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Wind Energy on the High Seas: Regulatory Challenges for a Science Fiction Future

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Abstract: This paper aims to study the current regulation and governance of wind energy turbines on the high seas and detect regulatory challenges. We focus on the existing regulatory framework to develop marine wind farms in areas beyond national jurisdiction (ABNJ), the nature of wind farms and wind turbines in said areas, and which governance schemes and institutions ought to coordinate and regulate any future marine wind energy development. Our research shows that under public international law, the deployment of wind turbines on (most parts of) the high seas for all States is possible, but many issues still remain, either thinly regulated or unanswered. We inquire where, by whom, and how can marine wind parks be built on the high seas according to public international law and the United Nations Convention on the Law of the Sea (the LOSC). Lastly, we evaluate the possible role of marine spatial planning (MSP) in developing wind energy on the high seas.

Keywords: high seas; wind energy; renewable energy; climate change; spatial planning; public international law



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1. Introduction

1.1. Sea Spaces as Energy and Climate Change Engines

The ongoing climate change crisis creates an avalanche effect in the energy sector. Renewable energy projects are built daily across the globe. Wind farms, solar panels and hydropower plants are being installed at a tremendous pace. By 2030, it is expected that worldwide installations will reach a total installed capacity of 190 Gigawatts (GW), accruing to an estimated \$700 billion in investment [1]. Offshore wind projects, which we refer to in this paper as *marine wind projects*, are often seen as one of the best alternatives to scale up renewable energy production. Our reason for using this name is based on some of our previous work. When referring to hydrocarbon platforms installed on the sea, Radovich has argued that they should be described as ‘marine’ or ‘sea’ installations rather than ‘offshore’ installations. The word ‘offshore’ is focused on the land, the shore, not on the sea. The use of the word offshore was understandable 80 years ago when the exploration and exploitation of hydrocarbon resources in the sea started and was carried out close to the shore. However, the renewable energy installations we refer to in this paper are deemed to be installed at sea, on the high seas, far away from the shore. In order to conserve the sea, we shall first name it [2]. There are several reasons for this: they seem to generate fewer conflicts with different stakeholders [3], do not occupy space that is needed for the production of food, and there is vast marine wind potential to produce renewable energy. Additionally, technological development has dramatically reduced its cost per GW of installed capacity [1], even if the levelized cost of electricity production from offshore wind is still higher than other renewable energy technologies, such as onshore wind or solar photovoltaics [4].

Marine wind projects are part of the Blue Economy, the sustainable and integrated development of economic sectors in healthy oceans [5], as they utilize the sea as a provider of ecosystem services, defined from an economic point of view as the contribution of the natural world to generating goods and services that people value [6]. At the same time, there is a close link between the protection and use of the ocean and climate change, acknowledging that as the ocean is a provisioner for humankind, States and other stakeholders have an obligation to govern and utilize it sustainably. In 2015, progress was made in the regulation of the relationship between climate change and the ocean, as the ocean for the first time was specifically mentioned within the ecosystems that shall be preserved in their integrity from climate change in the Paris Agreement [7], a result of the N° 21 COP (Conference of the Parties) to the United Nations Framework Convention on Climate Change (UNFCCC) [8].

More recently, the Intergovernmental Oceanographic Commission (IOC), a United Nations (UN) body, declared the Oceanic Science Decade for Sustainable Development (2021–2030), a ten-year programme of joint action to advance research and technological innovation towards compliance with Sustainable Development Goal 14 relating to the sustainable conservation of oceans.

The marine energy literature stresses the potential of oceans as a source of renewable energy and for this energy to mitigate climate change in the long term [9–11]. The International Energy Agency (IEA) forecasts that the oceans have the potential to generate 20,000–80,000 Terawatt-hours (TWh) per year [12]. The literature, however, acknowledges that the deployment of wind farms may also impact the environment [13,14]. The advancement of wind technology is facilitating and materializing the installation of larger and more powerful turbines in deeper waters, where wind flows are stronger and more stable [15]. This leads to both higher production of wind energy and a reduction in its cost.

To date, all marine wind energy projects have been conducted in waters under national jurisdiction—in territorial waters or beyond. Nowhere has a viable marine wind project been proposed 200 nautical miles outside of any nation State; in other words, on the high seas (Art. 86 LOSC). However, the marine areas beyond national jurisdiction (ABNJ) cover nearly half of the Earth's surface [16] and include some of the world's best wind resources [17–21]. The ABNJ includes the high seas and the Area (Art. 1.4 BBNJ Draft Agreement) [22]. The Area is regulated by the LOSC [23], and it comprises the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction (Art. 1.1 LOSC). As we discuss in Section 3.3, wind turbines located on the high seas will utilize the seabed and thus the Area, creating interesting legal issues.

1.2. Research Focus and Methodology

The relationship between the governance of ABNJ and marine wind energy is the subject of this paper. While there is acknowledgment in the climate change legal framework of the significance of renewable energy production at sea, i.e., the Clean Development Mechanism under the Kyoto Protocol to the UNFCCC [9,24], there is scant analysis on the interface between the regulation of wind energy installations on the high seas [17,25,26].

Our main research question is whether it is legally possible, and, if so, under which circumstances for States to construct and/or authorize the construction of wind turbines and wind parks. This is a topic that has received, so far, little attention in the literature. However, technological development and marine renewable energy ambitions may open possibilities for wind energy harnessing in ABNJ, making our contribution timely.

We aim to engage in this discussion by focusing on the existing regulatory framework to develop marine wind farms in ABNJ, the nature of wind farms and wind turbines in said areas and which governance schemes and institutions that ought to coordinate and regulate any future marine wind energy development.

To conduct our research, we employ a combination of legal methodologies. We use the doctrinal legal approach, focused on the letter of the law as the binding and applicable rules to high seas spaces and potential renewable energy. This is a typically qualitative analysis where we focus on the content and meaning of the law as it is (*de lege lata*). However, based

on this analysis we conclude on the need to revisit the existing framework to better consider the interest of other States and environmental protection (*de lege ferenda*). We have focused on legal research on the applicable public international rules to this matter, leaving aside any national law considerations. Central to our research are the LOSC provisions as the instrument that to date has the most extensive regulation of ABNJ. Our research also looks beyond a pure doctrinal legal analysis, and it draws inspiration from the technological development around marine renewable energy technologies. To do so, we employ law in context as an additional methodology.

2. Wind beyond National Jurisdictions: Possibilities and Fiction

As the number of human activities on the sea is proliferating and diversifying, ocean space becomes more valuable and increasingly scarce. Navigation, fishing, cables, hydro-carbon platforms and, in recent times, renewable energy installations all need ocean space. Areas located near the coast are becoming overwhelmed by the different uses and users. Not all areas are the same, however. Some preclude any sea uses as nature sanctuaries, while in others human activity is allowed. When allowed, some areas have several uses and others, while others have exclusive uses. This area and use allocation are typical decisions made by local or national authorities as part of the adoption of marine/maritime plans.

Wind projects are space-intensive [27]. Marine wind farms occupy large surface and seabed areas. The sea area affected by a project is determined by the farm's installed capacity and the turbines' characteristics. The larger the turbine, the less space is needed for the same installed capacity. This relationship between space and power is the capacity density factor. Current projects in Europe are estimated to have a capacity density of between 5 MW/km² and 5.4 MW/km², and in 2021 Siemens Gamesa estimated that farms have an average size of 788 MW [28], with an average size of 157.6 km² [29]. However, large projects are much bigger than this; Hornsea Two, located in the UK, is estimated to cover an area of more than 460 km² [30]—almost 1.5 times the size of Malta (320 km²).

With the rapid increase in the number of installed and approved projects, the prime locations near the coast are being filled up as more areas are licensed and competition intensifies, and licensed areas are typically given with exclusivity for one project [31]. This means that space in some sea areas is becoming scarce and project developers are left with less optimal spots to build projects. An example of this project proliferation is the North Sea where wind projects are fighting for sea room with fisheries [27], shipping routes, or where wind farms are being affected by one another due to wind turbine wakes [32]. This development is likely to repeat itself in other areas, such as the Baltic Sea, the Mediterranean Sea, the Black Sea or the South China Sea.

The high seas represent a yet-to-be-exploited area when it comes to the development and construction of marine energy projects. Space is not a problem there. The high seas are the largest area of marine space, covering 219 million km² of a total of 361 million km² of ocean space, and thereby covering more than 60 per cent of it [33,34]. Thus, expansion towards the high seas is not unthinkable. A few years ago, this might have sounded like science fiction [35], but it may well be a reality within a couple of decades.

In addition to the availability of space, the literature indicates that some of the world's best wind resources, in terms of average wind speed, are located in ABNJ. This can be clearly seen in Figure 1 below. Wind speed varies substantially across the globe. Generally speaking, strong winds of more than 11 m/s are found in open sea spaces between 40° and 60° North and South of the Equator, while there is less wind in the tropical regions, usually below 7 m/s [17]. The areas with the average highest wind speed and availability are located near the South Pole.

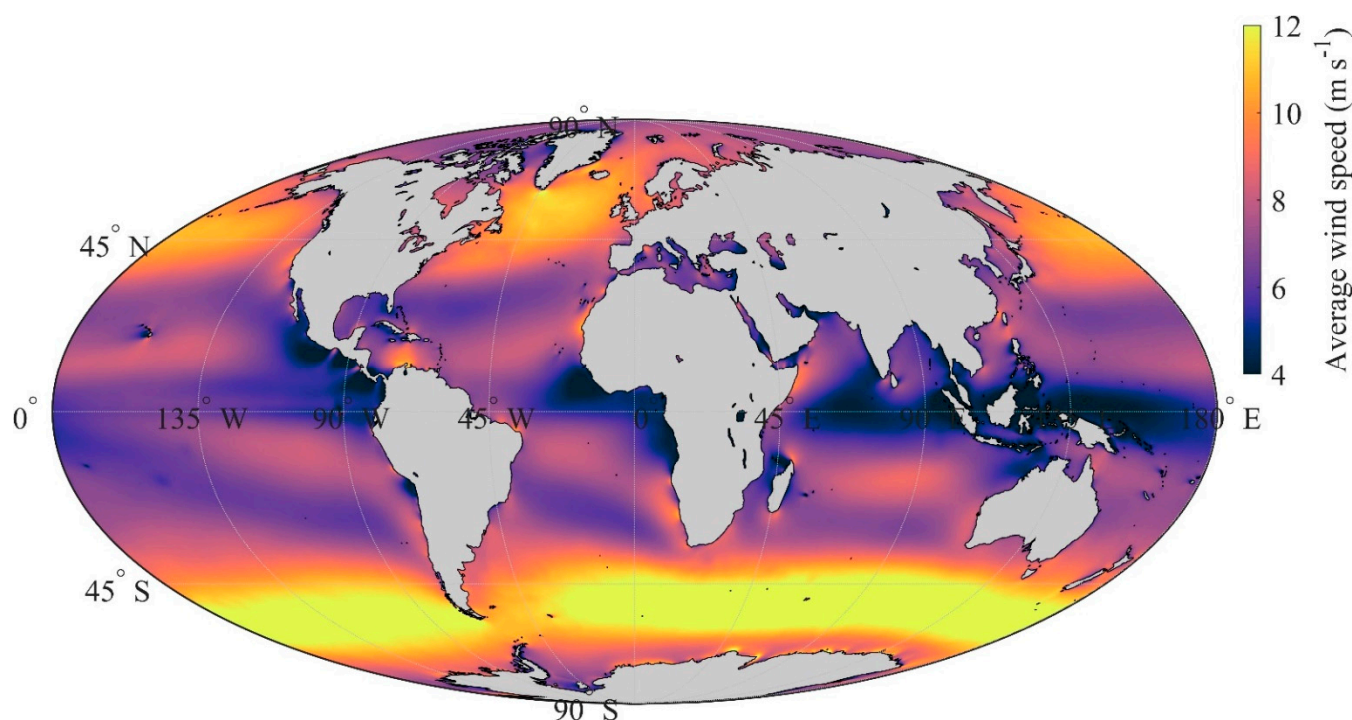


Figure 1. Global offshore hourly mean wind speed at 100 m above sea level computed using the ERA5 reanalysis database from 2010 to 2020.

Furthermore, technological developments are advancing quickly, making it possible for turbines to be installed in deeper waters, particularly floating ones. Floating wind turbines are a minor fraction of the offshore wind market, with only 0.25% of the global installed capacity in 2019 [36]. However, the development of technology and the use of this is spreading quickly. Nowadays, medium-sized floating wind farms are being constructed to power oil and gas rigs, such as the 88 MW Hywind Tampen project in Norway [37,38], but also to supply electricity to end consumers on shore, such as the Kincardine Offshore Windfarm in Aberdeen, Scotland with 50 MW or the smaller WindFloat Atlantic, outside Viana do Castelo, Portugal, with 25 MW [39]. In addition to being larger in size, floating turbines are now able to be situated in much deeper waters. Iberdrola reports that current pilot projects may operate in water depths of up to 800 m [40], while other reports are even more encouraging, indicating the technical possibility of reaching depths of 1250 m, without this being an absolute technical limit [41]. Currently, a new type of mobile floating wind turbines, intended to be designed for the electrification of oil and gas platforms, are being tested, with plans for these to be operative in 2024 [42,43]. Mobile and floating do not mean that they are not moored (or anchored) to the seabed; it means that they have been developed to be moved to different locations from time to time. These prototypes, like floating turbines, are moored to the seabed but “designed to be (relatively) easily detached from cables, other umbilicals, and mooring lines” [43].

The transmission of electricity from the high seas to the coast where it will be consumed is still a very important hurdle (electricity is lost over distance and transmission lines are expensive to build). However, new uses of electricity at sea are emerging: for example, electrical ships including container/cargo ships, such as the Yara Birkeland, which has been in operation in Norway since 2021 [44], and in China, there are plans to develop electric cruise ships [45]. Electricity produced on the high seas could be used to refuel vessels with renewable energy. With the increased use of hydrogen as an energy source and carrier, wind farms may be utilized to produce it and then hydrogen can be exported in pipelines (with no energy losses) or by boats to the coast [46–48].

This combination of technological development and wind conditions is not going unnoticed by researchers and potential project developers. As discussed by Elsner and

Suarez, there are suitable locations on the high seas for projects both in shallow and deep waters. Examples are the Mascarene Plateau in the Indian Ocean and the Grand Banks in the North Atlantic, and the Grand Banks/Flemish Cap or the Rockall Bank/Hatton Ridge in the North Atlantic, respectively [17].

From a legal standpoint, developing wind farms in ABNJ could be attractive for developers initially. As we discuss below, the governance framework of the ocean beyond national jurisdiction is underdeveloped. In principle, one might be tempted to say that wind projects would mostly be exempted from national control. However, if there were no rules that applied to the development of marine wind farms, this would lead to issues of fairness, allocation, use of what is meant to be a common resource for the benefit of individuals, environmental concerns and conflict [25].

In the following sections of this paper, we discuss what legal regime applies to marine wind projects in ABNJ, what sort of legal classification wind turbines would fall within, and which regulatory frameworks and alternatives that may be adopted beyond the existing rules.

3. The High Seas Governance Framework for Marine Wind Projects

3.1. Introduction

The legal framework for ocean governance in ABNJ has undergone an important evolution that is not necessarily linear. Historically, the high seas were an area in which international law dominated, largely influenced by the concept of freedom of the seas proposed by Grotius in 1609 in his work *Mare Liberum*. This was because the territorial sea was a novel concept covering less nautical miles than now, and the exclusive economic zone (EEZ), or the continental shelf had been recognized only somewhat recently as areas under national jurisdiction [49]. By the mid-twentieth century, the high seas had lost much of their importance.

However, legal developments, with the LOSC at the forefront creating a convention-based regime for ABNJ, and an increase in the need for global ocean management have led to a myriad of instruments creating rules for the protection of the sea environment as well as the regulation of human activity in these waters. Currently, the high seas are regulated by a fragmented and uncoordinated set of norms. There are at least 190 multi- and bi-lateral agreements addressing a spectrum of issues affecting the oceans [50]. We have gone, therefore, from *Mare Liberum* to understanding the high seas as a managed common area, restricting what was once thought to be the unlimited freedom of mankind in this area.

The cornerstone of marine wind farm regulation in ABNJ is the LOSC, as discussed in detail in the literature by a handful of authors [17,35], despite the fact that this convention does not include any provisions for dealing with wind energy exploitation per se. In fact, it is debatable whether the LOSC has created an adequate or even sufficient regulatory framework for renewable energy to be produced on the high seas, and the right of States and commercial actors to do so remains uncertain [35].

Due to this uncertainty—or more accurately—lack of an adequate and comprehensive international regulatory framework for renewable energy, but more generally regarding the regulation of the high seas, the UN has initiated a process to convene an Intergovernmental Conference (IGC) to consider the recommendations of the Preparatory Committee established by Resolution 69/292 of 19 June 2015. This resolution kickstarted the preparation of the proposal for an agreement of an international legally binding instrument under the LOSC on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ). However, the instrument being negotiated has a focus on biodiversity and marine life, not on renewable energy and the word energy is not even mentioned in the last June 2022 draft.

3.2. What Legal Regime Covers Marine Wind Activity on the High Seas?

There is consensus in the literature that the LOSC constitutes the key instrument for marine wind installations in ABNJ. Regarding the high seas, the LOSC is considered to codify customary public international law, meaning that in principle a similar regime would apply to non-LOSC parties [51,52]. That said, the regime in place is scant and there are no rules that apply specifically to wind energy exploitation on the high seas, in contrast to the regime that applies to fisheries (Arts. 116 to 120 LOSC), or deep seabed mining in the Area (Part XI LOSC).

Art. 86 LOSC defines the high seas as sea areas outside the EEZ, the territorial sea or the internal waters of a State or the archipelagic waters of an archipelagic State. In these spaces, “sovereign claims purportedly made in respect of the high seas are invalid” [53]. This means that the sovereignty and control of States do not extend to the high seas.

However, States exercise jurisdiction and control over ships. This form of authority means that a ship on the seas must fly the flag of a single State and be subject to the jurisdiction of that State, on the high seas and in other parts of the sea (Art. 91 LOSC). Having a flag associated with a State grants the ship a nationality and it means that this State has granted it the right to sail. The State, in turn, has some responsibility for the behaviour of the ship at sea, including administrative, technical and social matters (Art. 94 LOSC) [54]. We will return to this principle when we discuss the nature of wind turbines.

Art. 87.1 1 LOSC declares that all States, whether coastal or land-locked, enjoy high seas freedoms. These include, *inter alia*, the freedom of navigation, the freedom to lay submarine cables and pipelines, the freedom to construct artificial islands and other installations, the freedom to fish and to carry out scientific research. However, the production of energy from wind, currents or waves, an activity which is explicitly mentioned as under the jurisdiction and control of the coastal State within the EEZ, is not explicitly mentioned as a high seas freedom.

Harnessing marine energy in ABNJ would fall into a residual category of the principle of freedom on the high seas. Not listed among the six categories enumerated by Art. 87, or regulated explicitly, energy production could still be enjoyed by all States, whether coastal or land-locked, if there is due regard for the interest of other States in their own exercise of the freedom of the high seas (Art. 87.2 LOSC). Elsner and Suarez, however, are of the opinion that marine wind energy production could be either an exercise of the freedom of navigation or the freedom to construct artificial islands and other installations, following the rules of Part VI LOSC, which deals with the continental shelf. It all hinges on whether turbines and wind parts are considered to be ships or structures or installations, a point which we discuss further in the article [17].

While the LOSC creates a wide high seas freedom to States, Art. 87.2 LOSC limits it when it states that: “[t]hese freedoms shall be exercised by all States with due regard for the interests of other States in their exercise of the freedom of the high seas, and also with due regard for the rights under this Convention with respect to activities in the Area”.

Thus, the LOSC imposes an obligation of balancing interests and to some degree requires international coordination. As we have mentioned, a coherent international regulation on this topic is lacking. Moreover, the above paragraph shows that under the current regulation, no renewable energy platform may be installed on the high seas, without creating conflict with the interests of other States. Part of the literature goes as far as indicating that based on this obligation of due regard no wind parks may be built [26], an opinion which for us goes too far based on a reading of the LOSC as a whole. Further, the expression “due regard” needs clarification. Renewable energy installations need considerable space on the sea and require a safety zone around them. Additionally, depending on the characteristics of the marine wind installation, other uses of the space where the platforms are installed like shipping, fishing or exploitation may be precluded.

The potential conflict between different sea uses and the express reference to “due regard” points out the need for coordination between States exercising their high seas freedom. Moreover, and as we discuss in Section 5 of this paper, due regard for the interest

of other States prompts the question of whether there should be an international authority in charge of both the granting of permits for the construction of these installations and controlling the application of the precautionary principle in the development of these activities on the high seas, as mandated by Art. 87.2 LOSC. As we discuss more in detail in Section 5, establishing such an authority will permit it to act in coordination with the International Seabed Authority (ISA), the authority that organizes and controls activities in the Area. Alternatively, if reformed, ISA itself may be granted the authority to grant permissions for the construction of wind parks on the high seas. With the current regulation, there is no mandatory requirement to obtain authorization from the ISA to use the seabed in the Area as this only becomes necessary when it comes to the exploitation of resources in it.

Ships or Structures?

With the development of hydrocarbon platforms on the sea, their legal status has become an object of study in international law. This discussion is of relevance to determine the nature of wind turbines. The first question is whether any type of hydrocarbon platform (and by analogy wind turbines) may be considered to be a ship. If hydrocarbon platforms are classified as ships, international law rules and provisions would also be applicable to these platforms, such as the law of flag, the arrest of ships, collision, pollution and salvage, limitation of liability. If they are not considered ships, then they are classified as installations.

Back in 1991, Finland filed an action against Denmark before the International Court of Justice (ICJ), alleging that the defendant did not grant the right of innocent passage to an oil rig through its territory because it did not consider it to be a ship. Eventually, the parties settled before judgment, so the ICJ did not decide whether or not the platform could be considered a ship [55].

The LOSC does not define the term “ship” or “vessel”. The 1986 UN Convention on the Conditions for Registration of Ships [56] defines a “ship” as “any self-propelled sea-going vessel used in the international seaborne trade for the transport of goods, passengers, or both with the exception of vessels less than 500 gross registered tonnes”. This definition contains some of the essential elements of the normal description of a “ship”. For example, they are self-propelled and sea-going. Mobile oil platforms sometimes share some of these characteristics but may not be considered ships if they are not used for the transport of goods or passengers [57]. This logic is also applicable to the case of floating wind turbines.

Art. 1.1(5)(a) LOSC defines “dumping” as: “any deliberate disposal of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea”. This provision shows that the LOSC makes a distinction between “vessels”, platforms and other structures.

Some maritime law conventions, for example, the International Convention on Civil Liability for Oil Pollution Damage 1969 (CLC) [58] and the 1989 International Convention on Salvage (Salvage Convention) [59], specifically leave platforms outside the definition of ship. For instance, Art. 1.1 CLC defines “ship” as “any seagoing vessel and any seaborne craft of any type whatsoever, actually carrying oil in bulk as cargo”. Therefore, this Convention is not applicable to either hydrocarbon or wind turbines. Mobile oil platforms may carry people and certain oil-related facilities, but they are not designed to transport oil in bulk as cargo.

In Art. 1b(b) the Salvage Convention defines “vessel” as “any ship or craft, or any structure capable of navigation”. Therefore, wind turbines are not covered by the Salvage Convention. The main aim of vessels is navigation, as it is clear that the main aim of both wind turbines and wind parks is not navigation but producing wind renewable energy. Following this line of thought, Esmaeili says that navigation or the ability to navigate appears to be a principal element in the definition of a ship [57].

Moreover, the 1969 International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (Intervention 69) [60] states: “ship means: (a) any

sea going vessel of any type whatsoever, and (b) any floating craft, with the exception of an installation or device engaged in the exploration and exploitation of the resources of the seabed and the ocean floor and subsoil thereof". Oil platforms, of whatever kind, are clearly excluded from the definition of 'ship' in this Convention. However, mobile drilling units on their way to or from their sites may be considered as floating craft and thereby fit the "ship" definition in the Convention. Again, wind mobile platforms may not be considered ships within the scope of this Convention; their main aim is not navigation, as they are moored to the seabed and not autonomically on their way to or from sites.

The International Convention for Prevention of Pollution from Ships (MARPOL 73/78) [61] includes mobile platforms within their definitions of ship; consequently, their provisions may apply to mobile wind turbines [43]. However, MARPOL is not applicable to either operative pollution—pollution derived from the daily activities of the platforms—or atmospheric pollution [2]; only to accidental pollution.

Further, as Esmaili states, until the late 1980s international conventions either employed the terms "vessel" or "ship" without further description or only gave a generalized definition without specific remarks in relation to oil rigs or wind turbines. This was primarily because oil platforms were not as important in the law of the sea in the past as they have been since the early 1980s and wind turbines at sea were not a reality until the early 1990s [57].

In conclusion, with regard to wind turbines, from a common-sense point of view, they lack the capacity of navigation. Moreover, wind turbines are not crewed by a captain and crew, as is the case for floating oil platforms. Wind turbines, bottom fixed and floating, are therefore installed to remain in place for a long period and not to navigate. Thus, in our view, wind turbines should not be generally considered as ships based on the interpretation of general international law provisions. This applies even to mobile wind turbines, at least under the current not-crewed prototypes, as they have no self-propulsion properties. However, as stressed by Severance, in the future some States might argue that future floating and mobile wind turbines are less permanently situated, making them inclined to argue that they are ships [43]. This is an area in which technological development might adjust the legal nature of a wind turbine.

Not being ships or vessels, under the LOSC, wind turbines fall into the category of installations and structures, an opinion shared in the literature [43,62]. This is because Art. 60.1 LOSC specifically mentions that in the EEZ, the coastal State has the exclusive right to construct and to authorize and regulate the construction, operation and use of: "(b) installations and structures for the purposes provided for in Art. 56 and other economic purposes". For the time being, wind turbines are deployed at sea and attached to the seabed with the purpose of being located in the same spot for a period (typically long, up to 30 years) to exploit economic resources, a possibility allowed for by Art. 56.1(a) LOSC. Like in the case of ships, installations and/or structures, such as wind turbines, are registered before a national authority, and therefore, are typically assigned a flag.

3.3. May Marine Parks Be Operated on the High Seas under the Flag State Principle: Implications Brought by the Area?

Defining the nature of marine wind turbines located on the high seas for the purposes of public international law does not really answer the question of whether it is possible to operate them under the current LOSC regime. Currently, the scant literature highlights the fact that if the flag State principle (or an adaptation of it) [26] applies to marine wind turbines, States may authorize the installation and operation of marine wind parks under their national law. However, such an approach can be criticized as it could generate controversies surrounding the high seas freedoms and respect for the rights of other States, as well as the individual use of resources that are deemed to belong to humankind. In this section, we revisit this question to determine if, under the LOSC, States have the right to authorize the construction and operation of marine wind projects in both the high seas and the Area, the latter being an aspect that has been under-discussed to date.

Wind turbines occupy space over the water column, in the water column, the seabed and ocean floor and subsoil thereof. Both bottom-fixed and floating wind turbines are attached to the seabed and ocean floor. The simplest of turbines, monopile ones, are anchored directly to the seabed and the foundation is buried at a depth of about 30 m. More complex models, with more anchoring points, such as jacket turbines that can be placed in deeper waters, are buried even deeper into the seabed [63]. Floating turbines are anchored to the seabed connecting the mooring systems of the turbines to the seabed [63]. Despite their name, they do not just float. This means that all turbine types actively utilize the Area, as defined by Art. 1.1 LOSC. Thus, the rules concerning the use of the Area must be considered when determining whether or not wind farms can be placed on the high seas and in defining the extent to which the flag State principle and derived rules may apply.

Art. 87 LOSC is key when discussing whether or not wind turbines might be operated on the high seas and governed by the flag State principle. This article establishes that the freedom to construct artificial islands and other installations is subject to the rules that apply to them in the continental shelf, which in turn are governed by those that apply in the EEZ (Arts. 80 and 60 LOSC, respectively). Under this regime, high seas marine wind parks would not qualify as islands or generate any territorial sea of their own nor would they have impact on the delimitation of EEZ or the continental shelf of the constructing State (Art. 60.8 LOSC). This is consistent with the principle that no State may link any part of the high seas to its sovereignty (Art. 89 LOSC).

Thus, under the *mutatis mutandis* application of these rules, States may authorize the construction of marine wind parks. They can do this as if they had sovereign rights to exploit wind resources (Art. 56.1(a) and Art. 77.1 LOSC), having “exclusive jurisdiction over such artificial islands, installations and structures, including jurisdiction with regard to customs, fiscal, health, safety and immigration laws and regulations” (Art. 60.2 LOSC). The LOSC creates a few basic obligations that apply to the high seas as well. First, due notice must be given of the construction of the marine wind parks and warning given of their presence. Second, national decommissioning rules and eventually abandoning wind parks must comply with basic international standards [64]. Third, safety zones around the installations must be implemented, not exceeding 500 m. Lastly, installing marine wind parks on the high seas should not interfere with the use of recognized sea lanes for international navigation.

As mentioned, the installation of marine wind parks on the high seas also involves the use of the Area (the seabed located therein) to moor the turbines. In the LOSC, the rules relating to the construction, operation and use of artificial islands or installations for economic purposes in the EEZ and the continental shelf do not have any direct link with the use of the Area. However, Art. 87 LOSC does subjugate the right to build installations on the high seas to paying “due regard for the rights under this Convention with respect to activities in the Area”. This, therefore, warrants some discussion. The LOSC clarifies that the Area, comprising “the seabed and ocean floor and Subsoil thereof, beyond the limits of national jurisdiction” (Art. 1.1 LOSC) and its resources are the common heritage of mankind (Art. 136 LOSC). Similarly to the high seas, “(n)o State shall claim or exercise sovereignty or sovereign rights over any part of the Area or its resources, nor shall any State or natural or juridical person appropriate any part thereof” (Art. 137 LOSC). Rights connected to the resources in the Area are coordinated by the ISA (Art. 156 LOSC) and belong to mankind.

The question arising from the basic rules relating to the Area as a common heritage of mankind is whether the exercise of any rights coastal States might have derived from the freedom to construct, operate and use them may be done freely, it cannot be done, or if this use needs to be coordinated by the ISA. An interpretation of the relevant LOSC provisions seems to leave the matter up for discussion. Due to the complexity of the topic, we acknowledge that this is an issue ripe for future research and upon which we restrict ourselves to highlighting different interpretative avenues seeking clarification.

On the one hand, an interpretation of the rules seems to indicate that States are not free to exercise rights that allow them to install wind parks on the seabed of the Area, or at least not without the coordination of the ISA. As indicated, the construction of marine wind parks requires turbines to be moored to the seabed. Mooring turbines to the seabed would be done as part of the sovereign rights to build and operate artificial installations on the high seas as derived from Art. 87 LOSC. However, this seems to be contrary to an isolated and textual reading of Art. 137 LOSC which establishes that “[n]o State shall claim or exercise sovereignty or sovereign rights over any part of the Area or its resources, nor shall any State or natural or juridical person appropriate any part thereof”. There seems, therefore, to be a contradiction between these provisions.

On the other hand, several provisions seem to indicate that any State may use the seabed of the Area at their free will without the need to ask for ISA coordination. A restrictive interpretation of Art. 137 LOSC would render the right to install artificial islands or installations on the high seas inoperable, rendering Art. 87 LOSC moot. The LOSC is clear: States have the right to install wind parks on the high seas, subject to the limitations imposed by international law, due regard and the limits imposed by the use of the Area. This means that there might be limits or it might be necessary to coordinate the use of the seabed, but that States may build marine wind parks on the high seas.

If this interpretation is accepted, then a subsequent question is whether there is a need for the ISA to coordinate the activities. Our analysis of the LOSC indicates that currently there is no mandatory requirement to obtain authorization from the ISA to use the seabed in the Area as this only becomes necessary when resources in it are exploited. Art. 1.1. LOSC defines “Activities in the Area” as “all activities of exploration for, and exploitation of, the resources of the Area”. As stated, the LOSC defines the Area and its resources as the common heritage of mankind (Art. 136). These resources are distinguished from the Area itself or its use. Mooring a turbine to the seabed, constructing it and operating it is an activity that takes place in the water column of the high seas and in the seabed part of the Area, but it does not imply a claim or exploitation of the resources in the Area. The word “resources” might be interpreted as implying minerals or other goods contained in or at the Area but not the seabed itself. Art. 133 LOSC clarifies that the word “resources” refers to “all solid, liquid or gaseous mineral resources in situ in the Area at or beneath the seabed, including polymetallic nodules”, and clarifies that resources once recovered are to be defined as minerals. Art. 137 LOSC explicitly gives the ISA authority to authorize the alienation of these resources.

Furthermore, a reading of the provisions related to the activities conducted by the ISA and their own attribution of functions indicate that the ISA has the authority to “organize and control all mineral-resources-related activities in the Area for the benefit of mankind as a whole” [65], a role which has been discussed in the literature [66]. Thus, while LOSC does explicitly mention that the ISA has the power to grant permissions for activities in the Area (Art. 152) and to organize and control activities in the Area, this is “particularly with a view to administering the resources of the Area” (Art. 157.1 LOSC).

Summing up, our research indicates that all States—and not only coastal States—may resort to the flag State principle to govern the construction and operation of marine wind parks on the high seas. This is done as an extension of the freedom to construct artificial installations and ought to comply with the minimum requirements that are set by Art. 60 LOSC. More uncertainty exists, however, over the interplay of these rules and the utilization of the seabed located in the Area. We have pointed out that it seems to be possible to utilize the seabed, provided its mineral resources are not exploited, without authorization from the ISA but this is an unsettled legal issue. However, an independent authority needs to coordinate and grant these permissions in order to guarantee that due regard for the interests of other States is respected, as mandated by Section 2 Art. 87 LOSC.

3.4. Safety Zones

Renewable energy structures, particularly wind turbines and wind farms, need considerable space on the sea and require a safety zone around them. A safety zone would usually imply that no shipping, fishing or exploitation of other resources may take place in the space where platforms are installed. The literature, however, shows that exceptions have been made, allowing fishing to take place within marine wind parks in several countries [27].

Art. 60.4 LOSC establishes that in the EEZ “the coastal State may, where necessary, establish reasonable safety zones around such artificial islands, installations and structures in which it may take appropriate measures to ensure the safety of both navigation and the artificial islands, installations and structures”.

Art. 60.5 LOSC states that “such zones shall be designed to ensure that they are reasonably related to the nature and function of the artificial islands, installations or structures, and shall not exceed a distance of 500 m around them, measured from each point of their outer edge, except as authorized by generally accepted international standards or as recommended by the competent international organization”. It shall be determined by competent authorities if this distance of 500 m is adequate concerning renewable wind energy structures on the high seas, or if it needs to be higher.

As Elsner and Suarez argue [17], there are rules for the safety of navigation and other maritime safety rules relevant to the hydrocarbons industries. These provisions have been established by the International Maritime Organization (IMO) in the context of extractive industries. For example, the IMO Resolution A.671(16) on safety zones and safety of navigation around marine installations applies to for extractive industries on the EEZ or the continental shelf. Therefore, it does not answer the challenges posed by wind parks to navigation. It should be role of the international community through the IMO or other organizations to develop safety of navigation rules for wind park facilities on the high seas.

Art. 147.2.(c). LOSC also states that safety zones shall be established around installations in the Area with appropriate markings to ensure the safety of both navigation and the installations. This provision is relevant considering that wind turbines are installed in the area or moored to it. The configuration and location of such safety zones shall not be such as to form a belt impeding the lawful access of shipping to particular maritime zones or navigation along international sea lanes.

3.5. Rules Applicable to the Network

The LOSC sets basic but sufficient rules related to the construction of the electricity cable network that would eventually be installed for marine wind parks on the high seas [17]. States have the freedom to “lay submarine cables and pipelines” on the high seas (Art. 87.1(c) LOSC), subject to the provisions governing the issue in the EEZ and continental shelf.

The main rule is that there is no need to require permission from any State or from the ISA to lay cables on the high seas. However, due regard shall be paid to cables or pipelines already in position (Art. 79.5 LOSC). Despite that electricity transport cables could be installed under the seabed and not only over it, the Area and its regulation are not explicitly mentioned. However, the main principles apply, States (and developers) must pay due regard to the freedom of other States when laying out cables in or over the Areas. The control and regulation of these cables would follow the flag State principle, therefore and in principle, the rules applicable to the cable will be those applying to the marine wind park. If these cables extend and enter the continental shelf, and/or the seabed of the territorial sea of a coastal State, then the specific provisions for those circumstances apply.

3.6. Decommissioning on the High Seas

The decommissioning of marine wind turbines is a topic that has seen little discussion or regulation at the national level. On the high seas, the regulation and requirements set by the LOSC is scant, to say the least. The LOSC does not set any specific requirements

in relation to the removal obligation of these installations [64], a point also remarked by Elsner and Suarez [17]. However, as the construction of artificial installations and artificial islands must follow the rules applicable to them according to the continental shelf and the EEZ governing provisions, we may apply the respective rules about decommissioning in these spaces [67]. Art. 60.3 LOSC sets a decommissioning regime based on a full removal obligation. Exceptionally, the LOSC allows the installations to be left in place. Decommissioning obligations are imposed primarily to protect navigation, but also the environment [64]. Interestingly, the LOSC has a more stringent approach when it comes to the removal of installations erected in the Area to exploit mineral resources but it does not seem to apply to marine wind parks. These installations ought to be removed “solely in accordance with this Part and subject to the rules, regulations and procedures of the Authority” (Art. 147.2(a)). An option could be the adoption of some international decommissioning standards by the IMO for the high seas. Such an instrument exists, but it applies to the removal of installations and structures on the continental shelf and the EEZ [68].

3.7. Environmental Protection and Standards

As they often are assembled onshore and tend to require much less drilling in the seabed when compared to large oil and gas platforms, the installation of wind parks is likely to cause less noise and acoustic pollution; and, therefore, cause less damage to marine animals than fixed marine parks at this stage. However, this is considering each turbine individually and not the aggregated impact of the park. Additionally and more importantly, during the production of energy, wind turbines produce noise, above and in the water column and the seabed if they are bottom-fixed or even only moored (and floating). The extent of the environmental impacts caused by the generation of renewable energy offshore is uncertain, and more scientific research is therefore necessary [69].

Nonetheless, the general obligation stated under Art. 192 LOSC to protect and preserve the marine environment applies to marine renewables installations on the high seas. According to Art. 194.1 LOSC, States “shall apply all measures that are necessary to prevent, reduce and control pollution of the marine environment from any source, using for this purpose the best practicable means at their disposal and in accordance with their capabilities, and they shall endeavour to harmonize their policies in this connection”. Further, Art. 194.5 LOSC emphasises that these measures shall be those “necessary to protect and preserve rare or fragile ecosystems, as well as the habitat of depleted, threatened or endangered species and other forms of marine life”. The provision under LOSC Section 2 of Part XV on global and regional cooperation in cases of pollution emergencies and Section 4 of Part XV on monitoring and assessment will also be relevant for energy generation activities on the high seas. For example, Art. 199 LOSC establishes that States shall jointly develop and promote contingency plans for responding to pollution incidents in the marine environment.

International rulings from the Tribunal for the Law of the Sea have stressed the binding obligation under public international law to undertake an environmental impact assessment (EIA) for activities that have the potential to cause harm to the natural environment and natural resources (International Tribunal for the Law of the Sea Advisory Opinion of 1 February 2011) [70]. EIAs are also mandatory under the 1992 Convention on Biological Diversity [71]. More recently and relevant for this paper, the BBNJ Draft Agreement also makes them binding [72].

Moreover, a comparison could be made with environmental provisions in the Mining Code enacted by the ISA [73]. While the Mining Code will not be applicable to wind parks, this regulatory piece sets important environmental requirements that may be extrapolated to marine renewable energy. The current version of the draft exploitation regulations requires applicants to submit along their application for the approval of a plan of work information on this respect. Among these, environmental impact statements,

environmental management and monitoring plans and closure plans (collectively known as Environmental Plans).

Lastly, the threats to birds and marine life in accordance with its obligations under relevant conventions to protect biodiversity, including the 1979 Convention on the Conservation of Migratory Species of Wild Animals shall be taken into account [74].

4. How Much of the High Seas Can Be Utilized?

While more than 60 per cent of the ocean space is part of the high seas, not all high seas may be fully utilized to construct and operate marine wind farms. The high seas regime applies to sea parts, but the regime applicable to the seabed located in the same space as the high seas can belong to either the Area, as discussed in Section 3.2, or the extended continental shelf.

The continental shelf comprises the seabed and subsoil of the submarine areas (where foundations of fixed and floating turbines are installed) that extend beyond the territorial sea of a State. Although the continental shelf normally extends up to 200 nautical miles (corresponding to the limit of the EEZ), it can go further than that as long as the submerged prolongation of the land mass of the coastal State reaches the outer edge of the continental margin up to an absolute maximum of 350 nautical miles (Art. 76 LOSC). When it goes beyond 200 nautical miles, the water column is located on the high seas, but the seabed is part of a claimed extended continental shelf, an opinion shared by Suárez-de Vivero [75]. Countries generally have up to 10 years after having ratified the LOSC to claim this extension pursuant to Art. 4 of Annex II LOSC. Parties to the LOSC and the Commission on the Limits of the Continental Shelf have agreed to count the deadline for submissions on 13 May 1999 to all State parties for which the LOSC has entered into force before such date [76]. The extension is made before the Commission on the Limits of the Continental Shelf (Art. 76 LOSC).

This overlap of seabed areas creates interesting interactions in the law [77], some of which have gone unnoticed in our opinion when it comes to marine wind parks [17]. An extended continental shelf does not give the coastal State right over the water column, the sovereign rights it grants end at the water edge, where the seabed makes contact with the water. Thus, the water column is on the high seas, and said regime applies on it, as also remarked by Elsner and Suarez [17]. However, the LOSC does grant sovereign rights to the coastal State over the continental shelf for the purposes of exploring and exploiting its natural resources, and conducting activities related to them. These natural resources are the mineral and other non-living resources of the seabed and subsoil together with living organisms belonging to sedentary species. See also stressing this when stating that “[c]oastal States for whom the legal shelf clearly exists beyond 200-n. miles have the legal entitlement to exercise exclusive jurisdiction over the resources of the shelf irrespective of the engagement with the Commission” [78]. These are exclusive rights, “in the sense that if the coastal State does not explore the continental shelf or exploit its natural resources, no one may undertake these activities without the express consent of the coastal State” (Art. 77.2 LOSC). By extending the continental shelf, the Area is reduced [79]. This explains why Art. 82 LOSC imposes obligations on coastal States to share revenues with the international community regarding its exploitation.

In addition to these exclusive exploitation rights, the LOSC also grants the coastal State that has claimed the extended continental shelf an exclusive right to “authorize and regulate drilling on the continental shelf for all purposes” (Art. 81 LOSC, emphasis added). This provision has the effect of restricting the freedom of any State to build and operate a marine wind installation on the high seas to the authorization of the coastal State in which the mooring on the extended continental shelf would take place. Without it, the drilling to install the foundations and utilize the seabed would be contrary to public international law. While authorization is needed, this provision, however, must also be read in light of Art. 78.2 of the LOSC, which also submits that exercise of rights of the coastal States must not

infringe or unjustifiably interfere with “with navigation and other rights and freedoms of other States as provided for in this Convention”.

This restriction not to drill without authorization and regulation of the State claiming an extended continental shelf is not minor in terms of its geographical extension and may put a stop to some projects. An extended continental shelf has the potential to almost double the seabed and its resources controlled by coastal States, with important geopolitical implications. Considering only the claims put forth before 2012, the extension of the continental shelf had the potential to reduce the Area by 4.6 per cent and the high seas by 6.51 per cent as noted by Suárez de Vivero [75]. By August 2022, more than 60 countries had made 92 submissions to extend their continental shelf. The Commission on the Limits of the Continental Shelf has issued 35 recommendations and there are more to come [80]. Moreover, some of the areas that have been identified as suitable for the current technology levels on the high seas in Hatton Ridge or Rockall Bank, as pointed out by Elsner and Suarez, would not be available to all States [17]. These would only be given to those States that have received authorization by the coastal State for an extended continental shelf, mostly because of financial compensation.

5. Governing Renewable WIND Energy on the High Seas: Authorities and Coordination

The Role of MSP. The ISA Authority as a Model?

As renewable energy activities move to deeper waters and waters beyond national jurisdiction, some level of overlap may be expected with other activities. This leads to the question of how to balance these various activities. Should renewable energy have primacy in these plans and policies based on its potential vital role on climate change mitigation [9]? MSP has been defined by United Nations Educational, Scientific and Cultural Organization (UNESCO) as a public process for analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic and social objectives that are usually specified through a political process [81]. UNESCO’s MSP model comprises ten steps, ranging from appointing the authority in charge, obtaining financial support, evaluating the present and future conditions, to stakeholder participation and performance evaluation. Moreover, UNESCO has developed a guide to evaluate MSP processes [82]. Given that the LOSC has failed to provide a management tool for the sea areas, MSP has proved to be an effective way of managing the EEZ. For instance, in Europe, under the Maritime Spatial Planning Directive of 2014, all 22 Member States of the European Union with marine waters now have MSP underway [83].

However, there is no overarching framework for the implementation of MSP in ABNJ, a tool that if existing could coordinate the exercise of high seas freedoms when it comes to the harnessing of renewable energy. While we find some progress the regional level, these initiatives cannot provide a global cohesive management without coordination, among themselves and with the various international organisations that have a role including ABNJ, e.g., the ISA, or the IMO [16].

In our view, the ISA or a specialized body in high seas areal use ought to be involved in the coordination of the granting of permits to install renewable energy structures on the high seas because, as we have explained, although they might float and even be mobile, they are connected in some way to the seabed, either moored through cables or drilled and attached to it. However, identifying and consulting relevant stakeholders in issues related to ABNJ is challenging. The high seas and the Area, as global commons beyond the control of any one State, might imply a wide or wider range of stakeholders with a legitimate interest in the conservation of biodiversity and the sustainable use of resources in ABNJ. Indeed, all of humankind has an interest in the preservation of the essential ecosystem services provided by ABNJ. In addition to this, wind resources on the high seas shall be classified as common heritage of mankind to benefit the international community and humankind in general, not just a small group of actors from industrialized States [17].

MSP approaches could be an appropriate way of managing potential conflicts of uses of and on the high seas, but they would ideally require a regulatory authority common to all users [84]. Global approaches are necessary. If the global environment is to be protected, then global approaches must prevail [85]. This approach is mandated by Art. 197 LOSC, being particularly useful in the regions mentioned, such as South America, where regional agreements are lacking. The model of an international management authority would be consistent with the idea that the resources of the high seas belong to the global community and are to be shared [25]. Regulation of renewable energy platforms is not covered by the BBNJ negotiations and it will take years to negotiate a new implementing agreement to the LOSC on the topic.

As mentioned, the ISA Mining Code establishes the designation of areas of particular environmental interest (APEIs), where exploitation is prohibited. The ISA has experience in implementing MSP, since in 2012, as part of its Environmental Management Plan for polymetallic nodule mining in the Pacific Clarion Clipperton Zone [86], it designated nine Areas of Particular Environmental Interest (APEIs) [87].

In addition, the ISA Mining Code requires the designation of “impact reference zones” and “preservation reference zones” [73]. “Impact reference zones” are areas to be used for assessing the effect of activities in the Area on the marine environment and which are representative of the environmental characteristics of the Area. “Preservation reference zones” are areas in which no mining shall occur to ensure representative and stable biota of the seabed in order to assess any changes in the biodiversity of the marine environment (Art. 31.6 Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area and related matter, ISA) [88].

In the case of marine renewable wind energy, Hutchins has proposed granting States rights above their continental shelves—since energy will be transported to them as the nearest coastal State—and collectively managing renewable energy generation above the deep seabed Area through a unitary global authority similar to the ISA, or directly by the ISA [25].

If created, such an authority could manage part of the revenues on concerning the equitable sharing of financial and other economic benefits derived from activities on the high seas, as it is mandated to the ISA in the Area (Art. 140 LOSC).

6. Conclusions

Marine wind projects are often seen as one of the best alternatives for scaling up renewable energy production. So far, all marine wind energy activity is being conducted in waters under national jurisdiction. However, technological progress and occupation of the best spaces near the coasts may imply that marine wind parks may be deployed further in deeper waters, outside areas under national jurisdiction. The high seas represent a yet-to-be-exploited area when it comes to the expansion of marine energy projects. In addition to the availability of space, the literature indicates that some of the world’s best wind resources, in terms of constant speed, are located in ABNJ. Wind turbines on the high seas, which comprise about 60% of all ocean and sea areas across the globe, will utilize the high seas, the seabed and thus the Area, creating interesting legal issues.

The ocean governance framework beyond national jurisdiction is underdeveloped, as discussed in this paper. Currently, the high seas are regulated by a fragmented and uncoordinated set of norms. The cornerstone of marine wind farm regulation in ABNJ is the LOSC. However, this is a general instrument dealing with the freedoms and obligations of States when conducting activity on the high seas and the Area, and not having specific provisions to fully regulate wind energy exploitation. The lack of defined and concrete rules applicable in ABNJ is not a novel issue. To try to address this more generally, the UN has initiated a process to elaborate the Agreement of an international legally binding instrument under the LOSC on the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction (BBNJ). However, the instrument being negotiated has a focus on biodiversity and marine life, not on renewable energy.

Despite this, our analysis shows that under the LOSC regime, all States, whether coastal or land-locked, enjoy high seas freedoms. These include, *inter alia*, the freedom of navigation, the freedom to lay submarine cables and pipelines, to construct artificial islands and other installations, to fish and to carry out scientific research. However, the generation of energy from wind, currents or waves, an activity which is explicitly mentioned as being under the jurisdiction and control of the coastal State within the EEZ, is not expressly mentioned as a high seas freedom. Harnessing marine energy in ABNJ would fall into the residual category of the principle of freedom on the high seas. Not listed among the six categories enumerated by Art. 87 LOSC, or regulated explicitly as is the case within the EEZ for individual coastal States, energy production could still be enjoyed by all States, whether coastal or land-locked, if there is due regard for the interest of other States in their own exercise of the freedom of the high seas.

As we discussed, under public international law, wind turbines should not be classified as ships because their main aim is not navigation but producing renewable wind energy. Instead, they would be classified as installations or structures, being subject to the regulation of their flag state, and having all States the high seas freedom to build them, with due regard to other States.

We further discussed the consequences of this basic structure and the limited regime set by the LOSC when it comes to the regulation of wind turbines that may be installed on the high seas by any State.

Our study showcased that States and developers may insert safety zones around wind turbines. We put forward that it shall be determined by competent authorities if the distance of 500 meters is adequate concerning renewable wind energy structures on the high seas, or if it should be increased. It should be the international community's role under the aegis of the IMO or other organizations to develop safety rules related to navigation and sea uses and users nearby marine wind parks on the high seas.

Further, our study highlights that the decommissioning of marine wind turbines is a topic that has seen little discussion and even less regulation at the national level. On the high seas, the regulation and requirements set by the LOSC is scant, to say the least. An option could be adopting some international decommissioning standards by the IMO for the high seas.

Related to environmental considerations and protection, public international law creates a general requirement of undertaking an EIA for activities that have the potential to cause harm to the natural environment and natural resources, as confirmed in international rulings. The impact of the construction, operation and decommissioning of wind turbines on the high seas is unknown; therefore, the precautionary principle of environmental law has an important role to play in this matter.

While it seems that any part of the high seas may be used freely by any State to install wind turbines and moor or fix them in the seabed, our study points to exceptions to this. The regime applicable to the seabed located in the same space as the high seas means that it can belong to either the Area or the extended continental shelves. This overlap of seabed areas creates interesting interactions in the law, some of which have gone unnoticed in our opinion regarding marine wind parks. An extended continental shelf has the potential to almost double the seabed and its resources controlled by coastal States, with important geopolitical implications.

Our study also discusses the importance of coordination between users and uses of marine spaces on the high seas. As renewable energy activities move to deeper waters and waters beyond national jurisdiction, some level of overlap may be expected with other activities, giving rise to the question of how to balance these various activities. MSP application on the high seas may help to achieve this balance. Currently, there is a lack of a regulatory framework related to the implementation of MSP in ABNJ. Some progress has been made at the regional level; however, these initiatives remain insufficient to provide cohesive management among regions and international organisations that have a role including ABNJ [16].

Yet the challenge of identifying and consulting relevant stakeholders is much greater in ABNJ as there might be a wider range of stakeholders with legitimate environmental and natural resources interests. Wind resources on the high seas shall be classified as the common heritage of mankind to benefit the international community and humankind in general, not just a small group of actors from industrialized States. MSP approaches could be appropriate in order to manage potential conflicts over uses of the high seas, but these would ideally require a regulatory authority common to all users [84]. Global approaches are necessary in order to manage the ocean global resource sustainably.

Therefore, as well as needing an international authority to grant permission to install wind parks on the high seas, an international authority is also needed to apply and coordinate MSP on the high seas. The alternative is to continue with unclear rules or without rules at all, which will lead to conflict and abuses.

In our view, we recommend conducting further research on the establishment of an authority in charge of granting permits to install marine wind parks and at the same time, in charge of controlling the application of the precautionary principle in the development of these activities on the high seas. Thanks to such an institution it will be possible to guarantee that due regard for the interests of other States is respected, as mandated by Section 2 Art. 87 LOSC. This authority shall act in coordination with the ISA, or the ISA itself may be granted the authority to grant wind park permissions on the high seas. With the current regulation, there is no mandatory requirement to obtain authorization from the ISA to use the seabed in the Area as the provisions require this when it comes to the exploitation of resources in it.

Finally, while our study has focused on marine wind parks, most of our conclusions may be extrapolated to other potential uses of the high seas by renewable energy technologies to exploit natural resources found therein, such as tide, streams or sunlight. Particularities concerning the use of the Area, the water column or the technology itself would carry some implications that may deviate from our general conclusions, however.

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