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Fair and equitable benefit-sharing in a new treaty on marine biodiversity: A principled approach towards partnership building?

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Fair and equitable benefit-sharing in a new international instrument on marine biodiversity: A principled approach towards partnership building?

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For more than ten years,[1] negotiators in New York have been debating the need for a new international instrument[2] to ensure benefit-sharing from the use of marine genetic resources of areas beyond national jurisdiction. The genetic material of marine sponges, krill, corals, seaweeds and bacteria in remote areas of the oceans possesses unique characteristics that may lead to significant innovations in the pharmaceutical, food and renewables sectors, among others.[3] But only a handful of countries, and very few companies within them,[4] have been able to file patents related to marine genetic resources,[5] while the vast majority of developing countries are not part of these bioprospecting efforts and are greatly underrepresented in marine taxonomic research.[6] There is still little evidence, however, of patents or products being specifically or exclusively based on marine genetic resources of areas beyond national jurisdiction, as opposed to resources of other marine areas.[7]

From a policy perspective, divergence remains[8] among States whether the freedoms of the high seas, the common heritage regime of the Area, or a hybrid should apply to marine genetic resources under a new international legally binding instrument on marine biodiversity of areas beyond national jurisdiction (BBNJ).[9] This article will not engage with this question as such, but rather focus on how

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1 UN General Assembly (UNGA) Resolution 59/24 of 2005, 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 at http://www.un.org/Depts/los/biodiversityworkinggroup/biodiversityworkinggroup.htm and *Earth Negotiations Bulletin* (ENB) reports at http://enb.iisd.org/oceans/marinebiodiv9/. See also 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.

2 While the mandate of the negotiations refers to an "international legally binding instrument" (UNGA Res 72/249 of 2017), it is expected that it will take a treaty form and serve as an implementing agreement to UNCLOS: E Morgera et al, 'Summary of the Fourth Session of the Preparatory Committee on Marine Biodiversity of Areas beyond National Jurisdiction' (2017) 25:141 *Earth Negotiations Bulletin* (ENB) at 5. All ENBs cited in this article can be found at http://enb.iisd.org.

3 P Oldham et al, *Valuing the Deep: Marine Genetic Resources in Areas Beyond National Jurisdiction* (Defra, London, 2014); and D Leary et al, 'Marine Genetic Resources: A Review of Scientific and Commercial Interest' (2009) 33 *Marine Policy* 183.

4 A 'single corporation registered 47% of all marine sequences including in gene patents, exceeding the combined share of 220 other companies (37%)': R Blasiak et al, 'Corporate Control and Global Governance of Marine Genetic Resources' (2018) *Science Advances*.

5 Only 10 countries account for 90% of patents related to marine genetic resources (the US, Japan, certain EU countries, Switzerland and Norway): S Arnaud-Haond, J Arrieta and C Duarte, 'Marine Biodiversity and Gene Patents' (2011) 331 *Science* 1521.

6 A Broggiato et al '*Mare Geneticum*: Balancing Governance of Marine Genetic Resources in International Waters' (2018) 33 *International Journal of Marine and Coastal Law* 3, at 15-16, referring to K Juniper, 'Use of Marine Genetic Resources' in M Banks, C Bissada and PE Araghi (eds), *The First Global Integrated Marine Assessment World Ocean Assessment I* (UN, 2016), at 7-8, and IE Hendriks and CM Duarte, 'Allocation of Effort and Imbalances in Biodiversity Research' (2008) 360 *Journal of Experimental Marine Biology and Ecology* 15, at 17.

7 Broggiato et al (n 6), at 12-13 and 23.

8 Report of the Preparatory Committee established by General Assembly Resolution 69/292 (2017) UN Doc A/AC.287/2017/PC.4/2.

9 There is abundant research on the question of how to "fit" marine genetic resources in the context of the different regimes beyond national jurisdiction established by the UN Convention on the Law of the Sea: eg D Tladi, 'Conservation and Sustainable Use of Marine Biodiversity in Areas beyond National Jurisdiction: Towards an Implementing

to ensure benefit-sharing from the use of these resources. The mandate of the BBNJ negotiations has invariably referred to benefit-sharing, without entering into the merit of whether this is a concept attached to one regime or both under the UN Convention on the Law of the Sea (UNCLOS).[10] This is not only an *escamotage* to avoid a principled question that has marred this international debate from the start. Rather, it arguably reflects the evolution of this legal concept in international law. Benefit-sharing was initially seen as part and parcel of the common heritage regime within the conceptual landscape of the New International Economic Order.[11] Actually, benefit-sharing was perceived as the most controversial element of common heritage, and was allegedly the reason why common heritage was not developed in other areas of international law.[12] Benefit-sharing has, however, become increasingly a self-standing obligation in international biodiversity law[13] that is capable of fitting into different regimes for natural resources (both within and beyond national jurisdiction).[14] On this basis, this paper argues that a reflection on benefit-sharing can be entertained independently of the legal status of marine genetic resources of areas beyond national jurisdiction,[15] and could serve to make progress in developing a hybrid approach to the matter[16] based on an evolutive and systemic interpretation of the law of the sea.

The article will first reflect on the terms in which benefit-sharing has been discussed in the BBNJ negotiations until now, which have been characterized by an operational concern for the type of benefits that could be accrued and distributed. It will then contrast the negotiations with insights

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Agreement' in R Rayfuse (ed), *Research Handbook of International Marine Environmental Law* (EE, 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 *The International Journal of Marine and Coastal Law* 221; DK Leary, 'Bioprospecting and the Genetic Resources of Hydrothermal Vents on the High Seas: What is the Existing Legal Position, where are we Heading and what are our Options' (2004) 17 *Macquarie J. Int'l & Comp. Envtl. L.* 137; N Morris-Sharma, 'Marine Genetic Resources in Areas beyond National Jurisdiction: Issues with, in and outside of UNCLOS' (2017) 20 *Max Planck Yearbook of United Nations Law* 71; D Tladi, 'Genetic Resources, Benefit-sharing and the Law of the Sea: The Need for Clarity' (2007) 13 *Journal of International Maritime Law* 183; and N Morris-Sharma, 'Marine Genetic Resources in Areas beyond National Jurisdiction: Issues with, in and outside of UNCLOS' (2017) 20 *Max Planck Yearbook of United Nations Law Online* 71.

[10] 2011 mandate (UNGA Res 66/231 of 2012); reiterated in the mandate of the Preparatory Committee (PrepCom) established by General Assembly Res 69/292 of 2015 "Development of an international legally binding instrument 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" and the Intergovernmental Conference (UNGA Res 72/249 of 2017). United Nations Convention on the Law of the Sea (UNCLOS) 1982, 21 ILM 1261.

[11] J Noyes, 'The Common Heritage of Mankind: Past, Present and Future' (2011) 40 *Denver Journal of International Law & Policy* 447, at 451 and 469-70.

[12] In addition to deep-seabed mining, common heritage has only been used in relation to the Moon in a treaty that did not enter into force: eg S Shackelford, 'The Tragedy of the Common Heritage of Mankind' (2009) 28 *Stanford Environmental Law Journal* 109, at 128; Noyes (n 10), at 451 and 469-470; J Frakes, 'The Common Heritage of Mankind Principle and the Deep Seabed, Outer Space, and Antarctica: Will Developed And Developing Nations Reach a Compromise?' (2003) 21 *Wisconsin International Law Journal* 409, at 417.

[13] Convention on Biological Diversity (CBD) 1992, 1760 UNTS 79 (CBD), Art 1; International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) 2001, 2400 UNTS 303, Art. 1. E Morgera, 'The Need for an International Legal Concept of Fair and Equitable Benefit-sharing' (2016) 27 *European Journal of International Law* 353.

[14] *Contra* K Baslar, *The Concept of the Common Heritage of Mankind in International Law* (Martinus Nijhoff, 1998), who instead suggested that common heritage as such should be applied to other natural resources of different international legal status as a functional rather than territorial concept.

[15] A similar argument is put forward by D Leary, 'Moving the Marine Genetic Resources Debate Forward: Some Reflections' (2012) 27 *International Journal of Marine and Coastal Law* 435, at 438; Broggiato et al (n 6); and by H He, 'Limitations to Patenting Inventions Based on Marine Genetic Resources of Areas Beyond National Jurisdiction' (2014) 29 *International Journal of Marine and Coastal Law* 521, at 525-526.

[16] Note the words of caution in AM Hubert and N Craik, Towards Normative Coherence in the International Law of the Sea for the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction, JCLOS Blog (2018) at http://site.uit.no/jclos/2018/02/01/towards-normative-coherence-in-the-international-law-of-the-sea-for-the-conservation-and-sustainable-use-of-marine-biological-diversity-of-areas-beyond-national-jurisdiction/.

arising from other international benefit-sharing regimes, with a view to suggesting a more principled approach focused on "sharing" benefits "fairly and equitably." This will help highlight the potential value added of benefit-sharing to foster deeper and cosmopolitan international cooperation[17] (that is, a global partnership[18]) vis-à-vis existing UNCLOS obligations on marine scientific research, capacity building, technology transfer and environmental protection. The article will then apply these considerations to the thorny and novel question of digital information on marine genetic resources of areas beyond national jurisdiction.[19]

1. The current operational focus on benefits

The BBNJ discussions on benefit-sharing have mainly focused on the nature and type of benefits to be distributed, along with linked questions on the material scope of a new instrument, and the need for a global mechanism and for control of access to marine genetic resources. With regard to the scope, the main concern surrounded the question of excluding fish used as a commodity, as opposed to that used for research and development purposes and possibly also for non-commercial research (such as research necessary for fisheries conservation and sustainable use). A proposal in this regard was put forward about developing a scientific threshold to distinguish fish used as a commodity from fish used by bioprospectors, by defining a certain quantity, depending on species and habitat variability, above which fish would be presumed to be caught as a commodity.[20]

Another question that remains very divisive is whether a new treaty should regulate, or otherwise address, access to marine genetic resources.[21] International regulation or control of access to resources is probably the most controversial implication of the proposal to extend the common heritage regime of the Area to marine genetic resources. Lighter-touch proposals have also emerged. Some have suggested, for instance, requiring researchers' prior notifications of intended access to a centralized database, to ensure information-sharing on bioprospecting efforts and monitoring of subsequent use of genetic resources.[22] Access would thus not be made conditional upon obtaining an

[17] Morgera (n 13) at 363-364.
[18] Inspired by international solidarity and the Rio Declaration on Environment and Development. For a critical view of Sustainable Development Goal 17 on global partnerships from this perspective, see N Cooper and D French, 'SDG 17: Partnerships for the Goals - Cooperation within the Context of a Voluntarist Framework' in D French and L Kotzé (eds) *Sustainable Development Goals: Law, Theory and Implementation* (Edward Elgar, 2018) 271.
[19] The article acknowledges, but does not address, the crucial role played by intellectual property rights (IPRs), with a view to complementing the well-documented debate on other legal issues: E Heafey, 'Access and Benefit Sharing of Marine Genetic Resources from Areas beyond National Jurisdiction: Intellectual Property--Friend, not Foe' (2014) 14 *Chicago Journal of International Law*; C Correa, 'Access to and Benefit-sharing of Marine Genetic Resources beyond National Jurisdiction: Developing a New Legally Binding Instrument' in C McManis and B Ong (eds), *Routledge Handbook of Biodiversity and the Law* (Routledge 2017); C Chiarolla, 'The Work of the World Intellectual Property Organization and Its Possible Relevance for Global Ocean Governance' (SSRN, 2016); A Jorem and MW Tvedt, 'Bioprospecting in the High Seas: Existing Rights and Obligations in View of a New Legal Regime for Marine Areas beyond National Jurisdiction' (2014) 29 *International Journal of Marine and Coastal Law* 321; A Bonfanti and S Trevisanut, 'TIRPS on the High Seas: Intellectual Property Rights on Marine Genetic Resources' (2011–2012) 37 *Brook. J. Int'l L.* 187; and C Salpin and V Germani, 'Patenting of Research Results related to Genetic Resources from Areas beyond National Jurisdiction: The Crossroads of the Law of the Sea and Intellectual Property Law' (2007) 16 *Review of European Community and International Environmental Law* 12.
[20] Chair's streamlined non-paper on elements of a draft text of an international legally-binding instrument 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 (Chair's streamlined paper), 2017, http://www.un.org/depts/los/biodiversity/prepcom_files/Chairs_streamlined_non-paper_to_delegations.pdf, at 14.
[21] E Morgera, et al, Summary of the 4th Session of the Preparatory Committee Established by the UN General Assembly Resolution 69/292: Development of an International Legally Binding Instrument 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: 10-21 July 2017, 25(141) *Earth Negotiations Bulletin* (ENB PrepCom 4).
[22] Broggiato et al (n 6) at 8 and 17-21.

international permit or necessarily following a prior environmental impact assessment.[23] This obligation could be accompanied by the issuance of "passports" or an internationally recognized certificate of compliance,[24] to ensure traceability of successive uses and users. Benefit-sharing was then linked to access, based on the idea that different pre-conditions could be set for access for different actors or thresholds, including requirements to provide capacity building and technology transfer for the analysis and use of marine genetic resources.[25] Among the possible conditions, one was identified as an upfront monetary contribution by upstream researchers into a global benefit-sharing fund as a mandatory advance payment, or as a voluntary payment to ensure exclusive access to certain marine genetic resources.[26] Another (additional or alternative) option was for upstream researchers to ensure facilitated access to marine genetic resource samples and research findings, on the basis of existing UNCLOS obligations on marine scientific research.[27] The sharing of samples has allegedly the potential to minimize the need for re-sampling, thereby preventing unsustainable harvesting.[28] As the value of genetic resources is not clear at the time of access, payments by operators further down the R&D chain were also considered. It was proposed requesting additional monetary benefit-sharing upon commercialization of products derived from marine genetic resources, and use "earn-out provisions" for triggering earlier payments at certain non-financial and financial milestones.[29]

The vast majority of the proposals have thus focused on various types and triggers of benefits. Convergence was only found on the need for the new instrument to address non-monetary benefit-sharing, however.[30] Divergent views surrounded the question of whether monetary benefit-sharing should also be specifically provided for and whether an international benefit-sharing "mechanism" would be needed to that end.[31] Opposition to monetary benefit-sharing was based on the fact that there already exist functioning centres and databases for documenting and sharing biological and genetic data, which arguably already provide for non-monetary benefit-sharing in the form of information-sharing.[32] A new instrument could thus contribute to make this a more systematic practice. Limited capacity of different countries to access and make use of the information contained in databases, as well as intellectual property protection of databases themselves, however, have not been adequately discussed.[33] The need to ensure inter-operability across databases through

[23] T Greiber, 'Common Pools for Marine Genetic Resources: A Possible Instrument for a Future Multilateral Agreement addressing Marine Biodiversity in Areas beyond National Jurisdiction', in EC Kamau and G Winter (eds), *Common Pools of Genetic Resources: Equity and Innovation in International Biodiversity Law* (Routledge, 2013), 399, at 409.
[24] Similar to that under the Nagoya Protocol Article 17(3-4); see ENB PrepCom 4 (n 19).
[25] ENB PrepCom 4 (n 21).
[26] Broggiato et al (n 6) at 28-29.
[27] Chair's streamlined paper (n 20) 15-16 and ENB PrepCom4 (n 19).
[28] Greiber (n 23), at 409.
[29] ENB PrepCom 4 (n 20). On other possible triggers, see M Tvedt and A Jorem, 'Bioprospecting in the High Seas: Regulatory Options for Benefit Sharing' (2013) 16(3-4) *Journal of World Intellectual Property* 150, at 154.
[30] Chair's overview of the second session of the Preparatory Committee, http://www.un.org/depts/los/biodiversity/prepcom_files/Prep_Com_II_Chair_overview_to_MS.pdf, 2016. See also discussion in Tvedt and Jorem (n 27), at 152-155.
[31] E Morgera and al, Summary of 3rd Session of the Preparatory Committee Established by the UN General Assembly Resolution 69/292 "Development of an International Legally Binding Instrument 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: 27 March - 7 April 2017", 25 (129) ENB (ENB PrepCom3).
[32] Eg H Harden-Davies, 'Deep-sea Genetic Resources: New Frontiers for Science and Stewardship in Areas beyond National Jurisdiction' (2017) 137 *Deep-Sea Research Part II* 504.
[33] C Chiarolla, 'Intellectual Property Rights and Benefit Sharing from Marine Genetic Resources in Areas beyond National Jurisdiction: Current Discussions and Regulatory Options' (2014) 4 *Queen Mary Journal of Intellectual Property* 171, at 183-184.

standardization of collection, storage and benefit-sharing practices[34] and to deploy a 'coordinating tracking system'[35] has also been underscored. Others raised the concern that the immediate provision of samples and information may act as a disincentive for scientists,[36] presumably on the understanding that it takes time to determine the potential value of genetic resources and other scientists may be able to determine it without taking the risks and bearing the costs of bioprospecting in areas beyond national jurisdiction.

Many delegations appear to share the view that non-monetary benefit-sharing may be more immediate and predictable, as well as more significant in development terms, than monetary benefit-sharing. In effect, it has been argued, with reference to other international regimes, that non-monetary benefit-sharing helps respond to endogenously identified needs through capacity-building that effectively bridges equity gaps in R&D.[37] But the insistence on an exclusively non-monetary approach raised suspicion that it would merely encompass existing good scientific practices, and not change the current *ad hoc* approach that has not sufficed to fully implement existing obligations on capacity building, technology transfer and marine scientific cooperation.[38] As a developed country group cautioned, non-monetary benefit-sharing could amount to relying on existing UNCLOS provisions embodying generic obligations to make research findings available through publication and dissemination, and promote data and information flows,[39] which are largely non-implemented. Some developing country delegations cautioned against making funding for capacity building and technology transfer conditional on access and use.[40] Furthermore, what has become increasingly clear in the negotiations is the understanding that monetary/non-monetary is a false dichotomy, because non-monetary benefits have costs and economic value.[41] For instance, sharing raw data on marine genetic resources as an open access resource still requires the development of adequate infrastructure and curation; training has costs related to trainees' travel, precious space/resources on expensive scientific research vessels, trainers' time, and scholarships; and the sharing of best practices requires analysis and effective delivery of information.

2. A principled approach to benefit-sharing and its value added

What has lacked in the BBNJ negotiations, and admittedly is often missing as an explicit consideration in other intergovernmental processes on benefit-sharing, is a more principled exchange on what it means "to share" benefits and when such sharing is "fair and equitable." As discussed below, benefit-sharing is a treaty objective, an obligation and a mechanism under international biodiversity law. It is also a component of the human right to science,[42] which is relevant to the BBNJ negotiations, as well as to international biodiversity law.[43] While the status of benefit-sharing in international law remains a matter of speculation, it can be argued that it is emerging as a general

[34] H Harden-Davies H, 'Marine Science and Technology Transfer: Can the Intergovernmental Oceanographic Commission Advance Governance of Biodiversity beyond National Jurisdiction?' (2016) 74 *Marine Policy* 260, at 261.
[35] Broggiato et al (n 6) at 32.
[36] ENB PrepCom 4 (n 21).
[37] This has been considered, for instance, the principal success of the ITPGRFA: E Tsioumani, 'Beyond Access and Benefit-sharing: Lessons from the Emergence and Application of the Principle of Fair and Equitable Benefit-sharing in Agrobiodiversity Governance" in Girard F and Frison C (eds), *The Commons, Plant Breeding and Agricultural Biotechnologies: Challenges for Food Security and Agrobiodiversity* (Routledge, 2018), 41, at 53.
[38] Report of the work of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea at its 11th Meeting' (2010) UN Doc A/65/164, paras 28 and 57
[39] Chair's streamlined paper (n 21), p 17-19.
[40] ENB PrepCom 3 (n 31).
[41] Ibid.
[42] Universal Declaration of Human Rights (1948) UN Doc A/810 at 71, Article 27.
[43] E Morgera, 'Fair and Equitable Benefit-sharing at the Crossroads of the Human Right to Science and International Biodiversity Law' (2015) 4 *Laws* 803.

principle of international law,[44] as a sub-set of the general principle of equity,[45] as it transcends particular treaty regimes as the manifestation of consensus among developed and developing countries[46] on 'the evolution of a new balance of rights and duties in many fields of international law' 'in a world deeply divided by conflicting ideologies as well as conflicting interests'.[47]

It has been argued elsewhere, that benefit-sharing, as a sub-set of the general principle of equity, is "open-textured and evolutionary" and "may be filled with content by establishing a linkage with different international legal sub-systems."[48] A principled approach can thus build not only upon the experience of other international benefit-sharing agreements related to genetic resources, but also on the objectives and standards of other areas of international law. The BBNJ negotiations have, of course, already identified the relevance of international biodiversity law for developing a new instrument, although, as will be discussed below, mainly form an operational rather than principled perspective. In addition, it is argued here that international human rights law[49] also provides insights and standards for filling with content benefit-sharing obligations under a new instrument on BBNJ.

This is notably the case of the human right to science. It was proclaimed in the Universal Declaration of Human Rights[50] and has been enshrined in several treaties, including the International Covenant on Economic, Social and Cultural Rights,[51] so its legally binding force is not under discussion.[52] It is seen as an autonomous right that is worthy of protection for its contribution to the continuous raising of the material and spiritual standards of living of all members of society, both for individual emancipation and collective economic and social progress.[53] As such, it may contribute to the enjoyment of other human rights such as the rights to food and health,[54] and therefore significant for the realization of SDGs 2 (hunger) and 3 (health and well-being). In addition, the right to science contributes to "[protecting] and [enabling] each person to develop his or her capacities for education and learning, to form enduring relationships with others, to take equal part in political, social and

[44] E Morgera, 'Fair and Equitable Benefit-sharing' in L Kramer and E Orlando (eds), *Principles of Environmental Law* (Edward Elgar, 2018) 323, at 332-334.
[45] F Francioni, 'Equity' in R Wolfrum (ed.), *Max Planck Encyclopedia of Public International Law* (OUP, 2010; online edition).
[46] R Wolfrum 'General International Law (Principles, Rules and Standards)' in Wolfrum (n 45) paras 28 and 33–36.
[47] W Friedmann, 'The Use of "General Principles" in the Development of International Law' (1963) 57 *American Journal of International Law* 279, at 287 and 289–290.
[48] Morgera (n 13) at 381-382.
[49] As the 2018 UN Framework Principles on Human Rights and the Environment underline, States should respect, protect and fulfil human rights in the actions they take to address environmental challenges and pursue sustainable development (Principle 16): Report of the UN Special Rapporteur on Human Rights and the Environment: Framework Principles on Human Rights and the Environment (2018) UN Doc. A/HRC/37/59.
[50] On the broad consensus regarding the inclusion of the human right to science in the Universal Declaration of Human Rights, see: A Schabas, 'Study of the Right to Enjoy the Benefits of Scientific and Technological Progress and its Applications' in Y Donders and V Volodin (eds.), *Human Rights in Education, Science and Culture: Legal Developments and Challenges* (Ashgate, 2007).
[51] International Covenant on Economic, Social and Cultural Rights, 6 ILM 360 (1967), Article 15. See also: Charter of the Organization of American States (1948) 119 U.N.T.S. 3, Article 38; American Declaration on the Rights and Duties of Man (1948) O.A.S. Res. XXX, Article XIII; Additional Protocol to the American Convention on Human Rights in the Area of Economic, Social and Cultural Rights, 28 ILM 156 (1989), Article 14; and Arab Charter on Human Rights (2004), reprinted in *International Human Rights Reports* 893 (2005), Article 42.
[52] M Mancisidor, 'Is There such a Thing as a Human Right to Science in International Law?' (2015) 4(1) *European Society of International Law* (blog series).
[53] A Plomer, *Patents, Human Rights and Access to Science* (Edward Elgar, 2015).
[54] Schabas (n 50); Manchisidor (n 52); and A Chapman, 'Towards an Understanding of The right to Enjoy the Benefits of Scientific Progress and its Applications' (2009) 8 *Journal of Human Rights* 1.

cultural life and to work without fear of discrimination."[55] It therefore contributes to the implementation of SDGs 4 (education), 8 (decent work) and 10 (inequality).[56]

In 2011, the UN Special Rapporteur on cultural rights Farida Shaheed suggested that the right to science encompasses four distinct elements: the right to share in the benefits of science for everyone without discrimination; the opportunity for all to contribute to scientific research; the obligation to protect all persons against negative consequences of scientific research or its applications on their food, health, security and environment; and the obligation to ensure that priorities for scientific research focus on key issues for the most vulnerable.[57] While the international law of the sea does not refer to human rights and is framed in terms of inter-State obligations, its provisions on scientific cooperation, technology transfer, capacity building and environmental protection can be read in light of the human right to science, as UNCLOS is a living instrument that is interpreted in light of other relevant international law developments.[58] Applying such an international human rights law lens would serve to highlight how limited implementation of these inter-State obligations negatively affects individuals and groups. In effect, recent efforts to conceptually clarify the human right to science have specifically pointed to inter-State technology transfer obligations,[59] arguably expressing a discontent about the current level of cooperation and implying that non-compliance with international environmental provisions on technology transfer is also a matter of international human rights law.[60] Thus, current efforts to clarify the content of the right to science provide useful insights also for BBNJ negotiations, which are expected to play a prominent role in advancing science.[61] And this in turn will be particularly relevant for the role of a new instrument in supporting the realization of the Sustainable Development Goals across scales. In other words, a human rights lens may provide a powerful analytic tool for deepening the understanding of the content of, and consequences of non-compliance with, international provisions on scientific cooperation, technology transfer capacity building and environmental protection, including vis-à-vis small-scale fishing communities and traditional knowledge holders.[62] The next two subsections will focus on how reliance on the the right to science helps fleshing out a principled approach to "sharing" benefits and to fairness and equity.

2.1 Why focusing on "sharing" benefits?

Legal scholars engaging with the right to science argued that "sharing" benefits is a key conceptual element to be clarified in this context. Mancisidor, who is currently leading the development of a general comment on the right to science, emphasized that the concept of "sharing" indicates agency.[63] The *traveaux preparatoires* of the Universal Declaration suggest that "sharing" conveys the idea that even if not everyone may play an active part in scientific advancements, all persons should indisputably be able to participate in the benefits derived from it.[64] In other words, beneficiaries should not be passive receivers of benefits, but active participants in discussions about the nature of benefits, their desirability/appropriateness, and their distribution modalities. While not explicitly referring to agency, other international sources have pointed to the linkage between benefit-sharing

[55] Plomer (n 53).
[56] E Morgera and M Ntona, 'Linking Small-Scale Fisheries to International Obligations on Marine Technology Transfer' (2018) 93 *Marine Policy* 295-306.
[57] Report of the Special Rapporteur in the field of cultural rights: the right to enjoy the benefits of scientific progress and its applications (2012) UN Doc A/HRC/20/26, paras 1, 25 and 30–43.
[58] Eg J Barret and R Barnes, *Law of the Sea: UNCLOS as a Living Treaty* (BIICL, 2016).
[59] Special Rapporteur in the field of cultural rights (n 57), paras 65–69.
[60] Morgera (n 43) at 818.
[61] G Wright et al, 'Protect the Neglected Half of our Blue Planet', *Nature*, 6 February 2018; J Harden-Davies, 'The Next Wave of Science Diplomacy: Marine Biodiversity beyond National Jurisdiction' (2018) 75 *ICES Journal of Marine Science* 426.
[62] See generally Morgera and Ntona (n 56).
[63] Mancisidor (n 52).
[64] Chapman (n 54) at 5–6.

and the right to self-determination of indigenous peoples,[65] or more generally to partnership building among different stakeholders.[66] On that basis, it has been argued that "sharing" implies a concerted, iterative dialogue aimed at finding common understanding in identifying and apportioning benefits to lay the foundation for a partnership among different actors in the context of power asymmetries,[67] and possibly different (world)views.[68] This relies on a consideration of a menu of benefits, the nature of which can be economic and non-economic, with a view to taking into account the beneficiaries' needs, values, and priorities through a contextual selection of the combination of benefits that may best serve to lay the foundation for a partnership.[69] In other words, benefit-sharing is not about the sharing of any benefits irrespective of the views of the beneficiaries. It should therefore not be understood in a mere logic of exchange, but rather as the identification of path towards a deeper form of cosmopolitan cooperation to realize relevant international objectives.[70]

But what difference would such a principled discussion make in the ongoing BBNJ negotiations? What value added would such understanding of benefit-sharing offer vis-à-vis existing UNCLOS obligations that already provide for non-monetary benefit-sharing, such as scientific cooperation, capacity building and technology transfer? A common trend seems to be emerging in other international benefit-sharing regimes that may provide an answer to these questions. Namely, a concerted and iterative dialogue can be arguably facilitated at the international level through a proactive and institutionalized multilateral approach to facilitate and broker, and possibly also oversee and identify gaps or issues in, an otherwise *ad hoc* flow of information-sharing, scientific cooperation and capacity-building activities.[71] One such example can be found in the context of guidelines on training programmes for operators used by the Secretariat of the International Seabed Authority (ISA). The guidelines act as a benchmark for assessing operators' exploration proposals. They specify that the training programme should be designed and carried out for the benefit of the trainee, the nominating country and ISA member states, with every attempt being made to follow best practice at all times and to contribute to the training and capacity development needs of the participants' country of origin. The guidelines also emphasize that the provision of training is no less important than any other activity included in the proposed plan of work and should be afforded the

[65] Special Rapporteur on the Rights of Indigenous Peoples, Report to the Human Rights Council (2009) UN Doc. A/HRC/12/34, para. 53; Rapporteur on Indigenous Peoples' Rights, Study on Extractive Industries and Indigenous Peoples (2013) UN Doc. A/HRC/24/41, paras 75–77, 88 and 92; UNPFII, Review of Developments Pertaining to the Promotion and Protection of Human Rights and Fundamental Freedoms of Indigenous Peoples (2001) UN Doc. E/CN.4/Sub.2/AC.4/2001/2, para. 19.

[66] On the intra-state dimension of benefit sharing, see, e.g., CBD, Mo'otz Kuxtal voluntary guidelines for the development of mechanisms, legislation or other appropriate initiatives to ensure the "prior informed consent", "free prior informed consent" or "approval and involvement", depending on national circumstances, of indigenous peoples and local communities for accessing their knowledge, innovations and practices, the fair and equitable sharing of benefits arising from the use and application of such knowledge, innovations and practices and for reporting and preventing unauthorized access to such knowledge, innovations and practices, CBD Decision XIII/18, para. 6 (2016), para 24; Review of Developments Pertaining to the Promotion and Protection of Human Rights and Fundamental Freedoms of Indigenous Peoples (2001) UN Doc. E/CN.4/Sub.2/AC.4/2001/2, para. 19. On the inter-state dimension, see, e.g., Report of the High-Level Task Force on the Implementation of the Right to Development on Its Second Meeting, UN Doc. E/CN.4/2005/WG.18/TF/3 (2005), para. 82.

[67] E.g., ECOSOC, Report of the high-level task force on the implementation of the right to development on its second meeting (UN Doc E/CN.4/2005/WG.18/TF/3, 8 December 2005), para. 82. For a discussion, Morgera (n 13) at 363-366.

[68] Morgera (n 13) at 363-366.

[69] Ibid.

[70] Ibid, at 364.

[71] E Morgera, 'Study on Experiences Gained with the Development and Implementation of the Nagoya Protocol and Other Multilateral Mechanisms and the Potential Relevance of Ongoing Work Undertaken by Other Processes, Including Case Studies' (2016) UN Doc UNEP/CBD/ABS/A10/EM/2016/1/2. This point is also made by Broggiato et al (n 6) at 24.

same priority in terms of time, effort and financing.[72] In addition, the guidelines assist in matching suitable candidates to training opportunities offered by contractors. The ISA Legal and Technical Commission agrees on a list of pre-approved candidates from the roster on the basis of transparent criteria and conducts regular reviews to ensure that the goal of equitable and geographic sharing of opportunities is followed.

Another example can be found under the International Treaty on Plant Genetic Resources for Food and Agriculture, which is developing a more institutionalized multilateral approach to support information-sharing and its links to capacity building. The development of a Global Information System (GLIS)[73] is under way with a view to integrating and augmenting existing information systems, by promoting and facilitating interoperability among them, and creating a mechanism to assess progress and monitor effectiveness. At the same time, the GLIS proactively identifies opportunities for all to contribute to scientific research, providing capacity development and technology transfer.[74] This shows the potential of more institutionalized approaches to ensure responsiveness to the needs of those benefitting from information-sharing, provide oversight of the distribution of benefits across different regions, and contribute to a more systematic encouragement of virtuous circles through capacity building.

Overall, this trend across international benefit-sharing regimes supports the proposal in the BBNJ negotiations for an international benefit-sharing mechanism, shedding light (as will be discussed below) on the possible roles of a clearinghouse. It also provides useful basis for assessing, by comparison, the potential role of the UNESCO Intergovernmental Oceanographic Commission under a new instrument on the basis of its existing and planned competencies and initiatives.[75]

A concerted and iterative dialogue through a proactive and institutionalized multilateral approach can also serve to identify and address any shortcomings in benefit-sharing that will emerge through implementation. This may be particularly useful with regard to monetary benefit-sharing, as the key lesson learn in other multilateral benefit-sharing instruments is that monetary benefits are very difficult to be accrued in practice. This is most notably the case of the ITPGRFA,[76] where government donations have been relied upon to operate the Benefit-sharing Fund, as a trigger for monetary benefit-sharing linked to patent-related access restrictions has 'proved to be ineffective.'[77] This is partly because of the uncertainties and length inherent in a bio-based R&D process and partly because of loopholes in the system (as genetic material is available outside of the system, in private-company genebanks or the collections of non-Parties).[78] To address the need to ensure the financial viability, ITPGRFA parties are thus considering an upfront regular payment of fees by users.[79] Another interesting example, already in operation, is provided by the WHO, which is implementing a system

[72] Recommendations for the guidance of contractors and sponsoring States relating to training programmes under plans of work for exploration, Document ISBA/19/LTC/14 (2013).
[73] ITPGR art. 17.
[74] ITPGRFA Resolution 3/2015.
[75] IOC-UNESCO 'IOC Potential Contribution to a New International Instrument under UNCLOS on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction' (2016) UN Doc IOC/INF-1338, 3-4. See also Harden-Davies (n 33) 74 *Marine Policy* 260; and Broggiato et al (n 6) at 31.
[76] The relevance of the ITPGRFA for the negotiations on marine biodiversity has been raised several times: P Drankier et al, 'Marine Genetic Resources in Areas beyond National Jurisdiction: Access and Benefit-Sharing' (2012) 27 *International Journal of Marine and Coastal Law* 375; see considerations by Leary (n 12) at 442-445 and E Tsioumani, 'Beyond Access and Benefit-Sharing: Lessons From the Law and Governance of Agricultural Biodiversity' (2018 forth) *Journal of World Intellectual Property Rights* 106.
[77] Chiarolla (n 33), at 186.
[78] E Tsioumani, 'Why Technicalities Matter – On the International Treaty on Plant Genetic Resources for Food and Agriculture and the Seventh Session of its Governing Body', BENELEX blog post, (March 2018). All BENELEX blog posts cited in this article can be found at https://benelexblog.wordpress.com.
[79] IT/GB-6/15/6 Add.1 and Rev.1 (2015).

of mandatory contributions (annual partnership contributions) to its benefit-sharing instrument related to pandemic influenza.[80] Each year the WHO issues a questionnaire that identifies potential contributors, such as companies and institutions that conduct research and development in the field of influenza and all recipients of pandemic influenza preparedness biological material recorded in the Influenza Virus Traceability Mechanism database.[81] This shows the potential of 'partnership contributions from commercial partners interested in accessing materials and metadata from institutions that belong to a public [marine genetic resources] research network.'[82]

Overall, a principled focus in the negotiations on "sharing" benefits can lead to a more systematic discussion about the objectives and functions of a benefit-sharing mechanism as an iterative partnership-building process for enhancing the implementation of UNCLOS and other relevant international law. This could serve to weigh different options to address the challenges that have characterized other international benefit-sharing instruments, such as the need to identify users that could become benefit-sharing trend-setters in their sector, the financial viability of both monetary and non-monetary benefit-sharing and in particular the challenges in linking monetary benefits to intellectual property rights with the result of restricting the use of materials that may provide other benefits to humanity.[83] Furthermore concerted and iterative dialogue through an institutionalized multilateral approach can serve to better understand the interactions between monetary and non-monetary benefits for building capacity, even where there may be institutional distinctions in the accruing and delivery of monetary and non-monetary benefits.[84]

2.2 Why focusing on fairness and equity?

Another key element of benefit-sharing that is often left undetermined in intergovernmental negotiations is equity.[85] Benefit sharing is invariably accompanied by the qualification 'equitable'[86] or 'fair and equitable'[87] in existing international treaties. The mandate of the BBNJ negotiations, however, was silent on whether benefit-sharing was linked to equity and fairness.[88] This section will first outline the different views of equity that have emerged in the BBNJ negotiations. It will then discuss the implications of addressing equity through a standardized contract and different ways to approach the distribution of benefits, with a view to identifying additional options arising from the application of the human right to science.

2.2.1 Different conceptions of equity

Under the BBNJ process, national delegations have expressed different conceptions of equity underlying the different jurisdictional regimes established by UNCLOS. Developing States have argued that the common heritage approach should be adapted to marine genetic resources, as both

[80] World Health Organization (WHO), Pandemic Influenza Preparedness Framework for the Sharing of Influenza Viruses and Access to Vaccines and Other Benefits, WHO Doc. WHA64.5, 24 May 2011, article 6(14)(3).
[81] http://www.who.int/influenza/pip/benefit_sharing/partnership_contribution/en/.
[82] Chiarolla (n 33), at 191, who also underscored the key differences between the WHO, ITPGRFA and BBNJ contexts at 184-191.
[83] Tsioumnai (n 76) at 116-117.
[84] E Tsioumani, 'Beyond Access and Benefit-Sharing: Lessons from the Law and Governance of Agricultural Biodiversity' BENELEX Working Paper n 9 (SSRN, 2016), at 28-29
[85] Francioni (n 45).
[86] UNCLOS, Art. 140; CBD, Art. 8(j).
[87] CBD Arts 1 and 15(7); ITPGRFA, Arts. 1, 10(2) and 11(1); the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from Their Utilization 2014, CBD Decision X/1 (2010) Annex I, Arts 1, 5.
[88] C Salpin, 'Marine Genetic Resources of Areas Beyond National Jurisdiction: Soul Searching and the Art of Balance' in E Morgera and K Kulovesi (eds), *Research Handbook on International Law and Natural Resources* (Edward Elgar, 2016) 411, at 428.

deep-seabed mining and deep-sea bioprospecting are activities that are only available to high-tech countries, thereby raising the same equity concerns than minerals in the Area: resources of areas beyond national jurisdiction should not be appropriated exclusively by technologically advanced States, but rather conserved and exploited only for the benefit of humankind, without discrimination. That is, control of these resources should be placed under an international institution to manage and regulate activities which must be conducted for peaceful purposes and lead to sharing revenues, as well as technology, research results and building-capacity opportunities (participation in scientific expeditions and follow-up research).[89] Some suggested that this role could be played by the International Seabed Authority itself.[90] Certain developed countries, however, have opposed this view of equity, underscoring that the high seas freedoms, as the default regime that applies in the absence of an explicit indication to the contrary in UNCLOS, supports a different equity perspective. According to that view, research and development on marine genetic resources in the deep seas is a highly costly and time-consuming endeavour with uncertain results, that when successful would benefit humanity in the form of scientific advancements contributing to global public health, food security and environmental protection. These countries have indicated openness to some form of non-monetary benefit-sharing, either through codes of conduct or the ad hoc sharing of data and research results, capacity building and scientific collaboration.[91]

While this divergence of views was not expected to be overcome during the preparatory phases of the BBNJ negotiations, some proposals were put forward about specific equity dimensions of a new instrument. One suggestion was to link "fair and equitable" benefit-sharing to UNCLOS preambular language on a "just and equitable international economic order which takes into account the interests and needs of [hu]mankind as a whole," as this was also the basis for UNCLOS benefit-sharing provisions in relation to outer continental shelf resources and deep-seabed mineral resources.[92] Another proposal was to create a review mechanism over time to assess fairness and equity in actual benefit-sharing arrangements under a new instrument.[93] The latter could be part of a global benefit-sharing mechanism supporting a concerted and iterative dialogue based on continuous learning.

From a theoretical perspective, it has been argued that the use of the two expressions 'fair and equitable' serves to make explicit both procedural dimensions of justice (fairness) that determine the legitimacy of certain courses of action, as well as substantive dimensions of justice (equity)[94] to balance competing rights and interests[95] to the benefit of all, not just to the advantage of the powerful.[96] References to fairness and equity in international law are thus understood as a mandate for the global community to engage in a dialogue to develop a common understanding[97] of what is understood as fair and equitable, including in light of other relevant areas of international law.[98] This can arguably help to discuss in an open and structured manner the respective merits of different legal

[89] UNCLOS Arts 137, 140 and 144.
[90] E Morgera, 'Summary of the Eight Meeting of the Working Group on Marine Biodiversity Beyond Areas of National Jurisdiction: 16-19 June 2014' (2014) ENB at 1; E Morgera et al, 'Summary of the Second Session of the Preparatory Committee on Marine Biodiversity Beyond Areas of National Jurisdiction: 26 August-9 September 2016' (2016) 25:118 ENB at 4.
[91] ENB PrepCom 4 (n 21) at 19; Salpin (n 88) at 412.
[92] M Lodge et al, 'Sharing and Preserving the Resources in the Deep Sea: Challenges for the International Seabed Authority' (2017) 32 *International Journal of Marine and Coastal Law* 427.
[93] ENB PrepCom 4 (n 21).
[94] R Klager, *Fair and Equitable Treatment in International Investment Law* (CUP, 2013), at 141–152 commenting on T Franck, *Fairness in International Law and Institutions* (OUP, 1995).
[95] C Burke, *An Equitable Framework for Humanitarian Intervention* (Hart, 2014), at 197–198.
[96] *Ibid*, at 250–251.
[97] Klager (n 94), at 144.
[98] The suggestion to draw on the evolution of fair and equitable treatment under international investment law: F Francioni, 'International Law for Biotechnology: Basic Principles', in F Francioni and T Scovazzi (eds), *Biotechnology and International Law* (Hart, 2006) 3, at 24.

options from different justice perspectives in developing a new international instrument.[99] Specific justice considerations can be drawn from the right to science, such as prioritizing 'simple and inexpensive technologies that can improve the life of marginalized populations' and the 'development of international collaborative models of research and development for the benefit of developing countries and their populations.'[100] In both cases, the preferences of intended beneficiaries and local contextual elements need to be assessed,[101] to prevent dependency on exogenous, ready-made solutions that may not fit particular circumstances or the exertion of undue influence.[102] The components of the right to science thus provide concrete pointers: non-discriminatory results, prioritization of the needs of the vulnerable, and protection against negative environmental and socio-economic consequences of scientific research.

2.2.2 Accruing benefits through standardized contracts

Defining legal choices in a new instrument on benefit-sharing, however, would not exhaust the space for dialogue on concrete fairness and equity dimensions. Although multilateral benefit-sharing is often conceived as an inter-State mechanism, all existing multilateral benefit-sharing mechanisms ultimately rely on standard contractual clauses to reach non-State actors that will ultimately be those producing benefits.[103] A standardized contractual approach in principle allows to distill intergovernmental consensus on certain conditions to achieve fairness and equity in the relationship with a private user, while making a clear and explicit connection with the public international law dimension of the benefit-sharing obligations under an international instrument.[104] To that end, such a contract can make reference to treaty objectives and international provisions as terms of reference for the interpretation of the contract,[105] to ensure uniform interpretation across jurisdictions where users may be based.

In addition, a standardized contract can address the risk of differing interpretations by national courts,[106] by opting for alternative dispute mechanisms. This can be done on the assumption that non-judicial means entail higher flexibility, simpler procedures and lower costs than national judicial ones.[107] Such an assumption, however, needs to be critically examined. In actual fact, alternative dispute resolution (particularly arbitration) may well be costlier than access to national courts, and can be less transparent as arbitral awards are usually confidential. In addition, arbitrators are likely to be more familiar with (and, therefore, more inclined to give weight to) commercial law than public international law dimensions of the dispute. From a private international law perspective, a principled

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[99] E Morgera, 'Justice, Equity and Benefit-Sharing Under the Nagoya Protocol to the Convention on Biological Diversity' (2015) *Italian Yearbook of International Law* 113. See also B Dauda et al, 'What Do the Various Principles of Justice Mean Within the Concept of Benefit Sharing?' (2016) 13 *Journal of Bioethical inquiry* 281.
[100] Special Rapporteur in the field of cultural rights (n 57), para 68.
[101] O De Schutter, 'The Right of Everyone to Enjoy the Benefits of Scientific Progress and the Right to Food: From Conflict to Complementarity' (2011) 33 *Human Rights Quarterly* 304, at 348.
[102] E Morgera, E Tsioumani and M Buck, *Unraveling the Nagoya Protocol: A Commentary on the Nagoya Protocol on Access and Benefit-sharing to the Convention on Biological Diversity* (Nijhoff Publishers, 2014), at 313 and 331.
[103] J Harrison, 'Who benefits from the exploitation of non-living resources on the seabed? Operationalizing the benefit-sharing provisions in the UN Convention on the Law of the Sea', BENELEX blog post, July 2015; and E Morgera, 'Multilateral benefit-sharing: whither from here?', BENELEX blog post, June 2016.
[104] E Morgera and L Gillies, 'Realizing the Objectives of Public International Environmental Law through Private Contracts: The Need for a Dialogue with Private International Law Scholars?' in D French, V Ruiz Abou-Nigm and K McCall Smith (eds), *Public and Private International Law: Strengthening Connections* (Hart, 2018) 175.
[105] C Chiarolla, 'Plant Patenting, Benefit Sharing and the Law Applicable to the Food and Agriculture Organisation Standard Material Transfer Agreement' (2008) 11 *Journal of World Intellectual Property* 1, observes 'The reference to "the objectives and the relevant provisions of the Treaty" (i.e. truly international standards) reflects the important public interest functions discharged by the SMTA.'
[106] Ibid.
[107] H Isozaki, 'Enforcement of ABS Agreements in User States' in Kamau and Winter (n 23), 439, 446.

objection can also be identified: arbitration essentially 'takes away from States altogether' their regulatory authority over the private law questions at hand,[108] and with that also the regulatory authority over the underlying public international law objectives.[109] There is, therefore, a risk in diverting disputes from courts, as public bodies may be better entrusted to pursue public objectives. The risk consists in exposing parties to power imbalances in the resolution of the dispute, and to potentially lower standards of justice than those presumably inherent in national courts.[110] In addition, even in the context of standardized contracts, complex legal questions arising from the interface of public and private international law in relation to access to justice as a human right[111] cannot be excluded and have only started to be mapped in legal scholarship.[112]

A principled discussion on fairness and equity under a new BBNJ instrument could thus address issues around interpretation in light of public international law objectives of standardized benefit-sharing contracts, as understanding of equity and fairness issues evolves among relevant parties. It could seek to find a balanced approach to confidentiality, legal certainty and access to remedies also in light of relevant international human rights standards and the different dimensions of the right to science in particular. A cautious and iterative multilateral dialogue on the use of contracts from a fairness and equity perspective is particularly important as research on the role of benefit-sharing contracts remains very limited.[113]

2.2.3 Distributing benefits through other multilateral approaches

Establishing more specific conditions for equity and fairness in benefit-sharing to a standardized contract does not exhaust the need for multilateral dialogue either. For one thing, these contracts are mainly concerned about accruing benefits from users, but may not necessarily address the question of the distribution of benefits. Along these lines, as complementary approaches to a standardized contract for benefit-sharing, the World Health Organization has developed a benchmark for equity in relation to the distribution of benefits based on the principles of public health risk and needs.[114] On this basis, a prioritization of beneficiary countries is carried out by the WHO's regional officers. The WHO Director General oversees the distribution of benefits, with the support of an advisory group (comprising a mix of internationally recognized policy makers, public health experts and technical experts) that monitors implementation and provides recommendations on the application of the fairness and equity criteria.[115] A similar model could be conceived under a new BBNJ instrument, on the basis of global assessments of risks for ocean health and needs to address them, and an involvement of regional seas conventions and relevant sectoral bodies in the identification of beneficiary countries.

A different approach for the distribution of benefits has been adopted instead under the International Treaty on Plant Genetic Resources for Food and Agriculture: a global Benefit-Sharing Fund channels benefits to particular activities in developing countries with a view to assisting particular communities and partner research institutions in producing global benefits (in terms of conservation and

[108] A Mills, 'Connecting Public and Private International Law' in French, Ruiz Abou-Nigm and McCall Smith (n 104) 13.
[109] Morgera and Gillies (n 104) at 189.
[110] L McGregor, 'Alternative Dispute Resolution and Human Rights: Developing a Rights-Based Approach through the ECHR' (2015) 26 *European Journal of International Law* 607, at 609.
[111] F Francioni (ed), *Access to Justice as a Human Right* (OUP, 2007).
[112] Morgera and Gillies (n 104) at 196-198.
[113] Tsioumani (n 84) at 29.
[114] PIP Framework, Art 6(1).
[115] PIP Framework, Art 7(1)-(2) and Annex 3, 2(1)(d).

sustainable use of biodiversity) as well as the livelihoods of concerned communities.[116] Equity and fairness are therefore addressed through specific eligibility and selection criteria to assess project proposals, which were adopted by the ITPGR Governing Body and applied by a panel of experts. This approach could serve to create links between international and local benefits, taking into account the local contributions to, and implications for, the realization of the SDGs in relation to traditional knowledge holders whose relevance have become increasingly clear in the BBNJ process.[117] It would also be in line with guidance under the Convention on Biological Diversity on integrating traditional knowledge in marine impact assessments and ecologically and biologically significant marine areas.[118] It could also chime with ongoing global scientific assessments such as those under the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.[119] At the same time, however, the competitive nature of a project-based approach may take insufficient account of the unequal capacities of different countries and actors.[120] To address some of these concerns, the ITPGR Secretariat has organized a series of workshops and a helpdesk function to assist applicants to prepare proposals.[121] Prioritizing and effectively supporting beneficiaries in an increasingly complex landscape of actors and different (public and private) interests remains an issue under the ITPGRFA and should be considered also in the context of the BBNJ process.[122]

A principled discussion of a benefit-sharing mechanism under a new BBNJ instrument could focus on fairness and equity criteria and approaches for distributing benefits in order to avoid discrimination and respond to the needs of the vulnerable, while preventing negative environmental and socio-economic consequences of scientific research. Such a discussion could focus on possible means to target both global and local benefits, as well as on opportunities to build on global and regional findings and institutions. The discussion could further reflect on ways to receive and assess proposals from local actors, and supporting new collaborative approaches and learning across scales.

3. Digital sequence information

The previous sections have made the case for a principled focus in the negotiations of a new BBNJ instrument on "sharing" benefits and on fairness and equity to lead to a more systematic discussion of the objectives and approaches of a benefit-sharing mechanism as an iterative partnership-building process for enhancing implementation of UNCLOS and other relevant international law. This could serve to learn from the lessons accrued in other international benefit-sharing instruments with regard to fairness and equity, including the trend to rely on more institutionalized multilateral approaches to assess progress and challenges, facilitate and broker, and ensure coherent implementation of multiple international obligations. Such a discussion could also focus, taking into account the human right to science, on how to distribute benefits in order to avoid discrimination and to respond to the needs of the vulnerable, in light of various international objectives (human rights standards, as well as multiple Sustainable Development Goals). And considering the connectivity of the ocean, a principled discussion on a benefit-sharing mechanism could consider opportunities to building on global and regional assessments, as well as receiving inputs from traditional knowledge holders and researchers,

[116] http://www.fao.org/plant-treaty/areas-of-work/benefit-sharing-fund/overview/en/.
[117] Note references to traditional knowledge under all the elements of a new treaty in Report of the Preparatory Committee established by General Assembly resolution 69/292 (2017) UN Doc A/AC.287/2017/PC.4/2.
[118] Morgera and Ntona (n 56) at 4.
[119] IPBES *Deliverable 1(c): Procedures, approaches and participatory processes for working with indigenous and local knowledge systems: https://www.ipbes.net/deliverables/1c-ilk*
[120] S Louafi, 'Reflections on the Resource Allocation Strategy of the Benefit Sharing Fund' (Swiss Federal Office for Agriculture, 2013).
[121] Morgera (n 103).
[122] Tsioumani (n 84) at 28-29.

with a view to supporting collaborative approaches and learning across scales to deliver global and local benefits.

All these considerations will now be related to one of the trickiest questions around benefit-sharing in a new BBNJ instrument – whether to subject to a future benefit-sharing regime also digital sequence information on marine genetic resources, rather than only the genetic resources themselves.[123] This is a question arising from bioinformatics, i.e. the application of computer science and information technology to expand the understanding of biological processes and to generate value in the genetic material without physical access to the biological sources where it was originally found.[124] The underlying North-South divergence of views on digital sequence information has emerged in various fora, including existing benefit-sharing mechanisms under the Convention on Biological Diversity (CBD) and ITPGRFA. On the one hand, developing countries argue that the prevailing or growing trend in bio-based research to rely on digital information may ultimately render physical access to the genetic resource unnecessary, thereby making the premise of current benefit-sharing regimes obsolete. Even if R&D based on physical access and on digital information will continue to co-exist in practice, exchange of digital sequence information would escape international benefit-sharing requirements, frustrating the objective of relevant treaties. Developed countries, on the other hand, argue that the scope of existing benefit-sharing instruments does not cover information, but only genetic resources in their physical form.[125] A counterargument offered by developing countries is that through sequencing and genetic manipulation in the lab, digital information "re-materializes" as genetic resources in every sense of the term.[126]

More specifically under the CBD, the terminology concerning digital information remains subject to debate.[127] It is unclear whether the definition of 'utilization' of genetic resources under the Nagoya Protocol on Access to Genetic Resources and Benefit-sharing (ABS) under the CBD,[128] which is one of the sources of inspiration of the BBNJ negotiators, may encompass reliance on digital information. Even if that was the case, however, the overall architecture of the Protocol has been conceived without specific consideration of bioinformatics. CBD Parties thus noted, in 2016, "rapid advances regarding the use of digital sequence information on genetic resources," the "importance of addressing this matter in the CBD framework in a timely manner," and the need to consider in 2018 "any potential implications of the use of digital sequence information on genetic resources for the three CBD objectives."

In the specific context of the ITPGRFA, already in 2013, Secretary Shakeel Bhatti highlighted the 'increasing trend for the information and knowledge content of genetic material to be extracted, processed and exchanged in its own right, detached from the physical exchange of the plant genetic material' and called on Parties to widen the focus of the ITPGRFA provisions with the potential to address the non-material values of genetic resources. In 2017, a proposal was made by the African Group to reflect the concept of digital sequence information in a revised Standard Material Transfer Agreement (SMTA) under the ITPGRFA through a new definition of genetic parts and components as "elements of which they are composed or the genetic information/traits that they contain." No

[123] Also referred to as "*in silico* access": see Morgera et al, 'Summary of the First Session of the Preparatory Committee on Marine Biodiversity of areas beyond National Jurisdiction: 28 March – 8 April 2016' 25 (106) ENB.
[124] For some background, B. Fedder, *Marine Genetic Resources, Access and Benefit Sharing. Legal and biological perspectives* (Earthscan, 2013), 122- 155 and 172-.
[125] E Tsioumani et al, 'UN Biodiversity Conference Highlights: 6 December 2016' (2016) 9:669 ENB. 1.
[126] E Tsioumani et al, Summary of the Seventh Session of the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture: 30 October – 3 November 2017, 9(691) ENB.
[127] CBD Decision XIII/16 (2016), fn 1.
[128] J Vogel et al, 'The Economics of Information, Studiously Ignored in the Nagoya Protocol on Access to Genetic Resources and Benefit Sharing' (2011) 7 *Law, Environment and Development Journal* 52.

consensus was reached on if and how to reflect this issue in the text of the revised SMTA.[129] In addition, the African Group suggested inviting, pending clarification of their benefit-sharing obligations, voluntary contributions to its benefit-sharing fund from users of digital sequence information on genetic resources obtained from the ITPGRFA Multilateral System and from the use of which such users obtained benefits. While the proposal did not find sufficient support, the Treaty's Governing Body is expected to consider at its meeting in 2019 the potential implications of the use of digital sequence information for the objectives of the Treaty.[130]

The argument put forward in this paper is that while views may diverge on the most persuasive legal interpretation of the scope of existing benefit-sharing agreements, a solution that fosters increased cooperation and multilateral learning should be favored in the name of the principles of effectiveness and good faith.[131] These principles support interpretations that contribute to ensure *full* effect to a treaty,[132] rather than depriving international provisions of impact on the ground.[133] They further suggest 'rejecting results that maintain an uncertain position or the perpetuation of disagreements'[134] and rather privileging an approach aimed at 'better protection or implementation of universal values, and in addition [ensure] international institutions are involved to monitor or steer the process.'[135] These ideas clearly chime with the proposed principled approach to sharing benefits fairly and equitably as an institutionalized multilateral partnership-building process, thereby guiding the developing of a new international instrument, in addition to the interpreting of existing ones.

Considering limited progress in other areas of international law to address digital sequence information, the fact-finding studies commissioned under existing international benefit-sharing processes,[136] and in particular the studies prepared under the CBD and the ITPGRFA, provide useful insights for the BBNJ discussions. Notably, these studies provide a sense of current scientific practices in relation to digital sequence information, and how they challenge the conceptual premises of existing international benefit-sharing regimes. In addition, these studies identify certain ways forward that can be assessed on the basis of the principled approach to fair and equitable benefit-sharing discussed above in relation to the BBNJ negotiations. Finally, this section will suggest considering the merits of addressing digital sequence information "from the side", rather than "head on," along the lines of an incipient initiative on information sharing under the ITPGRFA.

3.1 Opportunities and Challenges

[129] E Tsioumani et al, Summary of the Seventh Session of the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture: 30 October – 3 November 2017, 9(691) ENB.
[130] Ibid.
[131] E Morgera, E Tsioumani and S Switzer, 'Study into the Criteria to Identify a Specialised Access and Benefit-sharing Instrument, and a Possible Process for its Recognition' UN Doc CBD/SBI/2/INF/17 (2018).
[132] M Fitzmaurice, 'The Law of Treaties' in M Shaw (ed), *International Law* (6th ed, Oxford University Press, 2008), 810, at 832-838.
[133] A Orakhelasvili, *The Interpretation of Acts and Rules in Public International Law* (Oxford University Press, 2008) at 398.
[134] Ibid, at 395.
[135] S Zappalà, 'Can Legality Trump Effectiveness in Today's International Law?" in A Cassesse (ed), *Realizing Utopia* (Oxford University Press, 2012) 105.
[136] The Commission on Genetic Resources for Food and Agriculture (CGRFA) agreed to request the Secretariat to conduct an exploratory, fact-finding scoping study on "digital sequence information," and also to submit that study to the CBD COP: Report of the Sixteenth Regular Session Rome, 30 January – 3 February 2017 (2017) UN Doc CGRFA-16/17/Report/Rev.1, paras 86-90; the Parties to the CBD and the Nagoya Protocol requested in 2016 a fact-finding and scoping study to clarify terminology and concepts, and to assess extent, terms and conditions of the use of digital sequence information on genetic resources in the context of CBD & Nagoya Protocol: CBD COP Decision XIII/16, para 3(b); and ITPGR report on genetic information associated with material accessed from the MLS (IT/OWG-EFMLS-6/17/Inf.8). See also WHO World Health Assembly decision WHA70(10) of 2017, para 8(b).

In terms of current scientific practices, the 2018 CBD fact-finding study underscores that currently most digital sequence information 'is the product of sequencing technologies that have become faster, cheaper and more accurate in recent years… and permeates every branch of the life sciences and modern biology today.'[137] So, on a positive note, new genetic sequences that are routinely published in sequence databases can be seen as 'a resource for the global community' that has led to 'dynamic knowledge hubs and diffuse scientific collaborations.'[138] This is particularly significant in terms of non-monetary benefits supporting advancements in marine science that contribute to conservation and sustainable use of marine biodiversity, which is seen as an essential contribution of benefit-sharing in the BBNJ negotiations.[139] The CBD study, for instance, underscored that technologies related to digital sequence information can serve to 'deepen knowledge about diversity including by identifying and mitigating risks to threaten species, engaging ability to track illegal trade, identifying species and geographic origin of products, and assisting with biodiversity planning and conservation management.'[140] The study also noted the potential for digital sequence information to lead to products that can be used to control invasive alien species, reduce consumption of fossil fuels, or reduce pollution from manufacturing.[141] Views submitted to the CBD from Parties and stakeholders further pointed to opportunities for open access to digital sequence information to support prioritizing conservation efforts in situ and ex situ, evaluating the effectiveness of in situ conservation, collecting information on genetic variation, understanding resilience and adaptability of populations vis-à-vis environmental changes and climate change, and reducing need to take samples from wild populations.[142] Some of the examples mentioned in the submission were specific to the marine environment, such as the restoration of coral reefs through the selection of appropriate places for reintroduction, the definition of population stocks for fisheries management decisions, as well as the labelling of fish to certify its legal origin, to clarify whether it is derived from aquaculture or capture, and to show compliance with quality control.[143]

Several challenges, however, were identified in the CBD scoping study. First, there are often-ignored equity issues in relation to sequence databases. Most countries do not have funds or capacity to maintain comparable databases and the benefits from digital sequence information (usually underestimated) accrue to the few countries hosting databases and their users.[144] This finding challenges the argument advanced in the BBNJ negotiations that current scientific practices may already cater to developing countries' needs. Power imbalances have also been underscored in the ITPGRFA study, which found that database operators, and scientists, notwithstanding open-access and open-source sharing ethos, are resistant to implementing tracking and generally agree to "publishing and making accessible other 'parts' or information whose money-making potential is more theoretical," while 'strategically patent[ing] research tools with clear commercial applications.'[145] Furthermore, the study indicated that researchers would not normally share 'developments with commercial potential, particularly where, for example, the research was funded

[137] S Laird and R Wynberg, 'Fact-finding and Scoping Study on Digital Sequence Information on Genetic Resources in the Context of the Convention on Biological Diversity and the Nagoya Protocol' (2018) UN Doc CBD/DSI/AHTEG/2018/13, at 8.
[138] Ibid, at 9-11
[139] Report of the Preparatory Committee established by General Assembly resolution 69/292 (2017) UN Doc A/AC.287/2017/PC.4/2, at 10; Broggiato et al (n 6) at 24-28.
[140] Laird and Wynberg (n 137), at 9.
[141] Ibid, at 13 and 40.
[142] CBD Secretariat, Synthesis of views and information on the potential implications of the use of digital sequence information on genetic resources for the three objectives of the Convention and the objective of the Nagoya Protocol, (2018) UN Doc CBD/DSI/AHTEG/2018/1/2, at 9-10.
[143] Ibid, at 6-7 and 12.
[144] Ibid, at 13.
[145] E Welch et al, 'Potential Implications of New Synthetic Biology and Genomic Research Trajectories on the International Treaty for Plant Genetic Resources for Food and Agriculture' (ITPGRFA or 'Treaty') October 2017, http://www.fao.org/fileadmin/user_upload/faoweb/plant-treaty/GB7/gb7_90.pdf at 16.

by government entities interested in local or regional job creation, and in seeing clear economic benefits returning to taxpayers.'[146] In addition, relevant technologies have increasingly blurred 'distinctions between different industrial sectors, and between academic, government and industry research, … as academic research institutions require generation of economic value and to that end seek intellectual property rights.'[147] This means that devising benefit-sharing that differentiates between upstream and downstream, non-commercial and commercial, actors along the R&D chain (particularly for monetary benefit-sharing purposes), as discussed in the BBNJ negotiations, may be based on inaccurate assumptions.[148]

The ITPGR scoping study systematized digital sequence information-related developments as challenges to three pillars of international access and benefit-sharing regimes (identification, monitoring and value generation), as well as the premise that the control over access to resources enables the identification of users and the establishment of contracts.[149] Without recurring explicitly to the same distinction, the CBD study also offers insights on the challenges to these three pillars, which are relevant for the BBNJ process.

With regard to identifying the provenance of digital sequence information, the CBD study indicates that increasingly publication of new genetic sequences in sequence databases is accompanied by information on provenance and meta-data.[150] But identification of provenance can be difficult in practice, as 'sequences from the same species from the same habitat might differ due to natural mutations over short periods of time and sequences from different species and origins may be similar' and/or because 'digital sequences can no longer be recognizable as belonging to a particular source because they undergo several modifications.'[151] The ITPGRFA study, in turn, indicated that the importance of information about provenance varies, as 'researchers may be less likely to return to the original material over time', 'database owners, sequencing companies and others are neither keeping nor requesting information about the material source of digital sequence information,' patents do not necessarily request geographic origin information, and 'the information may be hidden if a particular sequence could be obtained from more than one kind of organism.'[152]

The ITPGR study also found that digital sequence information undermines the approach to monitoring 'the transmission of the rights associated with the resources through subsequent exchanges,' which in turn relies on the capacity to identify exchanges and track individual germplasm samples.[153] The study acknowledged that database access could be tracked.[154] One option is currently being tested on the basis of block chain technology (the same used for the electronic currency BitCoin),[155] which could be combined with the creation of unique identifiers for the materials for which notification was given.[156] But the ITPGR study found that, on the one hand,

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[146] Ibid, at 21.
[147] Ibid, at 9-11
[148] For a similar conclusion, see also E Morgera and G Geelhoed, Consultancy report to the European Commission on the notion of 'utilization' under the Nagoya Protocol and the EU ABS Regulation for Upstream Actors (2016), available at http://ec.europa.eu/environment/nature/biodiversity/international/abs/pdf/ABS%20Final%20Report%20upstream%20users.pdf.
[149] Welch et al (n 145) at ii-iv.
[150] Laird and Wynberg (n 137), at 12.
[151] Ibid, at 15.
[152] Welch et al (n 145), at iv-v.
[153] Ibid, at v and 24.
[154] Ibid, at 13.
[155] Sequencing the world: *How to map the DNA of all known plants and animal species on Earth,* 23 January 2018*, The Economist;* F Perron-Welch, Blockchain Technology and Access and Benefit-sharing (August 2018), http://www.abs-canada.org/category/featured/.
[156] Broggiato et al (n 6) at 19-20.

> even with such tracking, identifying uses of accessed data would not be intuitive due to (1) the myriad ways that partial sequence information can be combined, and (2) the fact that the same sequence or portion of a sequence may be present in multiple organisms.[157]

With regard to value generation, the CBD study underscores that it is difficult to assess value and contributions as new collaborations do not include bilateral agreements or direct interaction among researchers.[158] In addition, the authors call attention to the practice of 'bulk studies' that raise different benefit-sharing issues from discrete and unique sequence associated with a particular organism of interest: value is often found in the aggregate as part of larger collection of sequences within databases against which searches and analyses are run.[159] The ITPGRFA study, in turn, concludes that the dematerialization of genetic resources has 'led to a multiplication of innovation trajectories, diffuse uses and means of combining sequences and parts'[160] that 'makes articulation of a specific monetary value of a sequence within an entire new product or process challenging.'[161]

The key take-home messages for the BBNJ processes therefore are the following. Digital sequence information is a growing practice, that presents opportunities to create global knowledge and dynamic partnerships and increases the 'potential for generating high-value products, and thus monetary and non-monetary benefits, with the increasing use of synthetic biology technologies in the future.'[162] It also has potential to contribute to conservation and sustainable use of marine biodiversity. But digital sequence information greatly complicates the identification of relevant actors and the drawing of distinctions among them (which impacts on the setting of triggers for benefit-sharing obligations, as discussed above). In addition, even if information is eventually made available through open-access databases, that does not mean that all individuals in different countries would have the same capacity to retrieve relevant information and put it to use. Nor is there any guarantee that scientists will include in these databases promising or valuable information. Furthermore, the determination of provenance, the tracking of use, and the determination of when value is generated are particularly challenging when digital sequence information is concerned.

3.2 Potential ways forward

The ways forward identified in the two scoping studies will now be analyzed with respect to their potential to contribute to partnership building as part of a principled reflection on sharing benefits fairly and equitably in the BBNJ context.

The ITPGRFA scoping study considers pooling genetic resources as part of a multilateral benefit-sharing mechanism as a way forward: "interviewees generally considered the pooling of benefits to be more feasible and more in line with common research practice."[163] This is also relevant for the BBNJ process, where the idea of pooling marine genetic resource samples and other data through an international clearinghouse has been put forward,[164] as discussed above. Under the ITPGRFA, a Multilateral System already pools genetic resources under standardized contractual terms, which served to rationalize the administrative costs of benefit-sharing. When thinking of the existing System in the context of digital sequence information, the ITPGRFA study indicates that a pooling approach can be suitable to the 'multiplication of holders of digital information collections distributed in a

[157] Welch et al (n 145), at 13.
[158] Laird and Wynberg (n 137), at 14.
[159] Ibid, at 15.
[160] Welch (n 145), at vi and 36.
[161] Ibid, at iv and 38.
[162] Ibid, at vi.
[163] Ibid, at vi and 26; Tvedt and Jorem (n 29), at 155-158.
[164] Greiber (n 23); and Broggiato et al (n 6) at 8 and 21.

number of media and the diversity of standards, norms and behaviours' as it will allow for 'establishing an aggregated and standardized system at a desirable scale, [requiring] a central authority to adopt and manage collective rights.'[165] But it also points to the drawback that it will 'probably lower flexibility for adaptation to specific contexts.'[166]

Furthermore, the ITPGRFA study points to an upfront fee/subscription model for access, although there may be 'different willingness to pay' among users because of 'a shift in perceived value of the collection of [digital sequence information] and recognition of the value of particular entries within databases.' Currently, ITPGRFA Parties are developing an upfront mandatory payment (a subscription system to all genetic resources covered by the Multilateral System), but they have not found agreement yet on payment rates, enforcement measures and whether to include digital sequence information.[167] For its part, the CBD study notes that 'given the blurred boundaries between commercial and non-commercial user, all might gain access on the same terms….some have suggested a global fund to be established to address benefit-sharing from public databases.'[168] These considerations can be related to the proposals for a global benefit-sharing fund in the BBNJ negotiations, and for an upfront payment to ensure the viability of the fund. Financial viability of multilateral benefit-sharing mechanisms, and the complexity in particular of ensuring monetary benefit-sharing from bio-prospecting, are common issues across existing regimes, as discussed above.[169] As such, they underscore the need to learn from experience within and across international processes through systematic monitoring and understanding of bottlenecks. Such systematic learning can be facilitated through a multilateral institutionalized approach, as autonomous efforts by States or other actors are largely seen as less conducive to 'systematically and structurally' improving inter-institutional learning.[170] Learning seems a key aim to keep in mind moving forward as the understanding of scientific practices, and of feasible and necessary forms of accountability and incentives for the scientific community to participate in equitable collaborations, is only incipient.[171]

The ITPGRFA study concludes that monitoring the use of digital sequence information requires a mechanism and incentives 'to build norms of exchange across multiple users and uses,'[172] which further supports the proposition made above about the merits of proactive facilitation, brokering and oversight through multilateral institutionalized approach. The ITPGRFA study also finds potential in the facilitation of public access (both entry-level and advanced users) to synthetic biology technologies and tools for education, participation in scientific endeavors and low-cost investment with a view to supporting social and institutional innovations as mechanisms for identifying and capturing collective benefits (information-sharing, capacity-building and technology transfer). The same finding was also reached in the CBD study,[173] and is directly relatable to the BBNJ negotiations.[174] It chimes with the argument made above about the need for a multilateral institutionalized approach to assess equity issues and look at digital sequence information in the context of relevant technologies, capacities and scientific endeavors with a view to reflecting on

[165] Welch et al (n 145), at 38.
[166] Ibid.
[167] Tsioumani (n 78).
[168] Laird and Wynberg (n 137), at 14.
[169] Morgera (n 71) at 19 and 30.
[170] S Oberthür, 'Interplay Management: Enhancing Environmental Policy Integration Among International Institutions' (2009) 9 *International Environmental Agreements: Politics, Law and Economics* 371, at 376
[171] E Karger, Options for Benefit-sharing: The Case of Digital Sequence Information on Genetic Resources (Master thesis , University of Bayreuth, Germany, 2018) at 86 (on file with author).
[172] Welch et al (n 145), at vi and 36.
[173] Laird and Wynberg (n 137), at 13.
[174] This seems to be the conclusion on digital sequence information in the BBNJ context of Broggiato et al (n 6) at 17 and 30.

potential synergies between obligations on scientific cooperation, information-sharing, capacity-building and technology transfer.

The risks related to the increased accessibility of these technologies are not discussed in the ITPGRFA study, but have been identified in the CBD process. Accordingly, undue reliance on digital sequence information could arguably undermine the resolve to conserve biodiversity in situ. It could negatively impact (economically and culturally) other knowledge producers such as traditional knowledge holders. And it may lead to modifying organisms that could become invasive, even within one country.[175] These risks point to the need for oversight at the multilateral level, informed by the dimensions of the right to science outlined above. They also point to the need to address the concerns of traditional knowledge holders, in consideration of their potential role in environmental and strategic impact assessments and area-based management tools under a new BBNJ instrument.

The CBD study also identifies a range of approaches to attach use conditions to digital sequence information: notifications on databases, notices of conditions of use, or click-through agreements. These can be used to assert that the information is patrimony of a certain country (or of humankind, in a BBNJ scenario) and requiring users to acknowledge the source in any publication or contact a focal point if the information is used for commercial purposes.[176] They can also serve to require best efforts to collaborate with a certain laboratory in the analyses and to share products derived from data.[177] The development and use of agreements could be facilitated and brokered by an international body, with a view to systematically ensuring contributions to realizing relevant international objectives, as discussed above.

The CBD study, in addition, reports of new research agreements ('protected commons') that serve to ensure recognition and attribution of material through a flexible and easy process and to involve research collaborations, which do not address monetary benefit-sharing.[178] Rather they contribute to the creation of global web of collaborators contributing in iterative ways to a final product that is openly available for use, including on topics of research that receive less attention by private sector, thereby addressing a situation where each participant is at the same time a provider and a user through reciprocal benefit-sharing.[179] This has the potential to contribute to enhanced implementation of UNCLOS provisions on scientific collaboration in light of the right to science.

The CBD study further notes that researchers increasingly use personal unique identifiers that could allow the tracking of research through their publications all along their careers and could potentially link to sequence data deposited in or accessed from databases.[180] This provides another element of consideration in facilitating inter-operability of existing databases at the international level. The CBD study also recommends separating legal and scientific databases to help address concerns among scientists.[181] This can be a helpful consideration in the current discussions on the need to establish a clearinghouse in the negotiations on a new treaty on marine biodiversity.

Finally, the CBD study points to the opportunity to consider issuing 'fair trade label' to certify that certain companies contributing to benefit-sharing[182] This option could also be considered in the context of BBNJ negotiations, possibly replicating the WHO experience mentioned above of

[175] CBD Secretariat (n 142), at 7 and 13-14.
[176] Laird and Wynberg (n 137), at 11.
[177] Ibid, at 38.
[178] Ibid, at 43
[179] Ibid, at 47 and 37.
[180] Ibid, at 15.
[181] Ibid, at 16.
[182] Ibid, at 48

identifying key actors that are involved in research on marine genetic resources of areas beyond national jurisdiction in contributing to a multilateral benefit-sharing fund.

3.3 Addressing digital sequence information from the side, rather than head on

While we are still far from the identification of clear solutions to the challenges posed by digital sequence information in existing benefit-sharing regimes, some progress has nonetheless been achieved in the context of the ITPGRFA Global Information System (GLIS) mentioned above.[183] This example is to be treated with caution as this initiative is still in very early stages of development and has mainly focused on digital object identifiers to 'unambiguously and permanently identify' genetic resources exchanged across organizations.[184] In addition, the initiative is not free from controversy, as civil society has underscored with regard to the DivSeek initiative.[185] This is a multi-stakeholder partnership of plant experts working on sequencing and phenotyping data, which allegedly uses technologies to sequence, include in a database and electronically distribute the genomes of crop seeds, without cooperating with the ITPGRFA.[186] Nonetheless, the GLIS represents a salient example for the BBNJ process to address digital sequence information without necessarily first agreeing on a definition or on its inclusion in the scope of a new instrument. It rather addresses digital sequence information in a sideway manner,[187] focusing on existing information-sharing obligations, thereby promoting transparency in this field and having the potential to gradually build some form of multilateral governance of genetic resource-related information.

The vision and programme of work on the GLIS explicitly acknowledge the need to provide principles and tools to support the operation of existing information systems in accordance with the ITPGRFA principles and rules, and promote transparency on the rights and obligations of users for accessing, sharing and using such information.[188] What is noteworthy about the GLIS is that a web-based entry point to information and knowledge is specifically geared towards strengthening the capacity for the conservation, management and utilization plant genetic resources for food and agriculture.[189] In other words, it is a combination of elements to actively pursue the sharing of scientific information by promoting and facilitating interoperability among existing systems, and creating a mechanism to assess progress and monitor effectiveness of such enhanced and more coordinated information-sharing opportunities.[190] The GLIS can therefore provide inspiration for an ambitious and systematic clearinghouse under discussion in the context of the BBNJ negotiations: it is not just an online repository of information, which is rather the case of the CBD or Nagoya Protocol clearinghouses.[191] Rather, the GLIS governance structure can arguably support a concerted and iterative dialogue to identify and respond to needs and priorities of beneficiaries in effectively making use of, and contributing to the production of, digital sequence information, in light with the principled

[183] ITPGR Article 17.
[184] http://www.fao.org/plant-treaty/areas-of-work/global-information-system/doi/en/.
[185] http://www.divseek.org; ITPGRFA Governing Body Resolution 5/2017, para 5(iii) and 6.
[186] Morgera, Tsioumani and Diz, 'Benefit-Sharing in marine areas beyond national jurisdiction: where are we at? (Part IV)', BENELEX blog post July 2016; Third World Network, 'Digital genebankers plan to ignore UN request on the impact of genomics and synthetic biology on access and benefit sharing' (April 2016), http://www.twn.my/announcement/digital_genebanks_final_uslet.pdf.
[187] Note that most likely progress on including digital sequence information is to be achieved under the World Health Organization: the Health Assembly agreed that the WHO secretariat should comprehensively analyse, in consultation with Member States and relevant stakeholders, the implications of amending the definition of PIP biological materials to include genetic sequence data (May 2017).
[188] ITPGR Resolution 3/2015; see also http://www.fao.org/plant-treaty/areas-of-work/global-information-system/en/.
[189] ITPGR Articles 13(2)(a) and 17.
[190] ITPGR resolution 3/2015 (IT/GB-6/15/Res 3).
[191] E Morgera et al (n 102) at 237-240.

understanding of benefit-sharing discussed earlier on. In addition, as discussed above, the GLIS provides institutional support for setting priorities, brokering of scientific cooperation, capacity-building and technology-transfer opportunities. For these reasons, it could also help operationalize identified synergies among the elements of a new BBNJ instrument, such as the scientific, capability and technological needs related to carry out or participate in environmental impact assessments, marine spatial planning and marine protected areas. Although this indirect approach focuses only on non-monetary benefits, it can possibly help explore in the interim technological solutions to move towards monetary benefit-sharing.

Finally, the GLIS may provide inspiration on how to devise a partnership-building approach that builds upon the various dimensions of the right to science. Tackling systematically inter-operability of databases and other online tools, facilitating the sharing of effective capacities and technologies to make use of them, and enhancing opportunities for collaboration can help ensure that all participate in relevant research efforts. It can also support the identification of priorities for the vulnerable, risks to humans or the environment, and any issues leading to discriminatory results in the sharing of information, by assessing progress and monitoring effectiveness through feedback and periodic consultations. It can finally focus efforts on the priorities of the vulnerable by supporting a focus on 'high-priority material.'[192]

4. Conclusions

The final report of the BBNJ preparatory process indicates that further discussions are required on whether a new instrument should regulate access to marine genetic resources, what is the nature of these resources, what benefits should be shared, whether to address intellectual property rights, and whether to provide for the monitoring of the utilization of marine genetic resources of areas beyond national jurisdiction; as well as with regard to modalities for capacity building and technology transfer.[193] Considering the limited reflection in the BBNJ process on the relevance of the new instrument for the Sustainable Development Goals,[194] the Intergovernmental Conference taking forward the negotiations from September 2018 onwards would benefit from a more principled reflection, focusing primarily on sharing as an iterative process of partnership-building across scales, on specific ways in which international law can cater to fairness and equity in light of other relevant areas of international law. In addition, it would benefit from taking into consideration the four dimensions of the human right to science, as earlier discussions on marine genetic resources of areas beyond national jurisdiction were recognized as essentially aimed at 'increasing humankind's knowledge about nature.'[195] A principled approach can provide a much-needed compass to weight the detailed, but still fragmented, proposals related to benefit-sharing, including on novel issues such as digital sequence information, towards enhancing cooperation to implement UNCLOS obligations on scientific research, capacity building, technology transfer and environmental protection holistically in areas beyond national jurisdiction.

[192] ITPGR resolution 3/2015.
[193] Report of the Preparatory Committee established by General Assembly resolution 69/292 (2017) UN Doc A/AC.287/2017/PC.4/2, at 17.
[194] Analysis of ENB PrepCom 4 (n 21).
[195] R Wolfrum, 'Concluding Remarks' (2009) 24 *The International Journal of Marine and Coastal Law 343,* at 346.