BATTLE ON INTERNATIONAL WATERS: A DEEP-DIVE INTO THE LEGALITY OF OCEAN CARBON SEQUESTRATION UNDER THE UNITED NATIONS BBNJ AGREEMENT

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INTRODUCTION

As climate change grows more severe, its increasing effects can be seen across the globe in the form of warmer temperatures, increasing spread of disease, changes in rainfall patterns, droughts, and more.[1] Between 1901 and 2016, the average global temperature increased by about 1.8 degrees Fahrenheit, which has resulted in serious shifts in climate and weather around the world.[2] This global heating largely comes from greenhouse gas emissions—produced principally via the burning of fossil fuels—which encase the Earth and trap the heat that enters the atmosphere from the Sun.[3] The maintenance of warmer temperatures over longer periods of time is leading to changes in weather patterns that are disturbing Earth's natural balance and incurring risks for humans and animals.[4] Scientists are unable to predict the specific impacts of climate change but agree that the effects will change Earth's climate as we know it.[5] The impacts of climate change can already be seen with the increasing rates of devastating natural disasters around the world, such as the 2020 Australian wildfire and the 2022 European drought.

From 2019–2020, Australia battled its largest wildfires on record.[6] The fires destroyed over 37 million acres and affected an

1. *Impacts of Climate Change*, Subsection of *Climate Change Science*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/climatechange-science/impacts-climate-change (last visited Nov. 29, 2023).

2. *Id.*

3. *Causes and Effects of Climate Change*, UNITED NATIONS: CLIMATE ACTION, https://www.un.org/en/climatechange/science/causes-effects-climate-change (last visited Nov. 25, 2023).

4. *Id.*

5. U.S. ENV'T PROT. AGENCY, *supra* note 1.

6. Byron Kaye & Colin Packham, *About Three Billion Animals Harmed in Australian Bushfires, WWF Says*, REUTERS (July 29, 2020), https://www.reuters.com/

estimated 1.25 billion animals.[7] Scientists believe that the wildfires resulted from sustained hot temperatures throughout central Australia that averaged 1 to 2 degrees Celsius hotter than temperatures the previous century.[8] New studies show that climate change made the Australian wildfires at least 30% more likely to occur than would otherwise be the case.[9] Furthermore, in a vicious cycle, the droughts and rising temperatures that make fires more likely to occur and increase their severity are subsequently exacerbated by the greenhouse gases released by those fires themselves.[10]

In the summer of 2022, Europe experienced record-breaking heatwaves and droughts that affected more than one-third of the continent.[11] The high temperatures exacerbated the severe drought and led to more than 16,000 heatwave-related deaths.[12] Records show that Europe has experienced warming at least twice as high as the global average for the past fifty years, with temperatures 2.3 degrees Celsius above pre-industrial averages.[13] Without drastic measures taken to reduce climate change, these heat stress extremes will become part of a pattern that occurs more frequently across the continent.[14]

Due to these concerns, many United Nations (U.N.) Member States joined together to create an international agreement that would address concerns over climate change's impacts on the high

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article/us-australia-bushfires-animal-deaths/about-three-billion-animals-harmed-in-australian-bushfires-wwf-says-idUSKCN24T14X; Daisy Dunne, *Explainer: How Climate Change Is Affecting Wildfires Around the World*, CARBONBRIEF (July 14, 2020), https://www.carbonbrief.org/explainer-how-climate-change-is-affecting-wildfires-around-the-world/.

7. *Id.*

8. Dunne, *supra* note 6.

9. *Id.*

10. *Id.*

11. Damian Carrington, *'Frightening': Record-Busting Heat and Drought Hit Europe in 2022*, THE GUARDIAN (Apr. 20, 2023), https://www.theguardian.com/environment/2023/apr/20/frightening-record-busting-heat-and-drought-hit-europe-in-2022.

12. Press Release, World Meteorological Org., Climate Change Impacts Scar Europe, But Increase in Renewables Signals Hope for Future (June 19, 2023), https://wmo.int/news/media-centre/climate-change-impacts-scar-europe-increase-renewables-signals-hope-future.

13. *Id.*

14. *Id.*

seas and help protect vast ecosystems from human destruction.[15] The U.N.'s Agreement on Marine Biodiversity of Areas Beyond National Jurisdiction ("the BBNJ Agreement" or "BBNJ") succeeds in establishing a legal framework that aims to protect marine biodiversity and conservation. Alternately, many scientists believe that the ocean is an excellent solution for ever-growing concerns about Earth's warming atmosphere through ocean carbon sequestration.[16] Ocean carbon sequestration is the process of enhancing or adjusting the ocean's natural characteristics to increase its ability to store anthropogenic carbon dioxide, thereby mitigating the effects of climate change.[17] However, ocean carbon sequestration faces legal implementation issues due to the BBNJ Agreement's key points, ultimately resulting in a legal and policy bar for the execution of marine sequestration projects.

Specifically, the Environmental Impact Assessment element of the BBNJ creates significant legal issues. This is due to the lack of current research on the wide impacts of ocean carbon sequestration needed to provide guarantees of protection for biodiversity. Additionally, the marine genetic resources and transfer of marine technology provisions result in economic and policy disincentives for marine carbon sequestration. The U.N.

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15. *Historic Agreement Adopted at the U.N. for Conservation and Sustainable Use of Biodiversity in Over Two-Thirds of the Ocean*, UNITED NATIONS: SUSTAINABLE DEV. GOALS (June 19, 2023), https://www.un.org/sustainabledevelopment/blog/2023/06/press-release-historic-agreement-adopted-at-the-un-for-conservation-and-sustainable-use-of-biodiversity-in-over-two-thirds-of-the-ocean/; *Beyond Borders: Why New 'High Seas' Treaty Is Critical for the World*, UN NEWS (June 19, 2023), https://news.un.org/en/story/2023/06/1137857; Stewart Patrick, *The High Seas Treaty Is An Extraordinary Diplomatic Achievement*, CARNEGIE ENDOWMENT FOR INT'L PEACE (Mar. 8, 2023), https://carnegieendowment.org/2023/03/08/high-seas-treaty-is-extraordinary-diplomatic-achievement-pub-89228.

16. *See, e.g.*, *Ocean-Based Carbon Dioxide Removal*, OCEAN VISIONS, https://oceanvisions.org/ocean-based-carbon-dioxide-removal (last visited Oct. 24, 2023) (describing the importance of the ocean in atmospheric carbon removal and the different ocean-based approaches); Romany Webb & Michael B. Gerrard, *Using the Oceans to Store CO2 Could Help Avoid Climate Catastrophe*, BLOOMBERG L. (Dec. 30, 2021), https://news.bloomberglaw.com/tech-and-telecom-law/using-the-oceans-to-store-co2-could-help-avoid-climate-catastrophe (explaining the environmental importance of using the oceans to store carbon dioxide, as well as the different carbon removal approaches and the legal issues each may face).

17. OCEAN VISIONS, *supra* note 16.

will likely need to create an exception under the BBNJ that lays out an in-depth path for researchers to move forward with ocean carbon sequestration. This exception is necessary because in-ocean testing is otherwise required to determine if any biodiversity issues exist before such projects can move forward under the BBNJ. The exception could potentially begin with a limited approach on participants in order to assess the effects of the varying ocean carbon sequestration approaches and then could expand based on the outcome of the research. Analyzing ocean carbon sequestration under each provision of the BBNJ will show why such an exception is necessary.

A. Understanding the United Nations' Agreement on Marine Biodiversity of Areas Beyond National Jurisdiction (BBNJ)

Although it is an essential shield against the ever-increasing impacts of climate change, the ocean is often an unknown ally in the fight for climate solutions.[18] The ocean is responsible for absorbing 25% of all carbon dioxide emissions across the planet, and it captures 90% of the excess heat generated from the carbon dioxide emissions process.[19] Due to its importance in regulating the climate, some U.N. Member States have pushed for the implementation of an agreement that could support the health of the ocean through marine conservation and ecosystem protection.[20]

These U.N. Member States hoped that by protecting the high seas—a largely unregulated area that accounts for roughly two-thirds of the ocean and half of the planet—the ocean could continue to serve its critical role in the Earth's climate system.[21] In international law, the high seas are defined as "all parts of the ocean that aren't included in the exclusive economic zone, the

18. *The Ocean–The World's Greatest Ally Against Climate Change*, UNITED NATIONS: CLIMATE ACTION, https://www.un.org/en/climatechange/science/climate-issues/ocean (last visited Oct. 25, 2023).

19. *Id.*

20. Monica Medina, *Why Protecting the High Seas Matters*, U.S. DEP'T OF STATE: DIPNOTE (Aug. 26, 2022), https://www.state.gov/why-protecting-the-high-seas-matters/.

21. *Id.*

territorial sea, or the international waters of a country."[22] This primarily refers to the parts of the ocean, and its associated resources, that no country directly owns or regulates.[23] Generally, coastal countries have control over the area of the ocean that stretches from their coastline to 200 nautical miles out at sea, which is known as a country's exclusive economic zone (EEZ).[24] Therefore, the high seas are the oceans that lie beyond the boundaries of a country's EEZ, known as the areas beyond national jurisdiction (ABNJ).[25] The adoption of the BBNJ implements a legal framework to address environmental issues in this area of the ocean.[26]

The BBNJ Agreement is heralded as an extraordinary diplomatic achievement for its international support in revitalizing ocean preservation for current and future generations.[27] The BBNJ addresses four key substantive elements that the original U.N. Conference on the Law of the Sea (UNCLOS) failed to implement.[28] The BBNJ mainly serves to address environmental issues through (1) area-based management tools (including marine protected areas), (2) environmental impact assessments, (3) marine genetic resources (including the fair and equitable sharing of benefits), and (4) capacity building and the transfer of marine technology.[29]

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22. Fae Sapsford, *What Is High Seas Governance*, NOAA: OCEAN EXPL. (July 20, 2022), https://oceanexplorer.noaa.gov/facts/high-seas-governance.html.

23. *Id.*

24. *Id.*

25. *Id.*

26. Intergovernmental Conference on 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, *Agreement Under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction*, U.N. Doc. A/CONF.232/2023/4 (June 19, 2023) [hereinafter BBNJ].

27. UN NEWS, *supra* note 15; Patrick, *supra* note 15; *Background Information on Ocean Governance and the BBNJ Treaty*, Subsection of *BBNJ Treaty*, HARV. UNIV. (2023), https://bbnj-mgr.fas.harvard.edu/background-information-ocean-gevernance [hereinafter BBNJ Background: HARV.]; *Ocean Biodiversity: Global Agreement on Protection and Sustainable Use of Resources and Biodiversity in High Seas*, EUR. COMM'N PRESS CORNER (March 4, 2023), https://ec.europa.eu/commission/presscorner/detail/en/IP_23_1382.

28. *See, e.g.*, UNITED NATIONS: SUSTAINABLE DEV. GOALS, *supra* note 15; BBNJ Background: HARV., *supra* note 27.

29. BBNJ Background: HARV., *supra* note 27.

Therefore, analyzing activities affecting environmental ecosystems, such as ocean carbon sequestration, in the ABNJ under these legal elements will determine the direction that the international community moves towards under the BBNJ.

B. An Introduction to Ocean Carbon Sequestration

The U.N. BBNJ Agreement is expected to curb environmental damage in the ocean through conservation and biodiversity protection; however, as discussed earlier, many scientists believe that ocean carbon sequestration projects are a promising option for reducing greenhouse gas emissions in the Earth's atmosphere.[30] Ocean carbon sequestration is the process of removing carbon dioxide from the atmosphere and storing it in the oceans—usually by biologically or chemically enhancing the ocean's natural process—in order to increase its ability to sequester carbon beyond the 30% of carbon dioxide from human activities it currently stores.[31] Because of the vast size of the ocean, scientists can upscale any viable removal approaches to the large scale needed to curb climate change at levels in line with treaties like the Paris Agreement.[32] However, since these techniques are still in the early stages of development, relatively little is known about their effectiveness and what impact they may have on the ecosystem.[33] As companies and investors move forward with the development of ocean carbon removal (OCR), a legal framework is necessary to ensure that the process is established in a way that minimizes risks to the ocean.[34]

The six main OCR approaches that may affect international waters include electrochemical carbon dioxide removal, alkalinity enhancement, artificial downwelling, nutrient fertilization,

30. OCEAN VISIONS, *supra* note 16.

31. *See* Katie Lebling et al., *Ocean-Based Carbon Dioxide Removal: 6 Key Questions, Answered*, WORLD RES. INST. (Nov. 15, 2022) [hereinafter *6 Key Questions Answered*], https://www.wri.org/insights/ocean-based-carbon-dioxide-removal; Webb & Gerrard, *supra* note 16.

32. OCEAN VISIONS, *supra* note 16.

33. *6 Key Questions Answered*, *supra* note 31.

34. *Id.*

artificial upwelling, and seaweed cultivation.[35] The impacts of these OCR approaches will not be equally distributed around the world due to the presence of various fragile ocean ecosystems and different ocean circulation patterns.[36] This increases the potential for widely dispersed transboundary impacts around the world.[37] There is significant legal uncertainty on how these OCR techniques would be regulated due to the largely unknown effects on the ocean as a whole, specifically under the BBNJ.[38] Each of the BBNJ Agreement's four elements has varying effects and requirements that are impacted by the implementation of the OCR approaches.

II. POTENTIAL LEGAL BARS TO THE IMPLEMENTATION OF OCEAN CARBON SEQUESTRATION UNDER THE BBNJ AGREEMENT

A. Ocean Carbon Sequestration Implementation Under Area-Based Management Tools

One of the BBNJ's main elements is the Area-Based Management Tool (ABMT).[39] ABMTs are an instrument used in international waters to establish a geographically defined area in which activities are managed in order to achieve specific

35. There are various carbon dioxide removal approaches. Some involve the more abiotic approach of electrochemical carbon dioxide removal, which harnesses the physical or chemical properties of the ocean to remove carbon dioxide. Others use a more biotic approach of seaweed cultivation projects, which involves the use of photosynthesizing organisms in the ocean to take carbon dioxide and store it as a biomass. *See, e.g.*, KATIE LEBLING ET AL., WORLD RES. INST., TOWARD RESPONSIBLE AND INFORMED OCEAN-BASED CARBON DIOXIDE REMOVAL: RESEARCH AND GOVERNANCE PRIORITIES 7 (2022) [hereinafter RESEARCH AND GOVERNANCE PRIORITIES].

36. *Id.*

37. *Id.*

38. Webb & Gerrard, *supra* note 16.

39. BBNJ, *supra* note 26, art. 1.1.; *Area-Based Management Tools, Including Marine Protected Areas*, Subsection of *BBNJ Treaty*, HARV. UNIV., https://bbnj-mgr.fas.harvard.edu/abmts (last visited Nov. 20, 2023) [hereinafter ABMTs: HARV.]; INT'L UNION FOR CONSERVATION OF NATURE, MEASURES SUCH AS AREA-BASED MANAGEMENT TOOLS, INCLUDING MARINE PROTECTED AREAS (2016); MARJO VIERROS ET AL., POLICY BRIEF: SPACE FOR CONSERVATION AND SUSTAINABLE USE: AREA-BASED MANAGEMENT IN AREAS BEYOND NATIONAL JURISDICTION 1–2 (2016).

conservation and sustainable use objectives.[40] One of the main implementations of ABMTs are marine protected areas, defined under the BBNJ as geographically defined marine areas that are managed to achieve a specific, long-term biological diversity conservation goal, and which may allow appropriate sustainable use when consistent with conservation objectives.[41] The main goal of ABMTs in the BBNJ is to create a legal framework that addresses conservation of biodiversity.[42] The BBNJ prevents the inclusion of any areas within national jurisdiction in an ABMT, thereby limiting the establishment of ABMTs to international waters.[43]

Under the BBNJ, the Science and Technical Body of the U.N. has established a list of criteria that are relevant to identifying ABMTs. [44] Some of the relevant factors include uniqueness, fragility, sensitivity, biodiversity, vulnerability (including to climate change and ocean acidification), as well as other economic and social factors.[45] However, many of the OCR approaches require specific geographical ocean requirements to work.[46] For example, ocean fertilization requires high-nutrient, low-chlorophyll waters to promote iron levels and, therefore, phytoplankton growth.[47] Scientists have narrowed the applicable geographic area of this to the Southern Ocean, the North Pacific, and the Equatorial Pacific, with the Southern Ocean as the top contender.[48] Currently, only 5% of the Southern Ocean is protected, but with over 10,000 unique polar species, there is a push to increase the range covered as a marine protected area.[49] Because specific ocean requirements must be met for the OCR approach to work there are likely to be issues that crossover with

40. BBNJ, *supra* note 26, art. 1.1.

41. BBNJ, *supra* note 26, art. 1.9.

42. ABMTs: HARV., *supra* note 39.

43. *Id.*

44. BBNJ, *supra* note 26, art. 19.5, annex I; ABMTs: HARV., *supra* note 39.

45. ABMTs: HARV., *supra* note 39.

46. RESEARCH AND GOVERNANCE PRIORITIES, *supra* note 35, at 25–39.

47. *Id.* at 42–43.

48. *Id.*

49. *Marine Protected Areas: Protecting the Southern Ocean*, ANTARCTIC & S. OCEAN COALITION, https://www.asoc.org/campaign/marine-protected-areas/ (last visited January 12, 2024).

the areas covered by ABMTs. Some factors, like uniqueness, biodiversity, and economic and social factors, typically used to determine ABMTs are also analyzed prior to the implementation of OCR approaches.[50] Although there are alternative options to try to get around this overlap, as discussed below, it is likely that ABMTs will still cause issues with OCR research and implementation.

In the BBNJ, the U.N. also addresses specific objectives for the AMBTs.[51] The goal to protect, preserve, restore, and maintain biodiversity and ecosystems is relevant to implementing OCR in international waters.[52] The U.N. BBNJ Agreement includes goals on enhancing the productivity and health of the ocean, while also strengthening its resilience to stressors, including climate change, ocean acidification, and marine pollution specifically.[53] In some ways, the objectives of the various OCR approaches can align with the goals for the BBNJ, such as addressing ocean acidification through alkalinity enhancement or electrochemical techniques.[54] However, the risks from some OCR approaches largely conflict with the goals of the BBNJ,[55] as many cause issues such as changes in habitats, the introduction or elimination of species, and nutrient depletion.[56] Due to this conflict, the U.N. is likely to weigh against any OCR project that conflicts with the

50. ABMTs: HARV., *supra* note 39; RESEARCH AND GOVERNANCE PRIORITIES, *supra* note 35, at 25–29.

51. ABMTs: HARV., *supra* note 39.

52. BBNJ, *supra* note 26, art. 17.

53. *Id.*

54. RESEARCH AND GOVERNANCE PRIORITIES, *supra* note 35, at 50, 54.

55. BBNJ, *supra* note 26, art. 17.

56. Some of the risks of seaweed cultivation are the nutrient depletion and diversion from other habitats, which could include marine protected areas, and introduction of non-native species. The risks of ocean fertilization include nutrient depletion and changes to populations of grazer and predator marine organisms. The risks of artificial upwelling are similar to those of ocean fertilization, but also include potential outgassing of carbon dioxide. The risks of alkalinity enhancement include changes to the species composition and growing locations of phytoplankton. The risks of electrochemical techniques are similar to those of alkalinity enhancement and also include the manipulation of large volumes of seawater. The risks of artificial downwelling are cooler surface waters and warmer deep water which can change weather patterns and impact ecosystems. RESEARCH AND GOVERNANCE PRIORITIES, *supra* note 35, at 59

ABMTs unless there is further research indicating options for mitigation or a lower likelihood of affecting the MPAs.

There is a significant exception that provides a loophole for OCR approaches to still be successfully implemented: the requirement that ABMTs only exist in international waters.[57] Because ABMTs cannot be established in national waters—in fact, the BBNJ requires that the part of the ABMT that falls within national jurisdiction immediately cease to be in force[58]—parties looking to establish OCR approaches should begin in the national waters of an approving nation.[59] It is important to note, however, that this approach creates a different hurdle by requiring the sovereign nation's approval for activities occurring within its territorial sea and exclusive economic zone.[60] Although most countries have included carbon dioxide removal approaches in their long-term strategies submitted under the Paris Agreement, research and governance gaps still exist even in the implementation of OCR projects within national waters.[61] Furthermore, while smaller research projects to test the viability of the different OCR approaches may be feasible in national waters, the large-scale carbon removal necessary for a global decrease in carbon dioxide would require projects implemented in the deep water of the high seas.[62]

Parties can also look to implement OCR in international waters by avoiding geographic regions UNCLOS has established as MPAs. These areas have particular conservation and sustainable use objectives but are limited to a specifically defined geographic area that could be avoided as the location of OCR project implementation.[63] However, due to weather and ocean currents, the unknown and potentially far-reaching impacts of OCR approaches—such as nutrient depletion, the introduction of non-native species, and the outgassing of carbon dioxide—that

57. BBNJ, *supra* note 26, art. 22.

58. *Id.*

59. *Id.*

60. Sapsford, *supra* note 22.

61. RESEARCH AND GOVERNANCE PRIORITIES, *supra* note 35, at 7; *6 Key Questions Answered*, *supra* note 31.

62. *6 Key Questions Answered*, *supra* note 31.

63. BBNJ, *supra* note 26, art. 1.1.

avoid ABMTs in international waters or occur in territorial waters, could still have indirect effects on the ABMTs.[64] It is unclear how activities that have a secondary effect on ABMTs, instead of directly occurring within the defined boundary, will be handled under the BBNJ. However, the requirements of Environmental Impact Assessments, as discussed below, may bar these activities.

B. The Impracticality of Ocean Carbon Sequestration Under Environmental Impact Assessments

The second major substantive element covered under the BBNJ is the Environmental Impact Assessment (EIA).[65] Under the BBNJ, an EIA is a process to identify and evaluate potential impacts of a Member State's activity on international waters to establish informed decision-making.[66] The U.N. considered this factor important in advancing conservation and the sustainable use of marine biological diversity in international waters.[67] The BBNJ defines specific objectives of the EIAs, including, as relevant to OCR: (1) ensuring that relevant activities are assessed and conducted in a way that prevents, mitigates, and manages significant adverse impacts for the purpose of protecting and preserving marine environments; and (2) supporting the consideration of cumulative impacts and impacts in areas within national jurisdiction.[68]

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64. RESEARCH AND GOVERNANCE PRIORITIES, *supra* note 35, at 7; *6 Key Questions Answered*, *supra* note 31; *see supra* text accompanying note 56.

65. *Environmental Impact Assessment*, Subsection of *BBNJ Treaty*, HARV. UNIV., https://bbnj-mgr.fas.harvard.edu/eias (last visited Nov. 20, 2023) [hereinafter EIAs: HARV.].

66. BBNJ, *supra* note 26, art. 1.7; EIAs: HARV., *supra* note 65; PATIENCE WHITTEN WITH INPUT FROM XIAO RECIO-BLANCO, ENV'T L. INST., IMPLEMENTATION OF EIA IN AREAS BEYOND NATIONAL JURISDICTION UNDER THE U.N. BBNJ AGREEMENT: NEXT STEPS IN EIA GUIDELINES 5 (2021); HIGH SEAS ALL., HOW COULD THE EIA PROVISION OF THE BBNJ AGREEMENT APPLY TO ACTIVITIES AND EXISTING BODIES? 1 (2021); Kahlil Hassanali, *Internationalization of EIA in a New Marine Biodiversity Agreement Under the Law of the Sea Convention: A Proposal for a Tiered Approach to Review and Decision-Making*, ENV'T IMPACT ASSESSMENT REV., Mar. 2021, at 1, 1.

67. EIAs: HARV., *supra* note 65.

68. BBNJ, *supra* note 26, art. 27.

The threshold for determining when an EIA is required looks to whether "a planned activity may have more than a minor or transitory effect on the marine environment, or the effects of the activity are unknown or poorly understood."[69] The different methods of ocean carbon sequestration vary from abiotic approaches, those that harness the physical or chemical properties of the ocean to increase CO_2 removal from the atmosphere, to biotic approaches, those that enhance natural photosynthesizing processes in the ocean to take up more carbon dioxide and store it.[70] However, since current OCR approaches require changing the ocean's natural currents or adding materials, organisms, or electricity, they are likely to cause more than a transitory effect on the marine environment.[71] Additionally, the broader impacts of these approaches on the ocean are not well understood, meaning the BBNJ would still require an EIA.[72] Because these six ocean carbon sequestration approaches will have more than a minor effect on the marine environment or have effects currently unknown due to a lack of research and testing, it is very likely that an EIA will be required for any OCR projects undertaken.[73]

Also relevant to ocean carbon sequestration projects is the BBNJ's requirement that a party conducts an EIA when their planned activity may have potential impacts on the marine

69. *Id.*, art. 30.

70. *6 Key Questions Answered*, *supra* note 31.

71. There are five ocean carbon removal approaches relevant to the discussion in this paper. (1) Seaweed cultivation, which involves growing seaweed in large blooms on the ocean's surface, imbuing the seaweed with atmospheric carbon, then sinking it to the deep ocean water for storage; ocean fertilization involves adding nutrients to depleted areas to increase phytoplankton populations which perform photosynthesis to decrease atmospheric carbon. (2) Artificial upwelling involves bringing nutrient-rich deep-ocean water to the surface to grow phytoplankton populations for photosynthesis. (3) Alkalinity enhancement involves adding alkaline materials that react with the ocean CO_2 to create bicarbonate and carbonate ions, which results in the ocean's increased capability of absorbing atmospheric CO_2. (4) Electrochemical techniques involve using electricity to remove CO_2 from the ocean, or to produce alkalinity similar to the process of alkalinity enhancement. (5) Artificial downwelling involves accelerating natural currents that bring carbon-rich water at the surface to the deep ocean through cooling the water or pumping it to the depths. RESEARCH AND GOVERNANCE PRIORITIES, *supra* note 35, at 11–13.

72. *Id.* at 9.

73. *See id.* at 11, 13.

environment in international waters.[74] This was included due to the substantial possibility that marine environments in international waters may be polluted or significantly harmed even if the activity takes place in a national jurisdiction.[75] This is because ocean gyres around the world play a significant role in ocean circulation as they drive the currents that move water around the globe.[76] This includes drawing coastal ocean water, and everything suspended in it, into the deeper ocean currents.[77] Therefore, ocean ecosystems and currents increase the likelihood of OCR projects within national jurisdictions having widespread impacts.[78] This provision in the BBNJ Agreement will likely result in any OCR projects implemented in the ocean, whether in national or international waters, to require a full EIA.

At minimum, the EIA will require: (1) a description of the location and scope of the project; (2) assessment of the marine environment likely to be affected with potential impacts in national and international waters; (3) descriptions of prevention, mitigation, and management measures; any uncertainties or gaps in knowledge; (4) information on the public consultation process; consideration of reasonable alternatives; (5) description of follow-ups such as an environmental management plan; and (6) a non-technical summary.[79] The BBNJ provides that a party who has jurisdiction or control over a planned activity is responsible for determining whether it may proceed by analyzing these requirements.[80] However, "jurisdiction or control" is not defined under the BBNJ.[81] During the BBNJ Agreement's negotiations, parties found that activities that occurred within national

74. BBNJ, *supra* note 26, art. 28.

75. *Id.*

76. Katarina Samurović, *How Ocean Currents Move Pollution Around the World*, GEOGRAPHY REALM, https://www.geographyrealm.com/how-ocean-currents-move-pollution-around-the-world/ (last updated June 17, 2021).

77. *Id.*

78. *See e.g.*, RESEARCH AND GOVERNANCE PRIORITIES, *supra* note 35, at 21 (explaining that the impacts of large-scale ocean carbon removal are likely to be transboundary); *see also* Samurović, *supra* note 76 (explaining ocean currents and the role they play on moving pollution throughout the sea).

79. BBNJ, *supra* note 26, art. 33.

80. *Id.* art. 34.

81. *Id.* art. 1.

jurisdiction, or that occurred beyond national jurisdiction but were undertaken by ships under their flag, were within a State's jurisdiction or control.[82]

Currently, the primary purpose of EIAs in international law is more procedural than substantive.[83] The BBNJ attempted to give some substantive teeth to the EIAs by requiring that a deciding party must make all reasonable efforts to ensure that the activity is done in a manner consistent with preventing significant adverse impacts on the marine environment.[84] Projects implemented under the BBNJ will allow the international community to assess the control of EIAs and the operative effects its substantive teeth have on States.

Looking specifically at OCR, this requirement means that any party to the BBNJ shall only approve an OCR activity if they have made all reasonable efforts to ensure that the ocean carbon sequestration approach is not causing significant adverse impacts on the marine environment. With the current standing of OCR research—the lack of knowledge on how ecosystems and the overall ocean health are affected—a party could not likely approve a project without further assurances that OCR is safe for the marine environment.[85]

III. BBNJ PROVISIONS THAT RESULT IN AN ECONOMIC AND POLICY BAR TO IMPLEMENTING OCEAN CARBON SEQUESTRATION

A. Marine Genetic Resources and the Fair and Equitable Sharing of Benefits Implemented for Ocean Carbon Sequestration

The next element of the BBNJ is the mechanism for fair and equitable sharing of benefits associated with marine genetic

82. Will Thomas et al., *The New High Seas Treaty: Part 1 – What Does It Provide?*, FRESHFIELDS BRUCKHAUS DERINGER (March 15, 2023), https://sustainability.freshfields.com/post/102iaf2/the-new-high-seas-treaty-part-1-what-does-it-provide.

83. Yan Song, *The Obligation of EIA in the International Jurisprudence and Its Impact on the BBNJ Negotiations*, SUSTAINABILITY, Dec. 28, 2022, at 1, 6.

84. BBNJ, *supra* note 26, art. 34.

85. RESEARCH AND GOVERNANCE PRIORITIES, *supra* note 35, at 9.

resources and digital sequence information.[86] Under the BBNJ, a marine genetic resource includes "any material of a marine plant, animal, microbial, or other origin containing functional units of heredity of actual or potential value."[87] This element of the BBNJ Agreement focuses on the idea that the biodiversity of international waters is a global common, in other words, that its use and benefits are a right that belongs to everyone, not specifically to any one particular nation.[88] This section of the BBNJ Agreement aims to ensure that all nations, particularly developing States, are building their capacity to use, store, or transfer marine genetic resources and the benefits that come from them.[89]

The BBNJ identifies two different areas of benefits necessary to create equitable sharing.[90] Monetary benefits, such as royalties from the commercialization of a product created from marine genetic resources, are included in the provision.[91] Also included are non-monetary benefits such as data, information, and training related to the collection, research, and use of the marine genetic resources.[92] For the materials and benefits covered, each nation is required to enact legislative, administrative, or policy measures to ensure they contribute to the benefit sharing between Member States.[93]

Under the BBNJ, the collection of samples and the use, storage, or transfer of marine organisms qualify for the equitable

86. BBNJ, *supra* note 26, art. 9; *Introductions to MGRs of Areas Beyond National Jurisdiction,* Subsection of *BBNJ Treaty,* HARV. UNIV., https://bbnj-mgr.fas.harvard.edu/marine-genetic-resources (last accessed Nov. 13, 2024) [hereinafter MGRs: HARV.].

87. BBNJ, *supra* note 26, art. 1.8.

88. MGRs: HARV., *supra* note 86.

89. *See* BBNJ, *supra* note 26, art. 9 (emphasizing that Parties, including developing States are engaging with activities related to marine genetic resources); *see generally id.* art. 11.1.

90. *See id.* art. 14; *Various Aspects of Benefits,* Subsection of *BBNJ Treaty*, HARV. UNIV., https://bbnj-mgr.fas.harvard.edu/benefits (last visited Oct. 15, 2024) [hereinafter BBNJ Benefits: HARV.].

91. BBNJ, *supra* note 26, art. 14.5, 14.7(b); BBNJ Benefits: HARV., *supra* note 90.

92. BBNJ, *supra* note 26, art. 14.2(a)–€; BBNJ Benefits: HARV., *supra* note 90.

93. *See generally* BBNJ, *supra* note 26 art. 1.11, 14.3 (clarifying by the definition of "party" that article 14.3 applies to States).

sharing of benefits.[94] The BBNJ does not differentiate between organisms based on size or characteristics; all are covered under the BBNJ, including microorganisms.[95] The inclusion of microorganisms are particularly relevant to biotic Ocean Carbon Removal (OCR) approaches, which leverage these photosynthesizing microorganisms to increase the carbon dioxide that they take up and store as biomass.[96] Using these microorganisms during the OCR process likely requires the Member State to partake in the equitable sharing of benefits.[97] Therefore, although the benefit of successful OCR is sequestering carbon to slow climate change, a global benefit, [98] a country may still be required to share additional monetary and non-monetary benefits that result from the activity while taking on the cost of implementing the carbon sequestration approaches.

Because climate change improvement is a public good, a State taking steps towards mitigation receives the benefits of reduced emissions but solely bears the costs.[99] However, because the benefits spill beyond a single country's borders, other States receive the benefits of improved climate without contributing to the costs.[100] This incentivizes free-riding, wherein a nation rides on the global environmental benefits while another country bears the cost for mitigation.[101] Additionally, this means that it is in any

94. *See* MGRs: HARV., *supra* note 86 (explaining that businesses or institutions who use, store, or transfer organisms in ABNJ qualify for the equitable sharing of benefits).

95. *Physical Materials,* Subsection of *BBNJ Treaty*, HARV. UNIV., https://bbnj-mgr.fas.harvard.edu/physical-materials (last accessed Oct. 17, 2024) [hereinafter Physical Materials: HARV.].

96. *6 Key Questions Answered*, *supra* note 31 (explaining biotic ocean carbon sequestration approaches including nutrient fertilization, artificial upwelling, seaweed cultivation, and coastal wetland restoration).

97. *See* Physical Materials: HARV., *supra* note 95; BBNJ, *supra* note 26, art. 9(a).

98. *See e.g.*, OCEAN VISIONS, *supra* note 16; *6 Key Questions Answered*, *supra* note 31; RESEARCH AND GOVERNANCE PRIORITIES, *supra* note 35, at 6 (asserting the carbon dioxide removal with help bring atmospheric CO2 to a safer level).

99. *See e.g.*, Utkarsh Leo & Nidhi Singh, *Why the planet needs legally binding obligations to limit climate-mitigation 'free-riders'*, WORLD ECON. F. (June 22, 2022), https://www.weforum.org/agenda/2022/06/incentives-free-rider-problem-climate-change-mitigation/; Natalie M. Roy, *Climate Change's Free Rider Problem: Why We Must Relinquish Freedom to Become Free*, 45 WM. & MARY ENV'T L. POL'Y REV. 821, 837-38 (2021).

100. Leo & Singh, *supra* note 99; Roy, *supra* note 99, at 837–38.

101. Leo & Singh, *supra* note 99; Roy, *supra* note 99, at 837–38.

country's best economic interest not to incur the costs associated with climate change actions and instead wait for others to bear the burden.[102] The BBNJ's equitable sharing of marine genetic resources means the country that implements a biotic OCR approach bears the cost while also dividing any monetary benefits.[103] Overall, an OCR implementing country will bear the cost, share the monetary and non-monetary benefits with other Member States, receive a portion of the climate change benefits, and have other countries riding on their coattails—this seems like a less than fair share of benefits.

Although the marine genetic resources provision does not explicitly bar OCR in international waters, some Member States may choose to forgo the biotic approaches to avoid the economic implications. To avoid the BBNJ's marine genetic resource benefit sharing requirement, countries may choose to implement abiotic approaches to ocean sequestration.[104] Since these approaches harness physical and chemical properties of the ocean through certain minerals and acidity,[105] the requirements for a marine genetic resource are not met.[106] However, as discussed below, the biotic approaches are likely covered under the transfer of marine technology provision of the BBNJ and result in similarly poor economic outcomes for the implementers of OCR.

B. Implementation of Ocean Carbon Sequestration Under the Capacity Building and Transfer of Marine Technology Prong of the BBNJ

The final major element of the BBNJ is the requirement of capacity-building and the transfer of marine technology between the Member States.[107] This element focuses on enabling developing States to have equitable cooperation in the marine activities in international waters and to ensure consistent

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102. Roy, *supra* note 99, at 838.

103. *Id.*; BBNJ, *supra* note 26

104. *6 Key Questions Answered*, *supra* note 31, at 5. (explaining the abiotic approaches to ocean carbon sequestration).

105. *Id.*

106. BBNJ, *supra* note 26, art. 1.8.

107. *Id.*, part V.

conservation and sustainable use of the marine resources through shared technological knowledge.[108] The United Nations drafted this area of the Treaty flexibly in order to allow the transfer obligations to move forward with society's changing technology.[109] For this future-proofing, the BBNJ defines marine technology broadly to include information and data on marine sciences and related marine operations and services.[110] The BBNJ Agreement does not define capacity-building, instead it broadly lists different areas that may qualify under the goals of sharing relevant data, information, knowledge, and research; dissemination and awareness-raising; and the development and strengthening of relevant infrastructure, institutional capacity, and national regulatory frameworks.[111]

Since the actions of any individual country in international waters can potentially impact communities in far-away countries, cooperation and coordination among the user States is necessary.[112] This is possible by ensuring that everyone has the technological capacity to participate in the governance of the ocean.[113] Without transferring scientific marine knowledge, gaps exist and informed decision-making is hindered.[114] This harms the international cooperation necessary to create a governing legal body over the marine biodiversity that exists in waters

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108. *Id.*, art. 40.

109. *Capacity-Building and the Transfer of Marine Technology,* Subsection of *BBNJ Treaty*, HARV. UNIV., https://bbnj-mgr.fas.harvard.edu/cbtmt (last accessed Nov. 13, 2024) [hereinafter Marine Tech.: HARV.].

110. BBNJ, *supra* note 26, art. 1.10, 44 (listing examples of marine technology, including: (1) manuals, guidelines, criteria, standards and reference materials; (2) sampling and methodology equipment; (3) observation facilities and equipment for in situ and laboratory observations, analysis and experimentation; (4) computer and computer software, including models and modeling techniques; (5) related biotechnology; and (6) expertise, knowledge, skills, technical, scientific and legal know-how and analytical methods related to the conservation and sustainable use of marine biological diversity).

111. *Id.*, annex II.

112. Marjo K. Vierros & Harriet Harden-Davies, *Capacity Building and Technology Transfer for Improving Governance of Marine Areas Both Beyond and Within National Jurisdiction*, MARINE POL'Y, Dec. 2020, at 1, 1.

113. *Id.*

114. Harriet Harden-Davies & Paul Snelgrove, *Science Collaboration for Capacity Building: Advancing Technology Transfer Through a Treaty for Biodiversity Beyond National Jurisdiction*, 7 POL'Y & PRAC. REVS. 1,1 (2020).

beyond national jurisdiction.[115] Currently, only a few States are able to undertake research in international waters or harness the benefits of that research.[116] For ocean carbon sequestration, without capacity building and the transfer of marine technology, very few countries can contribute to the global issue of climate change.

The varying approaches to Ocean Carbon Removal (OCR) involve different technological methods to modify the ocean's current composition—through either physical properties, chemical properties, or ocean organisms.[117] Under the broad definition of marine technology, all of the OCR approaches are likely covered under this provision of the BBNJ.[118] Therefore, any Member State with parties participating in OCR will be required to ensure the capacity-building and transfer of the technology to developing States through legal instruments and frameworks.[119]

However, when an individual has access to a shared public resource—such as international waters—and acts in their own interest by using those goods, the expense of that individual's use is shared among all.[120] This concept, known as the tragedy of the commons, is particularly applicable to marine technology and its use in international waters. Often, individuals take advantage of the opportunity to benefit themselves by using the ocean around them, such as with deep-sea fishing, but their actions are detrimental to society in the long term.[121] This is because as more parties use the shared public resource, over-exploitation occurs, which interferes with the use of the good by all parties.[122]

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115. *Id.*

116. Harriet Harden-Davies et al., *How can a new U.N. ocean treaty change the course of capacity building*, 32 AQUATIC CONSERVATION: MARINE & FRESHWATER ECOSYSTEMS 907, 907–08 (2022).

117. *See* RESEARCH AND GOVERNANCE PRIORITIES, *supra* note 35, at 11; *6 Key Questions Answered*, *supra* note 31.

118. BBNJ, *supra* note 26, art. 1.10, 44.

119. *Id.* art. 41.1.

120. *See* Deena Robinson, *Explainer: What Is the 'Tragedy of the Commons'?*, EARTH.ORG (Sep. 5, 2021), https://earth.org/what-is-tragedy-of-the-commons/.

121. *Id.*

122. *See e.g.*, *Tragedy of the Commons*, LUMEN LEARNING, https://courses.

Applying this concept to OCR approaches, countries with the technological capabilities may want to bar others from using the technology in order to continue their use of the common-pool resource. Because the approaches require specific environmental factors, such as nutrient availability and downwelling currents, sharing the technology among all Member States may result in depleting the resource overall.[123] Because the main benefit of OCR is the mitigation of climate change, all countries will share this advantage;[124] however, any country implementing the OCR approaches will have to share the monetary benefits that may coincide with the projects. This may result in countries with the capacity to implement OCR not being willing to transfer the technology because there is a limit on the use of the common-pool resource, and they lose any additional monetary benefits.

Similarly aligned to the tragedy of the commons issue, there is likely a problem with nations wanting to free-ride off of others. Because Member States would be obligated to share their OCR technology,[125] all Member States would have the capacity to affect climate mitigation. Therefore, States may choose to wait for others to implement the technology and free-ride off the climate change benefits that arise without bearing any cost.[126] With the requirement to share the marine technology, there is no reason for that country to bear the burden of implementing the technology alone. Instead, they can wait for others to take the step and free-ride off of that climate mitigation. As free-riding currently happens with other climate change mitigation efforts globally,[127] the addition of a provision to share the marine

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lumenlearning.com/suny-sustainability-a-comprehensive-foundation/chapter/tragedy-of-the-commons/ (last visited Feb. 12, 2024); Alexandra Spiliakos, *Tragedy of the Commons: What it is and 5 Examples*, HARV. BUS. SCH. ONLINE (Feb. 6, 2019), https://online.hbs.edu/blog/post/tragedy-of-the-commons-impact-on-sustainability-issues.

123. RESEARCH AND GOVERNANCE PRIORITIES, *supra* note 35, at 11.

124. *6 Key Questions Answered*, *supra* note 31 (detailing how many governments have included ocean carbon removal approaches already in their long-term climate action strategies submitted to the United Nations Framework Convention on Climate Change, which could have positive effects on climate change overall).

125. BBNJ, *supra* note 26, art. 42.

126. *See* Leo & Singh, *supra* note 99.

127. *Id.*

technology would likely further incentivize some nations to avoid OCR efforts.

Overall, the BBNJ Agreement itself does not bar ocean carbon sequestration under the capacity-building and marine technology transfer provision. However, it may cause developed nations capable of the OCR technology to pause their implementation in international waters.

IV. RECOMMENDATIONS AND CONCLUSION

In general, the BBNJ Agreement creates major legal and economic bars to the implementation of ocean carbon sequestration approaches. The Area-Based Management Tools are likely to create issues due to the potentially far-reaching impacts of the OCR projects that could interfere with biodiversity within the marine protected areas. This is especially true if the geographic requirements lead to necessary use of the protected areas. Environmental Impact Assessments will likely be required for any ocean carbon sequestration project. However, without further research to determine the effects on marine biodiversity throughout international waters, a country could not move forward with implementation of any OCR projects. The provisions on marine genetic resources and marine technology transfer differ in that they do not legally bar the implementation of ocean carbon sequestration. Instead, they create economic incentives for countries to avoid the implementation of OCR projects or bar others from involvement in climate mitigation. Overall, changes under the BBNJ Agreement and further research are necessary before any Member States undertake an ocean carbon sequestration project.

Due to the importance of carbon sequestration in the efforts towards global climate change mitigation, the United Nations should create an exception in the BBNJ Agreement for OCR projects. The ability to limit the exception based on a demand for further out-of-ocean research—in order to discover the effects on marine biodiversity before implementation—gives the U.N. the power to shape ocean mitigation projects moving forward. This provides the necessary balance between ensuring marine biodiversity among a global common for future generations and

utilizing an important technology in the fight against climate change.

Additionally, while 110 Member States have currently signed the BBNJ Agreement, only seventeen have officially ratified the document.[128] As an international agreement, only the Member States that ratify the Treaty are bound to uphold the provisions.[129] Therefore, any State not ratifying the BBNJ Agreement has the opportunity to utilize international waters as they desire with no legal structure governing the area. With this, any country could implement OCR in international waters regardless of the effects it would have throughout the ocean. This puts marine biodiversity backwards; as if the BBNJ does not exist. Because of the importance of the Treaty for the good of international common resources, the U.N. should create an exception that walks Member States through a process to implement ocean carbon sequestration while protecting marine diversity.

Without drastic steps to mitigate climate change, the Earth is spiraling towards environmental changes that humans cannot undue.[130] Due to the major impact that ocean carbon sequestration can have in the fight against climate change,[131] it is necessary to move forward with creating the legal framework for its use on projects now. The United Nations can work together with researchers to create an exception under the BBNJ that allows for the protection of ocean ecosystems *and* allows for the use of the largest carbon sink on the planet.[132]

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128. Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction, *opened for signature* Sept. 20, 2023, C.N.203.2023.Treaties-XXI.10.

129. Vienna Convention on the Law of Treatises arts. 2(1)(b), 14(1), 16, May 23, 1969, 1155 U.N.T.S 331; 8 I.L.M 679, arts. 2(1)(b), 14, 16 (1969).

130. *See, e.g.*, *The Evidence is Clear: The Time for Action is Now. We Can Halve Emissions by 2030*, IPCC (Apr. 4, 2022), ipcc.ch/2022/04/04/ipcc-ar6-wgiii-pressrelease/.

131. *See, e.g.*, OCEAN VISIONS, *supra* note 16; Webb & Gerrard, *supra* note 16; U.N. Climate Action, *supra* note 18; *6 Key Questions Answered*, *supra* note 31; RESEARCH AND GOVERNANCE PRIORITIES, *supra* note 35, at 6–7.

132. *See* U.N. Climate Action, *supra* note 18 (explaining how ocean habitats such as seagrasses and mangroves have the potential of sequestering carbon dioxide at much higher rates than terrestrial forests can, but even with this potential of contributing to the fight against climate change, they still need to be protected to ensure no detrimental effects occur to life under water).