Oceanography* 91; K McQuaid *et al.*, 'Broad-scale benthic habitat classification of the South Atlantic' (2023) 214 *Progress in Oceanography* 103016.

122 Hassanali and Mahon (n 95), at p 3.

123 BBNJ Agreement (n 8), Article 39(3).

124 *Ibid.*, Article 7(e).

125 *Ibid.*, Article 7(d).

126 *Ibid.*, Article 5(f).

127 *Ibid.*, Article 5(g).

128 McQuaid *et al.* (n 101).

environmental assessment has been undertaken in the deep-sea mining sector through a process to develop a regional environmental management plan for the northern Mid-Atlantic Ridge.[129] Regional SEAs can thus imply cross-sectoral cooperation to allow the description of environmental patterns and ecological processes acting at regional scales, improved understanding of poorly known areas, identification of sensitive areas and assessment of potential cumulative impacts.

Significantly, regional SEAs could encourage a more equitable approach to ocean knowledge production as collective data, knowledge and resources are pooled and capacities shared and developed[130] across relevant sectoral and regional management bodies, government research organisations, non-governmental organisations and other actors. This can be done within existing regional mechanisms such as the UNEP Regional Seas Programmes, large marine ecosystems and regional fisheries bodies. In undertaking a regional assessment, consideration could be given to approaches that support learning across regions and for repeating the assessment to measure change. Assessment measures include standardising thresholds and targets, sampling design, data collection protocols, morphospecies catalogues and data storage. These are all outstanding issues the deep-sea community is working to address[131] that can support a step-change in current ocean science practices by bolstering

129 P Weaver *et al.*, *Regional Environmental Assessment of the Northern Mid-Atlantic Ridge* (International Seabed Authority, Technical Study No. 28, Kingston, 2021) available at https://www.isa.org.jm/wp-content/uploads/2022/11/ISA_Technical_Study_28.pdf; International Seabed Authority (ISA), 'Draft regional environmental management plan for the northern Mid-Atlantic Ridge open for consultation until 3 June' (2022) available at https://isa.org.jm/news/draft-regional-environmental-management-plan-northern-mid-atlantic-ridge-open-consultation.

130 For example, BJ Bett, 'UK Atlantic Margin environmental survey: Introduction and overview of bathyal benthic ecology' (2001) 21 *Continental Shelf Research* 917; J Nedwell *et al.*, *Measurement and Interpretation of Underwater Noise during Construction and Operation of Offshore Windfarms in UK Waters* (Subacoustech Report No. 544R0738 to COWRIE Ltd, 2007) available at https://tethys.pnnl.gov/sites/default/files/publications/COWRIE_Underwater_Noise_Windfarm_Construction.pdf; HR Wallingford Ltd, *South Coast Dredging Association: MAREA Summary Report* (British Marine Aggregate Producers Association, 2010) available at http://marine-aggregate-rea.info/sites/www.marine-aggregate-rea.info/files/private/app-ascmarea-summary-report.pdf.

131 These initiatives include Challenger 150 and the Deep Ocean Observing Strategy (UN Decade-endorsed global programmes, whose work covers some aspects of standardisation in data collection and storage), as well as the work of the ISA on taxonomic standardisation, large marine ecosystems on transboundary diagnostic assessments including socioeconomic impacts, and the UN Regular Process (the ongoing intergovernmental process developing World Ocean Assessments, which is starting a process of regional assessments).

cooperation, integration and comparability. This would be of particular benefit to countries in the Global South as it would ensure that the maximum benefit from data is obtained and that processes are streamlined. These are crucial steps towards best use of equipment for monitoring and collection of novel data, data storage, and accessibility and interpretation of information for informed, ecologically meaningful ocean management (at ocean-basin scale, taking into account connectivity and contributions to regional and global ecosystem services) in ABNJ as well as within national jurisdiction. Such monitoring and analysis are, in turn, crucial steps towards identifying any foreseeable impacts on ocean-dependent human rights.

In addition, owing to the importance of understanding ecological connectivity within the ocean-climate nexus, regional SEAs and SEAs more generally are likely to provide enhanced access to marine genetic resources of ABNJ. Such assessments would also provide an opportunity to support more equitable international cooperation in marine scientific research related to MGRs and improved baseline studies of the state of BBNJ. In effect, efforts should be made for access to marine genetic resources to support the understanding of the impact of anthropological activities on biodiversity and associated ecosystem processes related to climate regulation and climate change mitigation. Regional SEAs could provide a framework for regional sampling to support integration of multiple data sets and comparability of data; identify opportunities for, and lessons from, cooperation and pooling of resources; and support periodic review of data and reports from SEAs with a view to benefitting management of areas within national jurisdiction (due to ecological connectivity).[132]

SEAs can thus serve for a proactive examination of regional areas if they provide baseline environmental information, assess cumulative impacts (including climate change) and offer a framework to support generation of new knowledge through regional sampling programmes. In doing so, they can support a more equitable approach to ocean knowledge production and access to marine genetic resources and inform other parts of the Agreement. Such an interpretation of the innovative provisions on SEAs in the BBNJ Agreement (which could be captured in the more detailed guidelines and review processes discussed below) would support regional SEAs that put ecosystems and their benefits to humankind at the centre of ocean research and management efforts, to ensure that all Parties and actors with an interest in BBNJ work together to ensure its sustainable future.

132 McQuaid *et al.* (n 101).

Maximising the Role of SEAs in Addressing Equity Issues in Ocean Science through the BBNJ Institutional Framework

In addressing critical ecological knowledge gaps, regional SEAs could provide strategic opportunities for developing fair research partnerships between the Global North and Global South, with particular attention paid to capacity development and equity issues. Regional SEAs could be region-wide research programmes co-designed and co-developed by countries in the Global North and South with a view to ensuring mutual benefits, including collection of mutually beneficial data and mutual capacity-building in sampling, technology co-development[133] and ship-to-shore programmes that consider benefits for lead investigators, students and the wider public.[134] In other words, the need for international scientific cooperation to address critical knowledge gaps intersects with a need to reimagine scientific partnerships that are traditionally defined by the Global North towards co-developed scientific and technical partnerships.

Global South countries and experts participating in the design process of SEAs and regional SEAs would ensure that these assessments are more reflective of the needs of the countries themselves in managing ABNJ, as well marine areas under their jurisdiction that are ecologically connected to ABNJ. This could then inform and improve biodiversity strategies and action plans.[135]

Devising locally relevant and fair global ocean research,[136] with attention to benefits in terms of long-term capacity-building in Global South countries and the creation of global networks of complementary expertise that 'co-develop, co-lead and co-publish research',[137] would in fact respond to the call articulated

133 K Hoareau *et al.*, 'Mutual learning through capacity building on marine biological diversity of areas beyond national jurisdiction' (One Ocean Hub Policy Brief, 2022) available at https://oneoceanhub.org/publications/policy-brief-mutual-learning-through-capacity-building-on-marine-biological-diversity-of-areas-beyond-national-jurisdiction/.

134 For example, K Barnhill *et al.*, 'Ship-to-shore training for active deep-sea capacity development' (2023) *bioRxiv*, doi: 10.1101/2023.03.11.531674.

135 Blasiak *et al.* (n 30); Hoareau *et al.* (n 133).

136 Several scholars emphasise the need for locally relevant and local-led research and a move away from parachute science where Global North researchers and universities extract knowledge and data from Global South contexts without due recognition. See P Stefanoudis *et al.*, 'Turning the tide on parachute science' (2021) 31(4) *Current Biology* 184–185, doi: 10.1016/j.cub.2021.01.029; K Hintzen, R Alegado and S Kahanamoku, 'Parachute science in Hawai'i: Assessing local connectivity of Hawai'i based marine and coastal research' (2023) available at https://hdl.handle.net/10125/104892.

137 Sink *et al.* (n 91); J Lavelle and R Wynberg with J Whittingham, *Marine Biodiscovery in South Africa* (One Ocean Hub and University of Cape Town, 2022) available at https://oneoceanhub.org/wp-content/uploads/2022/09/Lavelle-Wynberg-2022_Marine-Biodiscovery-in-South-Africa.pdf.

in the 2022 Alliance of Small Islands States (AOSIS) Declaration on Marine Science. The AOSIS call involves 'mov[ing] away from a movement of capacity and technology from North to South, but rather established principles of engagement such as: genuine, durable, equitable, sustainable partnership that are responsive to the self-identified needs of developing countries'.[138]

To that end, the co-design of SEAs and regional SEAs could support co-development of research questions and plans, co-leadership of cruises, berths for Global South participation in cruises, joint analyses of results and joint research outputs, and capacity development at the science-policy interface that contributes, ultimately, to equitable participation in decision-making processes. Importantly, these efforts should all be undertaken in the framework of mutual learning so that Global South researchers are viewed not as 'passive beneficiaries' but rather equal 'partners'.[139]

Much of the innovative provisions on SEAs, including regional SEAs, remain to be further developed by the institutional framework established by the BBNJ Agreement. These new international institutions, which essentially introduce into the law of the sea common institutional features under international environmental law, can contribute to more equitable ocean knowledge co-production. As mentioned above, the BBNJ Scientific and Technical Body has been allocated a mandate that comprises developing guidelines on SEAs,[140] and could therefore build upon the work of the scientific community outlined above for the purposes of regional SEAs. In addition, oversight of SEAs would fit under the mandate of this Body, as this is implicit in its role to 'provide scientific and technical advice to the Conference'.[141]

Essentially, the Scientific and Technical Body could monitor, review and make recommendations on regional SEAs to the BBNJ COP, by

(i) synthesising lessons learned from regional SEAs and identifying capacity-building needs and good practices, that could then be considered in the implementation of the capacity-building and technology transfer part of the BBNJ Agreement;
(ii) identifying the need to facilitate cooperation and coordination with other relevant global, regional, subregional or sectoral bodies that are relevant for the ocean-climate nexus and its human rights implications, in

138 Alliance of Small Island States, Declaration for the Enhancement of Marine Scientific Knowledge, Research Capacity and Transfer of Marine Technology to Small Island Developing States (2022) available at https://www.aosis.org/wp-content/uploads/2022/06/AOSIS-Declaration-UN-Ocean-Confernce-2022.pdf.

139 Hoareau *et al.* (n 133); Morgera (n 2).

140 BBNJ Agreement (n 8), Article 38(1)(g).

141 *Ibid.*, Article 49(4).

the implementation of the various provisions on regime interaction of the BBNJ Agreement;[142] and

(iii) facilitating inclusive and equitable participation from relevant actors, including natural and social scientists from the Global North and South, as well as Indigenous and local knowledge holders.[143]

An inclusive composition of the Scientific and Technical Body is crucial, as its members are to serve in their expert capacity and in the 'best interest of the Agreement', [144] rather than represent the interests of individual State Parties that may nominate them. This means that the Body will need to be made up of researchers, experts and knowledge holders from a variety of scientific disciplines, diverse geographical institutions, Indigenous peoples and local communities, and lived experiences to form this inclusive composition.

The role of the Scientific and Technical Body includes consideration and evaluation of the EIA draft reports submitted by BBNJ Parties to the clearing-house mechanism. As part of a public consultation process,[145] it could draw attention to the relevance of information (or knowledge gaps) for Global South Parties, particularly at the ocean-climate nexus.

The BBNJ clearing-house mechanism could also play a useful role once the COP mandates SEAs, including regional SEAs, by supporting research cruises – as 'access to ship time' is usually the key barrier to co-development – that are planned in an equitable and transparent manner. This can be realised by relying on three roles given to the clearing-house mechanism. First, to facilitate matching of capacity-building needs with the support available and with providers for the transfer of marine technology. Second, the mechanism shall foster enhanced transparency, including by facilitating the sharing of environmental baseline data and information relating to the conservation and sustainable use of BBNJ between Parties and other relevant stakeholders. Third, the mechanism is to be managed so as to facilitate international cooperation and collaboration, including scientific and technical cooperation and collaboration, giving full recognition 'to the special requirements of developing States Parties, as well as the special circumstances of small island developing States Parties'.[146]

In addition, the capacity-building and transfer of marine technology provisions of Part V of the BBNJ Agreement call for support and oversight of a

142 *Ibid.*, Articles 15(5), 22(3), 24(2), 26(2), 29(2)–(3), 47(6)(c), 50(4)(d), 51(4), 55(4).
143 McQuaid *et al.* (n 101).
144 BBNJ Agreement (n 8), Article 49(2).
145 *Ibid.*, Article 32(3–4).
146 *Ibid.*, Articles 51(2) and (5).

'country-driven, transparent, effective and iterative process'[147] and carrying out periodic reviews of successes and challenges.[148] The implementation of such measures could benefit from the lessons learnt in and the opportunities for equitable scientific and technological cooperation provided by SEAs, including regional SEAs, notably with regard to ensuring that capacity and technology are 'responsive to the needs and priorities of developing States Parties'.[149] The capacity-building and transfer of marine technology committee established under Article 46 should also develop guidance that 'reflect[s] technological progress and innovation and … respond[s] and adapt[s] to the evolving needs of States, subregions and regions'.[150] Further, the committee could issue recommendations to the Scientific and Technical Body on SEAs, including regional SEAs, building on its identification of

> follow-up activities, including on how capacity-building and the transfer of marine technology could be further enhanced to allow developing States Parties, taking into account the special circumstances of small island developing States and of least developed countries, to strengthen their implementation of the Agreement to achieve its objectives.[151]

Similarly to the Scientific and Technical Body, the committee members are also expected to serve independently, 'in the best interests of the Agreement'.[152] This means the composition of the committee should include experts from the Global North and South, from natural and social sciences, and Indigenous and local knowledge holders.

Along similar lines, the access and benefit-sharing committee could also learn from these lessons and integrate the opportunities arising from SEAs, including regional SEAs, with particular regard to any marine scientific research related to MGRs that could advance understanding of the ocean-climate nexus. To that end, it could integrate the process for co-developing SEAs and regional SEAs into its future guidelines on benefit-sharing,[153] as well as for periodic review of benefit-sharing approaches.[154] The committee would thereby be

147 *Ibid.*, Article 42(3).
148 *Ibid.*, Articles 45(2)(d).
149 *Ibid.*, Article 42(4).
150 *Ibid.*, Article 44(3).
151 *Ibid.*, Article 45(2)(e).
152 *Ibid.*, Article 46(2).
153 *Ibid.*, Article 15(1).
154 *Ibid.*, Article 14(10).

utilising these concrete opportunities for collaboration to assess the assumption enshrined in the BBNJ Agreement that

> [a]ctivities with respect to marine genetic resources of areas beyond national jurisdiction are in the interests of all States and for the benefit of all humanity, particularly for the benefit of advancing the scientific knowledge of humanity and promoting the conservation and sustainable use of marine biological diversity, taking into particular consideration the interests and needs of developing States.[155]

Finally, BBNJ Parties' obligation to develop a resource mobilisation goal, based on the 'information provided through the capacity-building and transfer of marine technology committee'[156] should consider prioritising regional SEAs co-designed by Global North and Global South actors that provide benefits for all parts of the Agreement with an emphasis on the ocean-climate nexus. This could be considered a practical application of the argument made elsewhere on the basis of international human rights law about the need to collectively identify the greatest need for progress in ocean science to support basic economic, social and cultural rights, taking into account ecological connectivity between areas within and beyond national jurisdiction, as well as our evolving understanding of the ecosystem services provided by BBNJ.[157]

Conclusion

The current state of ocean science and our understanding of inequities in international scientific cooperation indicate that we still have insufficient knowledge, which is unequally distributed, on some of the most fundamental aspects of marine biodiversity. Such knowledge is essential to fulfil the general obligations under the LOSC to protect the marine environment, including through the prevention and control of pollution so as to protect 'rare or fragile ecosystems, as well as the habitat of depleted, threatened or endangered species and other forms of marine life' and through assessments of 'significant and harmful changes to the marine environment'.[158]

155 *Ibid.*, Article 11(6).
156 *Ibid.*, Article 52(11).
157 Morgera (n 2).
158 LOSC (n 10), Articles 192, 194, 206.

Even if the LOSC foresaw the need to fill knowledge gaps and address equity issues through its provisions on scientific cooperation, capacity-building and technology transfer to developing countries,[159] it is evident that there has not been sufficient implementation of these provisions 40 years later.[160] So far, the capacity-building efforts that have been put in place have been insufficient,[161] which explains the limited effectiveness of the Convention in protecting the marine environment, particularly at the ocean-climate nexus.

The effective implementation of all these long-standing international obligations has become even more of a matter of urgency in the face of climate change. Increasingly we understand that the ocean plays a crucial role in delivering climate change mitigation and facilitating the presence of other ecological processes and services (food, health, culture, recreation, social and environmental innovation) across large spatial and temporal scales that benefits not just specific groups of people, but global society. This growing knowledge is essential for effective protection of the marine environment and climate change mitigation, including in marine areas within national jurisdiction, due to the ocean's ecological connectivity.

The BBNJ Agreement includes innovative international obligations on SEAs, particularly the COP-mandated regional SEAs, that can both advance ocean knowledge and equity in international scientific cooperation to the benefit of the broader protection of the marine environment and climate change mitigation. The BBNJ Agreement has not included any textual reference to the need to shift away from the LOSC assumptions of capacity-building and technology transfer as an inevitably one-way flow from the Global North to the Global South. For instance, the BBNJ Agreement could have referred to 'technology co-development', in addition to technology transfer, to that end.[162] But the BBNJ Agreement can still support a shift towards a more equitable model of mutual capacity-building and technology co-development.[163] Specifically, researchers in the Global South have been less able to negotiate approaches

159 Morgera (n 2).

160 UN Division for Ocean Affairs and the Law of the Sea, *The Second World Ocean Assessment* (2021) available at https://www.un.org/regularprocess/woa2.

161 H Harden-Davies *et al.*, 'Science collaboration for capacity building: Advancing technology transfer through a treaty for biodiversity beyond national jurisdiction' (2020) 7 *Frontiers in Marine Science* 40.

162 Note that such terminology is currently being considered under the World Health Organization's draft pandemic prevention, preparedness and response treaty (WHO CA+) at Article 9(2) and Option 6(c).X of Option 12.B. WHO, Draft Bureau's text of the WHO CA+, WHO Doc A/INB/X/X (22 May 2023) available at https://add8e83f-e0bf-4013-9ce0-9c1db8195ce2.usrfiles.com/ugd/add8e8_685117e9dea14adaa9580935d0ddc55f.pdf.

163 McQuaid *et al.* (n 101).

and deliverables that are beneficial to them due to their limited field experience and other exposure to deep-sea research, limited resources for expensive and state-of-the-art equipment, lack of representation in relevant bodies and committees, as well as limited experience in administering and managing large international research budgets.[164]

The Agreement must be interpreted and implemented in a way that nurtures a new global practice of fair co-production of ocean science, particularly at the ocean-climate nexus, to the benefit of marine environmental protection within and outside national jurisdiction. These opportunities can be realised through co-designed and co-developed regional research programmes that systematically tackle inequities in this area and contribute to the integrated implementation of the whole BBNJ Agreement, as well as the realisation of multiple international law objectives (law of the sea, climate change, biodiversity, human rights) and the Sustainable Development Goals.

This interpretation also finds resonance with the internationally protected human right to science (the right of everyone to benefit from scientific advancements).[165] This right entails (i) ensuring access to those applications of scientific progress that are critical to the enjoyment of the right to health and other economic, social and cultural rights; and (ii) prioritising allocation of public resources to research in areas where there is the greatest need for scientific progress in health, food and other basic needs related to economic, social and cultural rights, and the well-being of the population, especially with regard to vulnerable and marginalised groups.[166] The lens of the right to science thus puts into sharp contrast the fact that the LOSC and BBNJ Agreement obligations related to scientific cooperation, capacity-building and technology transfer, which are often seen in purely inter-State terms, have human rights implications.[167] Thus, while Global North States often interpret these kinds of obligations in terms of almost unfettered discretion, their implementation options are limited by the need to comply with relevant international human rights law.[168]

164 Sink *et al.* (n 91).

165 UNGA Res 217/A (III) (10 December 1948), Universal Declaration of Human Rights, UN Doc A/810, Article 27.

166 Committee on Economic, Social and Cultural Rights, General Comment No. 25 (2020) on Science and Economic, Social and Cultural Rights (arts 15(1)(b), (2), (3) and (4) of the International Covenant on Economic, Social and Cultural Rights), UN Doc E/C.12/GC/25 (30 April 2020), para 52.

167 Morgera (n 2), at p. 251.

168 For an initial discussion see E Morgera, 'Fair and equitable benefit-sharing at the crossroads of the human right to science and international biodiversity law' (2015) 4 *Laws* 803.

The human right to science in effect clarifies that equity issues in ocean research are a matter of international human rights law. Therefore, States Parties to relevant international human rights treaties have specific obligations to prevent negative impacts on human rights arising from these power asymmetries in implementing the BBNJ Agreement. This in turn helps to clarify how to ensure that all States comply with their obligations to protect their communities from the negative human rights impacts arising from reasonably foreseeable threats and life-threatening situations. These include climate change-induced alterations to marine ecosystems on which livelihoods, health and culture are dependent, particularly when alternatives are lacking, such as on small islands.[169] This interpretation, therefore, supports the consideration of food security, health, other socioeconomic objectives and the protection of cultural values that the BBNJ Agreement innovatively introduces in the law of the sea.[170] In other words, the human rights lens supports the visioning of imagined futures in ABNJ as a useful way to inspire action at the science-policy interface.[171] The proposed focus on SEAs and regional SEAs, and their role for fair research partnerships, to the benefit of the implementation of all parts of the BBNJ Agreement can arguably support a collective identification of priorities in ocean science and management. Such identification needs to take into account ecological connectivity between areas within and beyond national jurisdiction, as well as our evolving understanding of the ecosystem services provided by BBNJ that are essential for ocean-dependent human rights-holders.[172]

In conclusion, the BBNJ Agreement should be interpreted and implemented so as to fill these knowledge and capacity gaps. This will enhance the opportunities of countries in the Global South to influence the further development of the law of the sea[173] and the direction of international cooperation on BBNJ. It will also enhance the protection of their ocean-dependent communities' human rights to food, livelihoods and culture that may be affected by ecological connectivity with ABNJ.[174]

169 UN Human Rights Committee, Views adopted by the Committee under Article 5(4) of the Optional Protocol, concerning Communication No. 3624/2019, UN Doc CCPR/C/135/D/3624/2019 (22 September 2022).

170 BBNJ Agreement (n 8), Article 39.

171 L Pereira, 'The living infinite: Envisioning futures for transformed human-nature relationships on the high seas' (2023) 153 *Marine Policy* 105644.

172 Morgera (n 2), at pp. 273–274.

173 LOSC (n 10), Article 238; see also Matz-Lück (n 47), at p. 1609.

174 Morgera (n 2), at p. 271.