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# Climate Change and the Law of the Sea: Standing the Test of Time

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**Abstract**

*This article discusses the inadequacy of The United Nations Convention on the Law of the Sea (UNCLOS) in addressing issues arising from climate change. Although adopting a broad interpretation of UNCLOS articles could be an effective measure temporarily, this article argues that wider interpretation may seem difficult to follow given the complexity of climate change. Considering the rise in sea levels and fragile marine biodiversity, it is evident that universal and clear rules are needed, as the complexity that would arise from broad interpretation of UNCLOS works against the international community. The article concludes that amendments are required in order to make the current regime effective. An example of this is the amendment of the law concerning the submerged islands that could lose their statehood and the right to an Exclusive Economic Zone (EEZ) or continental shelf as a result of the rise in sea levels. Moreover, amendments are needed in order for UNCLOS to facilitate the Marine Protected Areas (MPAs), a significant measure for conservation of marine biodiversity that is currently incompatible with UNCLOS. Alternatively, the article suggests the development of new standards and rules within a unified framework where the emerging threats that arise from climate change are in the centre of the regime.*

## I. Introduction

Climate change is the most challenging global threat that the planet has to face together. There is abundant scientific research informing our understanding of how climate change is impacting the world's oceans. For example, many studies have explained the impact of increased water temperature causing "sea level rise and a reduction in the capacity of the oceans to absorb CO2."[2] According to Janis Searles Jones, Chief Executive of Ocean Conservancy, a non-profit organization working to conserve the oceans, there is enough evidence showing that the ocean has already absorbed 90% of the excess heat from global warming and has become 30% more

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[2] Monika Rhein and others, 'Observations: Ocean' in TF Stocker and Others (eds), *Climate Change 2013: The Physical Science Basis, Contribution of Working Group to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press 2013) 255.

acidic since the Western Industrial Revolution.[3] As excessive heat and energy warms the ocean, the change in temperature leads to unparalleled cascading effects, including ice-melting, sea-level rise, marine heatwaves, and ocean acidification. Moreover, marine heatwaves have doubled in frequency, and have become longer-lasting, more intense and extensive. As a result, the United Nations Environment Programme has warned that every one of the world's coral reefs could bleach by the end of the century if the water continues to warm.[4]

However, the response of the global community has been insufficient to eliminate or tackle the challenges of climate change on our oceans. For example, the target of restricting global temperatures to within 2°C above pre-industrial levels that was agreed to in the 2015 Paris climate agreement is insufficient. The Intergovernmental Panel on Climate Change (IPCC) predicts that if global temperatures rise by 1.5°C, perhaps 10–30% of coral reefs will survive, diminishing the habitat of roughly one-quarter of all ocean species, and affecting coastal storm protection, food, jobs, recreation and even medicines.[5] However, in an atmosphere that is 2°C warmer, "only 1% of reefs might survive, a remnant that could be too small to support all the species that depend on reefs."[6] This is just an example showing that the needs and dangers of oceans and the organisms that live within them have not been taken into account by decision-makers. Moreover, as of today, the 2015 Paris Agreement has not been fully applied in practice as there is no comprehensive policy with specific measures that could instruct how this goal could be achieved. As a result, progress is very slow.

The current international rules governing oceans is the "UN Convention on the Law of the Sea (UNCLOS)" which came into force in 1994 and replaced the four treaties of the 1958 Convention on the High Seas. UNCLOS lays down a comprehensive regime of law and order in the world's seas and conveys sovereign rights to coastal states over the seabed and subsoil of their continental shelf. Moreover, it provides obligations for the peaceful uses of the seas, the equitable and efficient

[3] Janis Searles Jones, 'To solve climate change, remember the ocean' (Nature, 19 September 2019) <https://www.nature.com/articles/d41586-019-02832-w> accessed 7 May 2022.

[4] The National Ocean Service of the National Oceanic and Atmospheric Administration explains that coral bleaching occurs when corals expel the algae (zooxanthellae) living in their tissues due to excessively warm water. This process causes the coral to turn completely white. Although coral bleaching does not necessarily lead to the coral's death, it does increase its stress level and vulnerability to mortality.

[5] ibid.

[6] ibid.

utilization of their resources, the conservation of their living resources, and the study, protection and preservation of the marine environment. However, according to Professor Schofield, Head of Research of the World Maritime University-Sasakawa Global Ocean Institute, it is "not adequate" for responding to climate change challenges.[7] The reason for that may be, as he highlighted, that climate change was not well understood in the 1970s and 1980s when UNCLOS was negotiated, and as a result the convention is "largely climate silent".[8]

This article provides an analysis of the issues involved in the relationship between the law of the sea and climate change. It highlights that climate change is not an "over the horizon challenge for the law of the sea"[9] anymore and therefore, the 'wait and see approach' has to be changed with effective policies that tackle the root of the problem. This article concludes that while some issues may be approached with adaptation within the existing legal framework, other issues may require a new legal framework.

## II. The role of UNCLOS in tackling the issue of climate change

It cannot be said that UNCLOS is a "climate change convention" as the phrases 'global warming' or 'climate change' are neither mentioned in the Convention's text, nor were central to the Convention's scope when enacted.[10] However, it provides the legal framework under which rules related to the ocean's role in climate change are to be adopted, making it the 'constitution for the oceans'.[11] On the one hand, UNCLOS includes features such as: permanence, timeliness comprehensiveness, and other embedded values, creating a regime that offers predictability and flexibility which are essential in order to adapt to new challenges.[12] On the other hand, critics have argued that its obligations on states to protect the marine environment as stated in Art. 192

[7] *Corrected oral evidence: UNCLOS: fit for purpose in the 21st century?* International Relations and Defence Committee, House of Lords November (2021) at Q60 <https://committees.parliament.uk/oralevidence/3063/html/> accessed 7 May 2022.
[8] ibid.
[9] Tim Stephens, 'Warming waters and souring seas: climate change and ocean acidification' in DR Rothwell and others (eds), *The Oxford Handbook of the Law of the Sea* (Oxford University Press, 2015), 797.
[10] Ingvild Ulrikke Jakobsen, Elise Johansen and Philipp Peter Nickels, 'The Law of the Sea as Part of the Climate-Change Regime Complex' in Elise Johansen, Signe Veierud Busch and Ingvild Ulrikke Jakobsen (eds), *The Law of the Sea and Climate Change: Solutions and Constraints* (Cambridge University Press 2020) 376.
[11] ibid.
[12] ibid.

and to prevent all sources of marine pollution,[13] whilst broad enough to encompass anthropogenic activities, are very general and add little to existing obligations relating to climate change.[14] Moreover, Articles 207 and 212 of UNCLOS, which state the requirements relevant to land-based and atmospheric pollution, do not set out acceptable global standards, nor pose an obligation on states to abide by any such standards.[15] The above examples illustrate that UNCLOS has not been fully successful to provide certainty or predictability in relation to environmental issues as there are various gaps that still remain ambiguous in terms of what is acceptable and what is not.

However, the relevance of UNCLOS in tackling climate change is located in the flexibility of the Convention's interpretation. For example, it has been argued that UNCLOS embodies some flexibility in relation to the rules governing the baselines, providing room for a wide interpretation of the current law without being necessary to alter the legal framework.[16] It also presents flexibility in regard to the countries responsibility to mitigate emissions and protect the marine ecosystem. In relation to the latter, The 1997 Kyoto Protocol established targets to moderate climate change (as well as 2012 Doha Amendment) and these targets have been recently enhanced with the 2015 Paris Agreement which "establishes a global average temperature increase target of well below 2°C above pre-industrial levels."[17] UNCLOS does not impose stricter requirements on states' obligations than the Kyoto Protocol[18] or Paris Agreement, as neither mention any such targets. Moreover, the above legal frameworks remain silent on the effect of the temperature rise of 2°C on the oceans or the issue of acidification that will occur as a result. This is where the flexibility in the UNCLOS' interpretation can seem useful. Although the Convention does not impose stricter obligations than the Kyoto Protocol or The Paris Agreement, UNCLOS requires states to "take action that targets ocean acidification in addition to, or at least

[13] UNCLOS, Art. 194.
[14] Karen Scott, *Legal Aspects of Climate Change, Law of the Sea and Principled Ocean Governance* (University of Canterbury 2018), 170.
[15] ibid.
[16] Jakobsen, Johansen and Nickels (n 10) 378.
[17] Paris Agreement, 12 December 2015 (2016) 55.l.m. 743 (2016).
[18] The Kyoto Protocol was adopted on 11 December 1997. Due to a complex ratification process, it entered into force on 16 February 2005. Currently, there are 192 Parties. In short, the Kyoto Protocol operationalises the United Nations Framework Convention on Climate Change by committing industrialised countries and economies in transition to limit and reduce greenhouse gases (GHG) emissions in accordance with agreed individual targets. It is designed to assist countries in adapting to the adverse effects of climate change whereas UNCLOS itself only asks those countries to adopt policies and measures on mitigation and to report periodically.

as part of their measures designed to address climate change, if they are to comply with their due diligence obligation to prevent, reduce and control pollution arising from ocean acidification under UNCLOS Part XII."[19] Thus, despite the ambiguities and generalities of the requirements that includes, one could argue that interpretation is the key to make UNCLOS an effective legal framework to fit today's needs and make it applicable to the emerging challenges arising from climate change.

## III. The challenges of rising sea levels

Although the argument above takes the optimistic view, an issue that challenges the interpretation and applicability of UNCLOS are rising sea levels. Climate change contributes to global warming which causes sea-level rise in two principal ways: "thermal expansion, which concerns the increase in volume as water warms, and the melting of glaciers on land."[20] A challenge imposed by the rising sea levels concerns the use of the zonal and sectoral approach established by UNCLOS as well as the concept of baselines. The latter serve as the starting point for a State's maritime sovereignty and jurisdiction, defining the boundaries of all areas of maritime authority. By creating a clear boundary between areas where a State has no rights and those where it enjoys jurisdiction, baselines constitute fundamental features in determining maritime boundaries.[21]

Furthermore, according to the zonal approach established by UNCLOS, there are four different types of maritime zones in the sea; the territorial sea (up to 12 miles off the coast); the contiguous zone (between 12 and 24 miles off the coast); the exclusive economic zone (up to 200 miles off the coast) and the continental shelf (the sea bed).[22] Critics have said that the ocean is a single dynamic ecosystem that requires a holistic management approach. The zonal approach mentioned above is a management approach based on spatial allocation of rights and responsibilities, without considering the interrelationships and complexities concerning marine issues.[23] In the context of UNCLOS, the zonal approach can lead to disputes between

[19] Jakobsen, Johansen and Nickels (n 10) 379.
[20] Orellana Marcos, 'Climate Change and the International Law of the Sea: Mapping the Legal Issues' in Abate Randal (ed), *Climate Change Impacts on Ocean and Coastal Law: US and International Perspectives* (OUP 2015).
[21] The Fletcher School of Law and Diplomacy, Tufts University <https://sites.tufts.edu/lawofthesea/chapter-two/> accessed 23 February 2023.
[22] ibid.
[23] Richard Barnes, 'The Law of the Sea Convention and integrated regulation of the ocean' (2012) 27(4) The International Journal of Marine and Coastal Law 859.

neighbouring states over overlapping claims to resources and jurisdictional boundaries. It can also result in the under-protection of areas that are ecologically important, but not recognised as such under the zonal system. Additionally, the zonal approach may not effectively address emerging issues such as climate change, which can have far-reaching and cross-border impacts on the ocean ecosystem. Tanaka acknowledges this "as a serious deficiency in the traditional zonal and sectoral management approach, sought compensated by the UNCLOS and by general international law through the obligation to cooperate."[24]

Moreover, the rising level of the sea could result in the loss of statehood as low-lying islands such as The Maldives, will become either submerged underwater or uninhabitable due to the lack of access to fresh water. As a result, submerged islands will lose their territorial inundation as established by UNCLOS and the 1933 Montevideo Convention criteria; according to which, defined 'territory' "(generally in the terrestrial sense), requires a permanent population, an effective government and the capacity to enter into relations with other states."[25] It follows that if the island state is not able to sustain economic life or human habitation, it is classified as a bare 'rock' and loses the right to an Exclusive Economic Zone (EEZ) or continental shelf. Finally, if it is only above water at low tide, it is classified as a low-tide elevation and again, has no maritime entitlements.[26]

There are several low-lying island nations and coastal regions that are particularly vulnerable to the effects of climate change, including sea level rise. For example, a report by the Intergovernmental Panel on Climate Change (IPCC) estimates that sea levels could rise by up to 1 meter by the end of the century, which could put low-lying coastal areas and island nations at risk of flooding and displacement. Moreover, a 2011 study by the Organisation for Economic Cooperation and Development (OECD) identified 17 countries that are highly exposed to the risks of sea level rise, including The Netherlands, Bangladesh, Egypt, Vietnam, Maldives as well as several small island nations in the Pacific and Caribbean.

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[24] Yoshifumi Tanaka, 'Principles of international marine environmental law' in Rosemary Rayfuse (ed), *Research Handbook on International Marine Environmental Law* (Edward Elgar 2015) 35.
[25] Hayley Keen and Charlotte Nichol, *Corrected oral evidence: UNCLOS: fit for purpose in the 21st century?* International Relations and Defence Committee, (House of Lords November 2021), <https://committees.parliament.uk/writtenevidence/40879/html/> accessed 7 May 2022.
[26] *UNCLOS: the law of the sea in the 21st century*, International Relations and Defence Committee (2022) HL Paper 159, 35.

In addition, rising sea levels will affect the low-water lines along the coast that are essential in order to determine normal baselines.[27] Under UNCLOS, the normal baseline is the low-water line drawn along the coast. In this regard, UNCLOS Art. 5 provides the following: "Except where otherwise provided in this Convention, the normal baseline for measuring the breadth of the territorial sea is the low-water line along the coast as marked on large-scale charts officially recognized by the coastal State."

Unfortunately, Art. 5 does not provide safeguards against sea level rise or rules to "specifically address the matter of determination of the normal baseline."[28] The current position of the law is that the 12-mile territorial sea and the 200-mile exclusive economic zone, is measured from a baseline, normally the low water mark. Those involved with the establishment of this arrangement could have never imagined that problems could arise from shifting baselines. This is because up until recently the dominant position was that the sea level and the low water mark were relatively constant features. However, climate change forces us to rethink many fundamental principles.

The question that we need to consider now is what should be the appropriate approach to define changing maritime baselines? Two approaches have dominated the literature, with each producing different disadvantages: the view which allows the use "of ambulatory baselines and the opposite approach of frozen baselines which has opted for the stability and preservation of baselines vis-à-vis the change in geography."[29]

The ambulatory theory argues that UNCLOS does not regulate the consequences of the rising sea level on the baselines, low-tide elevations and islands. Therefore, there are not any requirements that oblige a coastal State to permanently determine its boundaries.[30] The ambulatory theory supports the view that the continued tie between maritime boundaries to existing physical features is desirable because persons at sea may easily identify boundaries if they only look to the shoreline

[27] Marcos (n 20).
[28] Guifang Julia Xue, *Climate Change: International Law and Global Governance, Vol. I: Legal Responses and Global Responsibilities* (Nomos Verlagsgesellschaft 2013) 592.
[29] Sarra Sefrioui, 'Adapting to Sea Level Rise: A Law of the Sea Perspective' in Gemma Andreone (ed) *The Future of the Law of the Sea* (Springer 2017).
[30] Clive Schofield, *Against a rising tide: ambulatory baselines and shifting maritime limits in: International symposium on Islands and Oceans* (Tokyo 2009) 3.

which generates the boundary. However, this view is archaic due to the development of various technologies and satellites that allow us to determine maritime boundaries without having to locate physical reference points.

This theory also supports the view that marine boundaries (the boundaries between different countries' maritime zones) should be closely tied to the coastline. The reason for this view is that marine boundaries that are closely related to the shoreline can better reflect natural maritime boundaries. The coastline is an important feature in determining maritime boundaries, as it can affect the distribution of resources and the movement of ocean currents, which in turn can impact marine ecosystems and human activities. By closely aligning marine boundaries with the natural features of the coastline, it may be possible to manage these resources and activities more effectively and sustainably.

As the shoreline changes, marine borderlines should reflect those changes too. However, this approach would undermine the stability between States in their relations that the law aimed to achieve and would raise conflicts over the agreements on exploitation of natural resources.[31] States have agreed upon and accepted certain maritime zones, which are areas of ocean that fall under their jurisdiction or control. However, reaching a consensus on the boundaries of these zones was a complex and often contentious task. This has been due to disagreements over how to divide up the ocean and allocate resources, as well as competing claims to certain areas of the ocean by neighbouring countries. Therefore, uncertainty as to the boundaries of some maritime zones during a time when ownership of valuable resources such as fish stocks, oil and gas are major ground for conflict between states could lead to huge unrest. As a result, the states have started considering how to invest great amounts to maintain their baselines even "artificially."[32] An example of this is when China declared their plan to expand their maritime boundaries using artificial means in the South China Sea, which includes areas that have been officially acclaimed by Japan. These baselines extend beyond the natural features of the coastline and have been the subject of controversy and disputes with Japan and other neighbouring countries.
On the other hand, the concept of ambulatory baselines implies the necessity of legal thresholds to establish when baseline locations should be altered, to ensure a just and

[31] David Caron, 'When law makes climate change worse: rethinking the law of baselines in light of a rising sea level' (1990) 17 Ecol Law Q, 640.
[32] ibid, 641.

orderly process that occurs with some uniformity.[33] This would reduce the risk for potential conflicts as states are declined to use UNCLOS baseline rules as a tool for maximizing their territorial claims.[34] Otherwise, shifting baselines will destabilise existing boundaries between States, for example where they have been calculated on the basis of equidistance.[35] More importantly, shifting baselines will unsettle the stability, certainty, and predictability sought by maritime boundaries.[36] In this context, climate change will have a significant impact on the law of the sea and will shake up the UNCLOS' core principle according to which geography provides a stable basis for determining the state's boundaries under the law of the sea.[37]

On the other hand, according to the fixed approach, "when all maritime zones are established in accordance with the relevant provisions of the UNCLOS, they will remain unchanged even if the low-water line and baselines are changed as a result of sea-level rise."[38] However, under this approach, a State would result in claiming a baseline that does not reflect reality – thus, being incompatible with UNCLOS Article 5.[39] The fixed approach is based on the theory that boundaries need to be certain and undisputed, thereby allowing stability of expectation on both sides of the border. Under this theory, States with shifting shorelines would enter into boundary agreements setting forth a process whereby such boundaries may become immovable. Under this concept, a permanent fixing of maritime boundaries would avoid the cost of adjustment and put a stop to eternal litigation for determining the shifting maritime borderlines.[40]

Summarising all the above, it could be said that both approaches are at odds

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[33] Davor Vidas, 'Sea-Level Rise and International Law: At the Convergence of Two epochs' (2014) 4 Climate Law 70, 75.
[34] Michael Strauss, 'The Future of Baselines as the Sea Level Rises' (2019) 6(2) The Journal of Territorial and Maritime Studies 27, 37.
[35] Alfred Soons, 'The Effects of a Rising Sea Level on Maritime Limits and Boundaries' (1990) 37 Netherlands International Law Review 207, 216-218.
[36] Marcos (n 20).
[37] Davor Vidas, International Law and Sea Level Rise: The Role of the International Law Association, Mepielan Ebulletin (2014) <http://www.mepielanebulletin.gr/default.aspx?pid=18&CategoryId=4&ArticleId=174&Article=International-Law-and-Sea-Level-Rise-The-Role-of-the-International-Law-Association> accessed 7 May 2022.
[38] Signe Veierud Busch, 'Law of the Sea Responses to Sea-Level Rise and Threatened Maritime Entitlements' in Elise Johansen, Signe Veierud Busch and Ingvild Ulrikke Jakobsen (eds), *The Law of the Sea and Climate Change: Solutions and Constraints* (CUP 2021) 318.
[39] ibid.
[40] International Relations and Defence Committee (n 26) 642.

and incompatible with UNCLOS for the following reasons; if a state maintains its right to maritime zones "despite retreating or lost baselines, the distance between the new baselines and the outer limits of these zones would exceed the 12 and 200 nautical miles distance criterion under UNCLOS."[41] On the other hand, if they follow the ambulatory approach this would open the door to conflicts and litigation. Thus, even if we accept either of these theories, the changes in the interpretation of UNCLOS rules are unavoidable.[42]

## IV. The protection of marine biodiversity and UNCLOS

The protection of marine biodiversity has attracted the attention of policy makers and international organisations who regard the matter as urgent. Undoubtably, climate change has had significant consequences on the conservation and sustainability of marine biodiversity. Ocean acidification, rising water temperatures and changes in the ice formation threaten the productivity and even the survival of coral reef ecosystems, the migration of several species, including pelagic fish, marine mammals, and seabirds.[43] In response to this threat, states have committed to apply key measures set out in Article 8 (a) of the Convention on Biological Diversity (CBD)[44], under which they are required to establish "effectively and equitable managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures."[45] These systems of protected areas are also known as Marine Protected Areas (MPAs).

However, in order to implement MPAs, States need to consider the provisions in UNCLOS because UNCLOS includes the general principle laid down in article 192 ("States have the obligation to protect and preserve the marine environment"). The question that arises here is the following: is UNCLOS a practical framework to facilitate the Marine Protected Areas (MPAs) as a measure in order to mitigate climate change? At first sight the answer is no, because τhe conventional approach of dividing ocean management based on zones and sectors, as outlined in UNCLOS, could impede the creation of well-managed and integrated MPAs with effective protective

[41] ibid.
[42] ibid.
[43] Mark Eakin and others, 'Global Climate Change and Coral Reefs: Rising Temperatures, Acidification, and the Need for Resilient Reefs' in Clive Wilkinson (ed), *Status of Coral Reefs in the World* (Global Coral Reef Monitoring Network 2008).
[44] Convention on Biological Diversity (CBD), 5 June 1992, in force 29 December 1993, 1760 UNTS 79.
[45] ibid.

measures that account for the human activities that pose a threat to conservation. ."[46] In other words, although UNCLOS gives a legal basis to create MPAs, the concrete powers to implement them need further development.

In compliance with UNCLOS, the MPAs established within the territorial sea must not infringe the right of innocent passage[47] as well as should not restrict the right of other countries to exercise the freedom of navigation in the EEZ.[48] Whilst exerting their positive duty to safeguard the marine ecosystem and sovereign rights to establish MPAs within their EEZs, coastal states "shall have due regard to the rights and duties of other States"[49] and should not introduce unjustifiable restrictions that would infringe other States' rights of freedom and navigation. It follows that there is ambiguity in relation to MPAs established in areas beyond national jurisdictions under UNCLOS, as according to Art.87, "the high seas are open to all states, and the principle of the freedom of the high seas applies."[50]

UNCLOS has created a paradox. On one hand, as discussed in The South China Sea Arbitration,[51] Article 192 entails "the positive obligation to take active measures to protect and preserve the marine environment, and by logical implication, entails the negative obligation not to degrade the marine environment"[52] as well as includes "the duty to take measures necessary to protect and conserve rare or fragile ecosystems and habitats of depleted, threatened, or endangered species and other forms of marine life" as stated in Article 194(5).[53] It could be said that the adoption of MPAs could be lawful under these Articles as they would function as an adaptation measure to reduce the effects of climate change, promoting conservation of biological diversity itself. On the other hand, since the States do not enjoy sovereignty or sovereign rights in areas beyond national jurisdiction, they don't have the right to declare, unilaterally, a MPA on the high seas although these are mainly the areas of concern which remain widely unregulated. Although MPAs entail a management plan where all uses and activities with current or potential impact on the marine environment are regulated, we still need to overcome the incompatibilities with

[46] ibid, 240.
[47] UNCLOS, Art. 17.
[48] UNCLOS, Art. 58.
[49] UNCLOS, Art. 56(2).
[50] UNCLOS, Art. 87.
[51] South China Sea Arbitration (The Republic of Philippines v. The People's Republic of China) (Award) [2016].
[52] Xue (n 28) 249.
[53] ibid.

UNCLOS in order to implement them effectively.

The only way to resolve the above paradox is by triggering Article 197 which allows for cooperation in protecting the marine environment at the global level as well as at the regional level, when appropriate.[54]As a result, states in a given region would have the opportunity to agree on the development of a framework for establishing MPAs in an area beyond national jurisdiction within that region. This framework could also set the rules for establishing MPAs for adaptation and mitigation purposes, by defining the requirements for selection of areas as well as providing the instructions on how the activities for conservation could be governed. It is through regional cooperation and agreements, that states may be able to develop principles and rules that "connect ocean governance and climate-change considerations, thereby addressing the effects of climate change in a more effective way."[55]

However, cooperation could result in having too many and different regional agreements on this matter enhancing further the fragmentation of the law and causing confusion with not being able to distinguish which agreement applies to a particular situation and which provision prevails amongst the rest. Moreover, in order to implement the MPAs, the contribution of specialist institution such as the International Maritime Organization will be required to oversee and provide guidance on the States' activities. UNCLOS follows a sectoral based approach and therefore, many institutions may be involved in the regulation process concerning activities within the same ocean space. As a result, this could cause various complications in harmonising the different protective measures and could fail to provide adequate protection to the fragile marine ecosystems within a specific area, thus failing to reap the benefits of the establishment of MPAs. Therefore, a new comprehensive, straightforward and universal framework applicable to all MPAs may be required in order to resolve the complexities and overcome the legislation's ambiguities mentioned above.

## V. Ocean Iron Fertilization

Wide criticism has been generated about ocean iron fertilization, which is another suggested practice that could seem effective in mitigating against the consequences of climate change. The ocean is a significant factor for absorbing the

[54] UNCLOS, Art 197.
[55] Jakobsen, Johansen and Nickels (n 10) 383.

carbon on Earth and the method could potentially seem useful in mitigating against climate change.[56] The goal of iron fertilization is to encourage the growth of phytoplankton (a form of algae that produces oxygen and nutrients) which helps to reduce the levels of carbon found in the atmosphere and absorb it into the ocean.[57] This could be done by inserting iron in marine areas where iron levels are currently in low concentrations that prevents the growth of phytoplankton.[58] Some academics in favour of this method argue that iron fertilisation could be effective in absorbing atmospheric carbon, which is currently a significant factor of the greenhouse effect.[59]

However, according to Andrew Watson Professor at the College of Life and Environmental Sciences at the University of Exeter, speaking at a conference on ocean iron fertilization at Woods Hole Oceanographic Institution (WHOI) warned that "there's quite a range of things that are going to happen when you do that. The desired effects—drawing down carbon dioxide from the atmosphere and sequestering carbon in the deep sea—are only two of the possible consequences."[60] Apart from biological impacts, which are beyond the scope of this article, evidence suggests that phytoplankton can affect the physical properties of surface waters simply by absorbing light and heat from the sun.[61] According to Professor Watson, it follows that "by absorbing sunlight and heat, phytoplankton could also heat up surface waters. That would lead to higher atmospheric temperatures and further global warming."[62] As a result, the benefits of ocean fertilization are uncertain, and could include undesirable impacts on biological productivity and the sea's biochemistry.[63] In light of these uncertainties, a study published by the National Academy of Sciences argued that ocean iron fertilization constitutes "an immature technology" and that, given its "limitations and unknowns … the risks and costs currently outweigh the

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[56] IPCC, *Climate Change 2013: The Physical Science Basis, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press 2013) 471.

[57] National Geographic, 'Plankton' (National Geographic 2022) <https://education.nationalgeographic.org/resource/plankton-revealed/> accessed 25 February 2023.

[58] Raphael Sagarin and others, Iron Fertilization in the Ocean for Climate Mitigation: Legal, Economic, and Environmental Challenges, The Nicholas Institute for Environmental Policy Solutions (Duke University 2007) 2.

[59] ibid.

[60] Hugh Powell, 'What Are the Possible Side Effects? (*Oceanus, Journal of our Ocean Planet* 2008) <https://www.whoi.edu/oceanus/feature/what-are-the-possible-side-effects/> accessed 10 February 2023.

[61] ibid.

[62] ibid.

[63] National Research Council, *Climate Intervention: Carbon Dioxide Removal and Reliable Sequestration* (National Academies Press 2015) 61.

benefits."[64]

Moreover, ocean fertilization requires some clarity as to whether it falls within the exclusion from the ban of dumping as defined in the 1972 London Convention and 1996 Protocol (LC/LP). In fact, the LC/LP aims to "protect and preserve the marine environment from all sources of pollution," and to "prevent, reduce and where practicable eliminate pollution caused by dumping" of "waste or other matter.[65] In LC/LP, "dumping" is defined to mean the "deliberate disposal of waste or other matter at sea from vessels, aircraft, platforms, or other man-made structures."[66] However, it needs to be highlighted that the definition expressly excludes the "placement of matter for a purpose other than mere disposal thereof, provided that such placement is not contrary to the aims of the LC/LP mentioned above. [67] The side effects of iron fertilization include the risk of altering the biogenesis of phytoplankton per se which impacts the marine species and causes unwanted changes to the sea's biochemistry. Therefore, it could be argued that iron fertilization does not meet the aims established in UNCLOS and LC/LP and as a result it should not be permitted. In fact, the parties to the LC/LP have concluded that ocean fertilization projects may involve "dumping," at least in some circumstances and should be regarded as contrary to the aims of the LC/LP, because there is insufficient information about their "effectiveness and potential environmental impacts."[68]

The London Convention and Protocol went further and addressed the matter by adopting various resolutions on the method of fertilization. Its 2008 resolution concluded that the method falls within the objectives of the dumping definition and prohibited States from attempting ocean fertilization outside the scope of scientific research.[69] More recently, a new guidance published in 2013, required the parties to "prohibit ocean fertilization, except for legitimate scientific research authorized under a permit"[70] further raising the threshold.

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[64] ibid, 62.
[65] Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, Dec. 29, 1972, Art. I-II and Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters, Nov. 7, 1996, Art. III.
[66] ibid.
[67] Sagarin and others (n 58).
[68] Report of the Thirtieth Meeting of the Scientific Group of the London Convention and the First Meeting of the Scientific Group of the London Protocol, LC/SG 30/14 (July 25, 2007).
[69] IMO, London Convention/Protocol Resolution lc-lp.1(2008) on the regulation of geoengineering, adopted 31 October 2008.
[70] National Research Council (n 63).

Under UNCLOS, iron fertilisation could be permitted only for projects that are conducted for the purposes of research and is subject to Part XIII of UNCLOS, which establishes rules for "marine scientific research" ("MSR"). Under Article 206 of UNCLOS, before undertaking any activity which "may cause . . . significant and harmful changes to the marine environment," countries must "assess the potential effects" of the activity and publish the findings of that assessment.[71] However, due to the nature of this method and lack of scientific research it is not clear if iron fertilization could cause significant or harmful changes to the marine environment but as it was discussed above there may be negative effects.

Overall, it is vague how UNCLOS applies or could apply to iron fertilization and the regulation by the LC/LP does not provide sufficient guidance on the matter. Therefore, ocean fertilization showcases the insufficiencies found in the fragmented international legal system, under which in order to implement the rules effectively, there needs to be a combination of various international regimes such as the LC/LP and the United Nations Framework Convention on Climate Change, as a formal and universal mechanism to regulate this method is non-existent.[72]

This is a significant lacuna and demonstrates the limitations of both regimes to address the ultimate question of whether we should manipulate ocean processes in order to mitigate climate change. In this context, climate change highlights the need to reverse our traditional cultural values system which disfavours modifying one ecosystem to fix damage caused by humans in another. This is merely due to the fact that some sort of geoengineering may be essential to tackle the extent of the damage occurred by it.[73]

There is a new Agreement currently being negotiated in The United Nations called the "Biodiversity Beyond National Jurisdiction Agreement (BBNJ)" which aims to address the emerging issues that concern marine biodiversity in the climate change era. BBNJ will be established under UNCLOS but it is unclear at this stage as to whether and to what extent the BBNJ Agreement may also apply to ocean fertilisation and constitute a 'potential solution' to some of the gaps identified above. This is due

[71] Korey Silverman Roati and others, *Removing Carbon Dioxide Through Ocean Fertilization: Legitimisation: Legal Challenges and Opportunities* (Cambria Law School 2022) 25.
[72] ibid.
[73] Sagarin and others (n 58) 11.

to the fact that debates and negotiations are still taking place and therefore the international community still waits to see the outcome of the negotiations.

## VI. The challenges in climate change litigation

UNCLOS is a core legal organ, outside of the scope of climate change regime, which could be used for litigating climate change disputes. However, there are various issues that could arise under these circumstances, including: causation, attribution, the issue of establishing jurisdiction, liability and responsibility.[74] In particular, the difficulty is found on the claimant's inability to prove a causal link between the State's failure to meet its obligation and the damaging consequences of climate change on the marine environment on the other.[75] The difficulty in relation to the latter arise from the fact that most of the climate change effects appear delayed and therefore, it is hard to establish causation. It follows that it would be a challenge to measure the magnitude to which the State's contribution to climate change can be considered a sufficient legal cause for liability. Ambiguities such as the way that a state's contribution to climate change can be appropriately measured, the state's actual ability to mitigate pollution and the contribution of the state's activities to the global levels of pollution, [76] are factors that cannot be easily proved and pose great obstacles to litigation.

Moreover, the dispute settlement system under UNCLOS is problematic because raising a dispute in such a forum relies on the parties' willingness. Furthermore, the mechanism is only applicable under Part XV when there is a "dispute" that concerns either the "interpretation" or "application" of the Convention.[77] However, climate change case law demonstrates the insufficiency of UNCLOS to regulate matters that are beyond the Convention's interpretation. In particular, UNCLOS is weak in addressing disputes relating to the right to sue for breaches of duties that contribute to climate change, the suitability of available remedies and their sufficiency in compensating the affected party, the contribution of private

[74] Keely Boom, 'Exposure to Legal Risk for Climate Change Damage Under the UNFCCC, Kyoto Protocol and LOSC: A Case Study of Tuvalu and Australia' (Dphil thesis, University of Wollongong 2012) 229.
[75] Eric Biber, 'Climate Change, Causation, and Delayed Harm' (2008) 37 Hofstra Law Rev 975.
[76] Seokwoo Lee and Lowell Bautista, 'Part XII of the United Nations Convention on the Law of the Sea and the Duty to Mitigate against Climate Change: Making out a Claim, Causation, and Related Issues' (2018) 45 Ecology LQ 129, 153.
[77] UNCLOS, Art. 286.

corporations to the overall pollution level of a state and the appropriate sharing of responsibility for multiple wrongdoers. As a result, UNCLOS creates legal loopholes and fails to address such matters adequately.[78]

Finally, the next point of concern is the court's role in relation to climate change. In a world with a warming atmosphere, alteration of glaciers, and the rising of the seas, courts need to raise their voice. The International Court of Justice (ICJ), for example, could play a great role in future litigation concerning climate change as it is the principal judicial organ of the United Nations, maintaining a general subject matter jurisdiction at a global scale.[79] The rise in climate change cases will assist the ICJ's contributions to the evolution of the rules and through their existence and activity to raise consciousness on climate change mattes, they will help the international community understand what needs to be done as a matter of urgency, or if what is being done is sufficient.[80] Thus, climate change could potentially have a positive effect on UNCLOS by requiring the Courts to resolve ambiguities in the rules and evolve them through their interpretation in order to suit current needs.

## VII. Conclusion: The Way Forward

UNCLOS is under increasing scrutiny in light of climate change challenges, making its survival questionable. The climate crisis already challenges UNCLOS' strength to stand the test of time, and demands it adapt and develop new standards and rules within a unified framework.[81] Considering the deficiencies mentioned above, UNCLOS strives to strike a balance between stability and the need for change. The current practice focuses on interpreting UNCLOS so far as to address today's ambiguities and issues but it is uncertain what are the limits of the dynamic adaptation that the UNCLOS can reach, and whether the growing challenges can be effectively dealt within the current legal framework. Wider interpretation may seem difficult to follow and given the complexity of climate change, there needs to be more straightforward, certain, universal and clear rules as the degree of such unreasonable

[78] Boom (n 74).
[79] Roda Verheyen and Cathrin Zengerling, 'International Climate Change Cases' in Oliver Ruppel and others (eds), *Climate Change: International Law and Global Governance: Volume I: Legal Responses and Global Responsibility* (Nomos Verlagsgesellschaft 2013) 777.
[80] Philippe Sands, 'Climate Change and the Rule of Law: Adjudicating the Future in International Law' (2016) 28 Journal of Environmental Law 19, 22.
[81] Jill Barrett, 'The UN Convention on the Law of the Sea: a living treaty' in Jill Barrett and Richard Barnes (eds), *Law of the Sea: UNCLOS as a Living Treaty* (British Institute of International and Comparative Law 2016) 5.

complexity which adaptation could impose, works against the international community. Especially those in developing countries would struggle more as they lack environmental expertise and funding, thus rendering the rules for them hard to follow, undermining the collective effort to tackle climate change.

Furthermore, instead of reforming a unified legal framework, the evolution has taken place outside the basis of UNCLOS, with various instruments being in place such as The Paris Agreement or the UNFCCC, resulting in a complicated patchwork of exceptions and supplementary clauses, contributing further to the fragmentation of international law. On the other hand, someone could argue that any attempted improvements of UNCLOS would open the doors to a flood of litigation in order to clarify the new wording and would create much hassle for States adapting to the new policies. Although this perception seems sensible at first sight, considering the immortalisation of an obsolete legal framework that does not adequately serve the world and do not solve the problems occurring by climate change as being excluded from any improvement is excessive and irrational.

Undoubtably, climate change is a great crisis that has a significant impact in all aspects of society. The law should follow these changes and should not be an obstacle in responding to such challenges. It follows from all the above, that UNCLOS has been affected in various ways by climate change, proving to be a weak instrument in addressing the climate crisis alone. Therefore, it should be amended in order to take into account the emerging threats that arise from climate change. This could be done by including future-proof elements, ie. rules which have been drafted considering scientific predictions, contributing to the legislation's effectiveness and longevity. This would result in creating an integrated, harmonious and effective legal framework for the world and generations that follow.