

# Marine renewable energy technologies on the high seas: challenges and opportunities to strengthen international environmental and renewable energy governance

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*Marine areas beyond national jurisdiction (ABNJ) offer an extensive area of about half of the Earth's surface with an unparalleled potential for the use of marine renewable energy (MRE) technologies to provide energy security and competitiveness to States and in the fight against climate change. However, the expansion of MRE technologies into ABNJ as well as the environmental impacts associated with their development can entail risks and threats to security and biodiversity. This paper focuses on highlighting key regulatory and governing challenges associated with the deployment of MRE technologies in ABNJ as well as an initial exploration of regulatory alternatives and forms of governance that could provide an effective way to enhance the sustainable and secure development of the MRE industry in ABNJ.*

**Keywords:** *marine renewable energy technologies, areas beyond national jurisdiction, regulatory and governing challenges, environmental protection*

## 1 INTRODUCTION

Roughly 64 per cent of the global ocean consists of marine areas beyond national jurisdiction (ABNJ), ie the international seabed area (Area) and the high seas. This extensive area has unparalleled potential for the use of marine renewable energy (MRE)<sup>1</sup> technologies to provide energy security and competitiveness to States and to aid in the fight against climate change. However, the expansion of MRE technologies into ABNJ as well as the environmental impacts associated with their development can entail new risks and threats to security and biodiversity. The scholarly literature on regulatory and governing aspects regarding the development of MRE technologies in

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1. The concept of marine renewable energy (MRE) is generally used to mean all marine-based renewable energy, including wind. According to the United Nations (UN), MRE can be defined as 'a subset of renewable energy involving natural processes in the marine environment': Report of the Secretary-General, 'Oceans and the Law of the Sea' (2012) UN Doc A/67/79, 4. Offshore wind energy, ocean renewable energy, geothermal energy derived from submarine geothermal resources and bioenergy derived from marine biomass are the main types of MRE sources.

ABNJ is scarce<sup>2</sup> and has not yet explored whether the applicable regulatory framework in ABNJ is able to guarantee the secure and sustainable development of these technologies in ABNJ. Against this background, this paper aims to point out key regulatory and governing challenges for the deployment of MRE technologies in ABNJ as well as an initial exploration of regulatory alternatives and forms of governance that could provide an effective way to enhance the sustainable and secure development of these technologies in ABNJ. To achieve this, the paper is structured as follows: Section 2 presents two important challenges for the regulation and governance of MRE technologies in ABNJ; Section 3 analyses the ability of the United Nations Convention on the Law of the Sea (UNCLOS or the Convention)<sup>3</sup> to regulate MRE technologies in ABNJ and provide answers to the identified challenges; Section 4 briefly explores alternative approaches to strengthen the international and secure governance of MRE technologies in ABNJ; finally, Section 5 presents the conclusions.

## 2 KEY CHALLENGES FOR THE REGULATION AND GOVERNANCE OF MRE TECHNOLOGIES IN ABNJ

MRE technologies, and in particular those which use the power of currents, waves and winds, have mainly been developed in areas within national jurisdiction.<sup>4</sup> However, a series of factors such as the favourable renewable resource conditions in the open ocean,<sup>5</sup> the reduction of the renewable energy production costs, and the need to fight climate change could bring the MRE industry into new waters far from the coast. The availability of MRE sources such as wind energy is often higher in the open ocean than on land<sup>6</sup> and the cost of electricity from offshore wind farms has been consistently decreasing over recent years.<sup>7</sup> In addition, achieving the objectives of the Paris Agreement requires measures such as fostering the use of renewable energy. The Intergovernmental Panel on Climate Change's report of 2018 already confirmed renewable energy needs to supply 70–85 per cent of the world's electricity by

2. See eg Paul Elsner and Suzette Suarez, 'Renewable Energy from the High Seas: Geo-Spatial Modelling of Resource Potential and Legal Implications for Developing Offshore Wind Projects Beyond the National Jurisdiction of Coastal States' (2019) 128 *Energy Policy* 919; Todd Emerson Hutchins, 'Crafting an International Legal Framework for Renewable Energy on the High Seas' (2021) 51 *Environmental Law* 485; Glen Wright, Anne Marie O'Hagan, Jiska de Groot et al, 'Establishing a Legal Research Agenda for Ocean Energy' (2016) 63 *Marine Policy* 126.

3. United Nations Convention on the Law of the Sea (adopted 10 December 1982, entered into force 16 November 1994) 1833 UNTS 3 (UNCLOS).

4. For more specific information on average distance from shore and water depth for offshore wind farms in the period 2000–2019 see International Renewable Energy Agency (IRENA), 'Renewable Power Generation Costs in 2019' (2020) 75–81 <[https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jun/IRENA\\_Power\\_Generation\\_Costs\\_2019.pdf](https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jun/IRENA_Power_Generation_Costs_2019.pdf)> accessed 5 September 2022.

5. For the current and average global wind, ocean current, and wave resource availability see Earth Nullschool <<http://earth.nullschool.net/>> accessed 13 May 2022.

6. Anna Possner and Ken Caldeira, 'Geophysical Potential for Wind Energy Over the Open Oceans' (2017) 114 *Proceeding of the National Academy of Sciences of the United States of America* 11338.

7. IRENA, 'Renewable Power Generation Costs in 2020' (2021) <<https://www.irena.org/publications/2021/Jun/Renewable-Power-Costs-in-2020>> accessed 5 September 2022.

2050 to limit global warming to 1.5°C above pre-industrial levels.<sup>8</sup> Consequently, various studies have already suggested the massive and rapid deployment of MRE technologies at a global scale as a solution to address climate change and its effects on marine ecosystems.<sup>9</sup> However, this solution can also lead to other significant challenges that should be taken into account before developing the MRE industry in ABNJ.

Hutchins has highlighted some of the main regulatory problems associated with the development of MRE technologies in ABNJ, namely the insufficient flag State regulation, the threat to navigational freedom, the lack of environmental safeguards, the national appropriation of high seas resources, the spatial discontinuity created by the development of this industry, or the lack of judicially recognizable standards for resolving disputes.<sup>10</sup> All these challenges need to be addressed before the development of the MRE industry in ABNJ. However, this paper focuses on the issue of security and the environmental challenges. These two challenges are highlighted here in consideration of the importance of guaranteeing and maintaining peace and security for the development of any kind of activity as well as the importance of ensuring sustainable growth that will allow the development of measures that balance the protection of the environment with other potential benefits such as the fight against climate change or the contribution to energy security.

The first of the highlighted challenges relates to the maintenance of security. The development of MRE technologies in ABNJ can lead to possible conflicts over the use of space, as States do not have sovereignty or jurisdiction over ABNJ, and these spaces can only be regulated through international law. In this regard, conflicts can arise because MRE technologies such as offshore wind farms and ocean energy installations often need to occupy space in perpetuity<sup>11</sup> and could impose limitations on States regarding their exercise of the freedoms of the high seas. Pursuant to UNCLOS, the universal treaty that provides the general regulatory framework for the governance of all activities in the oceans and seas, any rights in respect of energy sources are ‘subject to a balancing of interest in light of other States’ interest and potentially competing use of sea space’ in maritime spaces beyond the territorial sea.<sup>12</sup>

The second of the highlighted challenges are the environmental problems, as the development of MRE technologies and related industries can also endanger the environment. The literature has already indicated that the installation, maintenance, operation and decommissioning of the different MRE devices, in addition to the energy transmission to the grid and the development of related industries, could compromise the protection of the marine environment including the habitats and the species of the marine ecosystems.<sup>13</sup>

8. Intergovernmental Panel on Climate Change, ‘Summary for Policy Makers: Global Warming of 1.5 °C’ (2018) 15 <[https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SPM\\_version\\_report\\_LR.pdf](https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SPM_version_report_LR.pdf)> accessed 5 September 2022.

9. See eg J-P Gattuso, A K Magnan, L Bopp et al, ‘Ocean Solutions to Address Climate Change and its Effects on Marine Ecosystems’ (2018) 5 *Frontiers in Marine Science* 1.

10. Hutchins (n 2) 501–507.

11. Sandy Kerr, Kate Johnson, John Colton et al, ‘Mare Reservarum: Enclosure of the Commons and the Evolution of Marine Rights in an Era of Ocean Industrialization’ in Glen Wright, Sandy Kerr and Kate Johnson (eds), *Ocean Energy: Governance Challenges for Wave and Tidal Stream Technologies* (Routledge, London 2018) 81.

12. Richard Barnes, ‘Energy Sovereignty in Marine Spaces’ (2014) 29 *The International Journal of Marine and Coastal Law* 573, 592.

13. See Erwan Garel and others, ‘Applicability of the “Frame of Reference” Approach for Environmental Monitoring of Offshore Renewable Energy Projects’ (2014) 141 *Journal of*

ABNJ are managed under the framework provided by UNCLOS through global and regional agreements and bodies,<sup>14</sup> but there are no instruments specifically regulating MRE technologies in these maritime spaces. However, UNCLOS provides the general applicable global framework regulating MRE technologies in ABNJ and the protection of the environment in their development.<sup>15</sup> Considering that UNCLOS plays a pivotal role for the regulation of MRE technologies in ABNJ and in order to understand how UNCLOS is able to provide solutions to the abovementioned challenges, the following section of this paper will focus on analysing the ability of UNCLOS to regulate MRE technologies and the protection of the environment against the unbridled development of these technologies in ABNJ, with a focus on the high seas.

### 3 MRE TECHNOLOGIES ON THE HIGH SEAS AND THE FRAMEWORK PROVIDED BY UNCLOS

UNCLOS establishes a framework based on zonal and topical approaches. The zonal approach divides the sea into juridical zones and stipulates rules for their governance, while the topical approach regulates the different activities in the sea such as the installation of structures. The Convention includes the framework for the exercise of jurisdiction over marine spaces including other obligations such as those related to the conservation and sustainable use of marine biodiversity. This section analyses the framework provided by UNCLOS to regulate MRE technologies on the high seas, in particular with a view to providing solutions to the abovementioned challenges. Hence the section will also briefly revise the applicable framework set by UNCLOS to MRE in maritime spaces under sovereignty and jurisdiction, which have been analysed in more detail previously in other works,<sup>16</sup> to later focus on marine ABNJ and specifically on the high seas.

#### 3.1 The regime provided by UNCLOS for the deployment of MRE technologies in maritime spaces under sovereignty or jurisdiction

In accordance with UNCLOS, and as highlighted in previous studies on the application of UNCLOS to MRE technologies in maritime spaces within national jurisdiction,<sup>17</sup> coastal States have the exclusive right to exploit and regulate the development of

Environmental Management 16, 18; and Lena Bergström and others, 'Effects of Offshore Wind Farms on Marine Wildlife - A Generalized Impact Assessment' (2014) 9 Environmental Research Letters 1.

14. See David Freestone, 'The Final Frontier: The Law of the Sea Convention and Areas Beyond National Jurisdiction' in Harry Scheiber and Moon Sang Kwon (eds), *LOSI Conference Papers* (2012) 5.

15. See eg Sarah McDonald and David VanderZwaag 'Renewable Ocean Energy and the International Law and Policy, Seascape: Global Currents, Regional Surges' (2015) 29 *Ocean Yearbook* 299, 301–302; Carlos Soria-Rodríguez, 'The International Regulation for the Protection of the Environment in the Development of Marine Renewable Energy in the EU' (2021) 30 *Review of European, Comparative and International Environmental Law* 46, 47–48.

16. Soria-Rodríguez (n 15) 48–50; Yen-Chiang Chang, 'Marine Renewable Energy: The Essential Legal Considerations' (2015) 8 *Journal of World Energy Law and Business* 26, 28–30.

17. Soria-Rodríguez (n 15) 48–50; Chang (n 16) 28–30.

MRE technologies in spaces under their sovereignty.<sup>18</sup> The exclusive competence is limited by general obligations provided by UNCLOS such as the protection and preservation of the marine environment,<sup>19</sup> navigational rights,<sup>20</sup> or other international rules such as the international obligations arising from customary international law and treaties which the coastal States had ratified.

In contrast to maritime spaces under sovereignty, the maritime spaces under jurisdiction are characterized by the right of jurisdiction or sovereign rights of the coastal States for specific purposes. In accordance with UNCLOS and as shown in the previous studies of Chang or Soria-Rodríguez on the application of UNCLOS to MRE technologies, coastal States have sovereign rights for the exploitation of natural resources, including the economic exploitation of energy from the water, currents and winds in the exclusive economic zone (EEZ), as well as jurisdiction over the establishment of artificial islands, installations and structures,<sup>21</sup> such as MRE installations.<sup>22</sup> In this regard, MRE technologies can be categorized as artificial islands, installations and structures since UNCLOS provides no definition of these terms and makes use of them interchangeably.<sup>23</sup>

UNCLOS explicitly recognizes the exclusive right of coastal States to construct and to authorize and regulate the construction, operation and use of artificial islands, installations and structures in the EEZ<sup>24</sup> as well as on the continental shelf.<sup>25</sup> Importantly, however, while exercising these rights, ‘the coastal State shall have due regard to the rights and duties of other States’.<sup>26</sup> Therefore, coastal States have to comply with the related obligations and duties provided by UNCLOS, including those which allow the compatibility with navigation or the conservation of the marine environment and the living resources.

Connected to the above, regarding the rights for laying submarine cables on the continental shelf, relevant for the transmission of energy from MRE installations to the grid, all States are entitled to do so, subject to UNCLOS.<sup>27</sup> In this sense, the Convention requires States to take reasonable measures for the exploration of the continental shelf, and the exploitation of its natural resources, but also to prevent, reduce and control pollution.<sup>28</sup>

Due to the clear definition of competences and rights provided in UNCLOS in maritime spaces under sovereignty or jurisdiction, the potential for conflict regarding the use of spaces among different States is eliminated.

### 3.2 The regime provided by UNCLOS for the deployment of MRE technologies in ABNJ

The Area and the high seas are the two marine ABNJ. The high seas are not defined in UNCLOS but include ‘all parts of the sea that are not included in the exclusive

18. Soria-Rodríguez (n 15) 48.

19. UNCLOS art 192.

20. See eg UNCLOS art 17.

21. UNCLOS art 56(1).

22. See also Soria-Rodríguez (n 15) 48–49; Chang (n 16) 30–31.

23. Francesca Galea, ‘A Legal Regime for the Exploration and Exploitation of Offshore Renewable Energy’ (2011) 25 *Ocean Yearbook Online* 101, 108.

24. UNCLOS art 60(1).

25. *Ibid* art 80.

26. *Ibid* art 56(2).

27. *Ibid* art 79.

28. *Ibid*.

economic zone, in the territorial sea or in the internal waters of a State, or in the archipelagic waters of an archipelagic State<sup>29</sup> while the Area comprises ‘the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction’.<sup>30</sup> That said, if the EEZ of a coastal State is not established, the high seas regime applies to these waters pursuant to UNCLOS.<sup>31</sup> The limits of the Area are determined by each State in conformity with the provisions of International Law. However, the suprajacent waters, ie the waters above the continental shelf, and the air space above these waters, are not part of the Area.<sup>32</sup> This is relevant for MRE technologies that do not necessarily have to be installed on the seafloor, such as certain types of floating MRE technologies, or those that include installations above the surface (eg offshore wind energy installations). The following subsections focus on the analysis of the applicable regulation in UNCLOS to MRE technologies in the Area and the high seas.

### 3.2.1 *The regulation of the Area in the context of MRE technologies*

The governance of the Area is based on the principle of ‘common heritage of mankind’,<sup>33</sup> which is characterized by three legal elements: the non-appropriation of the Area as well as its natural resources; the benefit of all mankind as a whole; and the peaceful use of the Area.<sup>34</sup> The International Seabed Authority (ISA) (hereinafter referred to as the ‘Authority’), governs the ‘activities in the Area’ following the aforementioned principle of ‘common heritage of mankind’. Pursuant to UNCLOS, ‘activities in the Area shall be organized, carried out and controlled by the Authority on behalf of mankind as a whole’.<sup>35</sup> However, the deployment of MRE technologies does not fall under the concept of ‘activities in the Area’ and therefore under the mandate of the ISA. Hence the regime for the Area cannot provide answers to face problems associated with the development of MRE technologies such as the potential conflicts for the use of space for the development of this industry.

The concept of ‘activities in the Area’ relates to ‘all activities of exploration for, and exploitation of, the resources of the Area’.<sup>36</sup> UNCLOS clearly states that ‘all rights in the resources of the Area are vested in mankind as a whole, on whose behalf the Authority shall act’.<sup>37</sup> However, the concept of ‘resources’ refers to ‘all solid, liquid or gaseous mineral resources in situ in the Area at or beneath the seabed, including polymetallic nodules’.<sup>38</sup> Given that MRE technologies cannot be listed under the concept of ‘resource’, they cannot be considered part of the mentioned ‘activities in the Area’ and therefore under the mandate of the ISA. The requirement that both criteria, ‘activities in the Area’ and ‘resources’, are present at the same time is essential.

29. Ibid art 86.

30. Ibid art 1(1).

31. Ibid art 78.

32. Ibid art 135.

33. Ibid art 136.

34. Yoshifumi Tanaka, *The International Law of the Sea* (CUP, Cambridge UK 2012) 173. See also UNCLOS arts 137 and 140–141.

35. UNCLOS art 153.

36. Ibid art 1(3).

37. Ibid art 137(2).

38. Ibid art 133(a).

So far, the ISA has only addressed the regulation of minerals such as polymetallic nodules and sulfides,<sup>39</sup> as the only recognized ‘activities in the Area’. The consideration of MRE technologies as an activity in the Area would enable their governance by the ISA. This could lead to the development of specific regulations to address the above-mentioned security and environmental challenges.

### 3.2.2 *The regulation of the high seas in the context of MRE technologies*

The high seas are characterized by the application of the principle that no State is allowed to exercise territorial sovereignty in these maritime spaces. In this regard, UNCLOS explicitly recognises that ‘no State may validly purport to subject any part of the high seas to its sovereignty’.<sup>40</sup> As Yturriaga Barberán indicates, the high seas are not a *res nullius*, their consideration as such would justify the right of appropriation according to the general principles of international law.<sup>41</sup> In contrast, they are a *res communis* and consequently not subject to appropriation.<sup>42</sup> Accordingly, territorial or State sovereignty cannot be exercised in the deployment of MRE technologies in these spaces. This could lead to problems for the management of the ocean space on the high seas for the development of MRE technologies and conflicts potentially arising between two or more States.

The high seas are governed by the principle of freedom. According to UNCLOS, ‘the high seas are open to all States, whether coastal or land-locked States’;<sup>43</sup> this means the freedoms of activities are there for all States. As a result, every State has an equal right to make use of the high seas under the conditions laid down in UNCLOS and other rules of international law.<sup>44</sup> The Convention provides a *numerus apertus* or open list of freedoms of the high seas that all States can enjoy and must respect. The explicitly recognized freedoms of the high seas are the following: navigation, overflight, freedom to lay submarine cables and pipelines, freedom to construct artificial islands and other installations permitted under international law, fishing, and scientific research.<sup>45</sup> Indeed, UNCLOS recognizes the freedom to construct artificial islands, installations, and structures (such as MRE installations) and the freedom to lay submarine cables which are necessary for the transmission of energy to the grid. In fact, all States, not just the coastal States, are entitled to lay submarine cables and pipelines on the bed of the high seas beyond the continental shelf.<sup>46</sup> There are no prohibitions for the deployment of MRE technologies on the high seas, however the freedoms of the high seas are not absolute, ie some limitations apply to their exercise.<sup>47</sup> These limitations are further explored in the following section.

39. See ISA, ‘Exploration Contracts’ <<https://www.isa.org.jm/exploration-contracts>> accessed 2 February 2022.

40. UNCLOS art 89.

41. José Antonio de Yturriaga Barberán, *Ámbitos de Jurisdicción en la Convención de las Naciones Unidas sobre el Derecho del Mar. Una perspectiva Española* (Ministerio de Asuntos Exteriores, Madrid 1996) 327.

42. *Ibid.*

43. UNCLOS art 87(1).

44. *Ibid* art 87(1); Tanaka (n 34) 151.

45. UNCLOS art 87(1).

46. UNCLOS art 112(1).

47. See eg Louis Sohn, Kristen Gustafson Juras, John E. Noyes and Erik Franckx, *Law of the Sea in a Nutshell* (2nd edn, West Publishing, St Paul MN 2010) 29–42.

The conclusion that can be drawn from this analysis is that States have the right to deploy MRE technologies on the high seas subject to UNCLOS and other rules of international law. However, conflicts can arise in case of competitive use of the spaces for this purpose. This problem is made worse by the fact that there exists no supranational authority governing or exercising control over the deployment of MRE installations on the high seas. This could entail disputes in the exercise of the freedoms and the use of these spaces.

### 3.3 The freedoms of the high seas and the deployment of MRE technologies

The high seas regime provided in UNCLOS includes general and specific limitations for the exercise of the freedoms of the high seas. This section continues exploring in further detail the legal regime for the deployment of MRE technologies on the high seas by revising the compatibility of this activity with the freedoms of the high seas. However, the focus is on the freedoms directly connected to the deployment of MRE technologies, ie the freedom to lay submarine cables and the freedom to construct artificial islands or installations. This analysis is of crucial importance in order to detect weaknesses of the existing framework and provide solutions, notably to the challenges mentioned in Section 2.

#### 3.3.1 *General limitations in the exercise of the freedoms of the high seas in the context of MRE installations*

There are general limitations in the exercise of all the recognized freedoms, including those directly connected to the deployment of MRE technologies. First, the high seas shall be reserved for peaceful purposes.<sup>48</sup> This entails that the deployment of MRE technologies shall be carried out for peaceful purposes. Second, these freedoms ‘shall be exercised with due regard for the interest of other States in their exercise of the freedom of the high seas, and also with due regard for the rights under [the] Convention with respect to activities in the Area’.<sup>49</sup> UNCLOS does not define the concept of ‘due regard’. However, the International Court of Justice (ICJ), in the context of the freedom of fishing in the *Fisheries Jurisdiction* cases, remarked that beyond 12 nautical miles

States have an obligation to take full account of each other’s rights and of any fishery conservation measures the necessity of which is shown to exist in those waters [and that] the former laissez-faire treatment of the living resources of the sea in the high seas has been replaced by a recognition of a duty to have due regard to the right of other States and the needs of conservation for the benefit of all.<sup>50</sup>

According to Nandan and Rosenne, the concept of ‘due regard’ in the context of the high seas ‘requires all States, in exercising their freedoms, to be aware of the interest of other States in using the high seas, and to refrain from activities that interfere with the exercise by other States of the freedoms of the high seas’.<sup>51</sup> Pursuant to this definition, the

48. UNCLOS art 88.

49. Ibid art 87(2).

50. *Fisheries Jurisdiction Case (United Kingdom of Great Britain and Northern Ireland v Iceland)* (Merits) (Judgment) [1974] ICJ Rep 3 [72].

51. Satya Nandan and Shabtai Rosenne, *United Nations Convention on the Law of the Sea, 1982, A Commentary: Volume III* (Brill Nijhoff, Leiden 1995) 86.



deployment of MRE technologies should not interfere with the exercise of other States' freedoms and all States must be aware of the existence of these installations on the high seas. However, how can compliance be ensured, if there is no supranational authority governing the high seas for the deployment of MRE technologies? This is an important gap for the governance of activities such as the deployment of MRE technologies, on the high seas, which is analysed in further detail in Section 3.3.3.

Third, the freedoms of the high seas must be exercised under the conditions specified by UNCLOS.<sup>52</sup> For instance, the freedom to lay submarine cables and the freedom to construct artificial islands and other installations are subject to the provisions of Part VI of UNCLOS<sup>53</sup> (see Section 3.3.2). As mentioned above, there is a large conflict-potential due to the absence of specific regulations for the deployment of MRE technologies on the high seas under UNCLOS.

Fourth, the freedoms are conditioned by 'other international rules'.<sup>54</sup> UNCLOS does not clarify what the 'other' international rules are. However, special treaties dealing with mainly navigational safety, maritime security, biodiversity and fisheries are transforming the management of the high seas.<sup>55</sup> For instance, the regime concerning straddling and highly migratory fish stocks set out in the Fish Stocks Agreement shows how the freedoms, in this case the freedom of fishing, can be limited by a *legis specialis*.

Although UNCLOS sets general limitations on the exercise of the freedoms of the high seas, these do not specifically address the problems that can occur when there are conflicts for the use of the space, or the environment is endangered by the deployment of MRE technologies on the high seas.

### 3.3.2 *Specific limitations in the exercise of the MRE related freedoms*

Regarding the exercise of the freedom to lay submarine cables, all States are entitled to do so on the bed of the high seas for the transmission of energy from MRE installations to the grid. However, this is subject to the aforementioned general limitations but also specific limitations such as taking reasonable measures for the exploitation of the natural resources<sup>56</sup> and having due regard for cables already constructed.<sup>57</sup> UNCLOS does not define 'reasonable measures' or 'due regard' in this context or its meaning for the deployment of MRE technologies, leaving this unclear and open to interpretation, which can lead to problems associated with the protection of the environment in the development of activities such as the deployment of MRE technologies. That said, UNCLOS does provide concrete restrictions in the exercise of this freedom. In this sense, all States must not infringe or cause any unjustifiable interference with navigation or any other freedom of other States in the exercise of their rights over the continental shelf.<sup>58</sup> Moreover, UNCLOS poses the obligation of the States to adopt laws and regulations in case of breaking or injuring a submarine cable.<sup>59</sup>

52. UNCLOS art 87(1).

53. Ibid art 87(1)(c)–(d).

54. Ibid art 87(1).

55. Donald Rothwell and Tim Stephens, *The International Law of the Sea* (Hart Publishing, London 2010) 146.

56. UNCLOS art 79(2).

57. Ibid art 79(5).

58. Ibid art 78(2).

59. Ibid arts 113–115. See also Yturriaga (n 41) 348–349.

In relation to the exercise of the freedom to construct artificial islands and other installations on the high seas, Part VI of UNCLOS refers to the application *mutatis mutandis* of Article 60 concerning the regime that applies in the EEZ. According to this, all States have the obligations to give due notice of the construction of MRE installations, maintaining warnings of their presence<sup>60</sup> and establishing reasonable safety zones to ensure navigation safety.<sup>61</sup> The safety zones should not exceed 500 metres around the artificial installation.<sup>62</sup> Additionally, States must ensure MRE installations do not interfere with recognized sea lanes essential to international navigation.<sup>63</sup>

The exercise of other freedoms (navigation, overflight, fishing, and scientific research) also has limitations. However, they are not further discussed here since they are not directly connected to the deployment of MRE technologies and are thus beyond the scope of this paper. That said, UNCLOS puts special emphasis on guaranteeing maritime navigational freedom. In this regard, the International Maritime Organization, which is responsible for the safety and security of shipping in addition to the prevention of marine pollution by ships, should ensure that the navigational freedom is not affected by activities such as the development of MRE technologies on the high seas.

### 3.3.3 *Legal constraints in the exercise of the freedoms of the high seas and the deployment of MRE technologies*

As shown by the previous analysis, the deployment of MRE technologies is compatible with the freedoms of the high seas as long as States comply with UNCLOS and the reviewed limitations of these freedoms. However, there can be some constraints or controversial issues that arise in the exercise of these freedoms in relation to the deployment of MRE technologies, which should be taken into account in order to guarantee their secure and sustainable development, notably with a view to overcoming the two abovementioned challenges, ie problems of security associated with the possible conflict for the use of space and environmental concerns associated with the deployment of MRE technologies. These constraints can be related to the management of the high seas and the governance of MRE technologies in these maritime spaces and the mechanisms for the dispute settlement in the exercise of the freedoms on the high seas.

The management of the maritime spaces is probably the central challenge among the constraints related to the governance of MRE technologies on the high seas. As previously noted, all States have equal rights to the use of the high seas for the deployment of MRE technologies. However, as Pardo suggests, the principle of freedom is a negative principle, which ignores the consequences of intensive use of ocean spaces and does not permit management.<sup>64</sup> This can also be true for conflict potential and the protection of the

60. UNCLOS art 60(3).

61. *Ibid* art 60(4).

62. *Ibid* art 60(5).

63. *Ibid* art 60(7).

64. 'The principle of freedom guarantees equal possibilities for all States to the use the ocean space with reasonable regard for the interest of other States. But this is a negative principle. It does not avoid the adverse consequences of intensive use of ocean space. The principle of freedom is a negative freedom, it is a permissive and it ignores adverse consequences. It is not a positive freedom – in other words, it does not permit management': Arvid Pardo, 'Perspectives on Ocean Governance' in Jon Van Dyke, Durwood Zaelke and Grant Hewison (eds), *Freedoms of the Seas in the 21st Century: Ocean Governance and Environmental Harmony* (Island Press, Washington DC 1993) 38, 38–39.

environment in the development of MRE technologies. Maritime spatial planning (MSP) is generally used by States for the organization and coordination of activities such as navigation, protection of the environment, tourism, or the deployment of MRE technologies, which could also prove useful on the high seas in order to accommodate different activities in these spaces and avoid conflicts for the use of space. For instance, the EU Member States are required by the Maritime Spatial Planning Directive to include the production of energy from renewable sources in their maritime spatial plans,<sup>65</sup> which are applicable to the maritime spaces where the EU Member States have sovereignty or jurisdiction in accordance with UNCLOS. However, no State can unilaterally claim jurisdiction for MSP on the high seas<sup>66</sup> and therefore this tool is difficult to apply in the management of MRE technologies on the high seas. It is therefore insufficient to address the abovementioned challenges related to security and the protection of the environment.

The mechanisms of dispute settlement in the exercise of freedoms and the use of the high seas for the deployment of MRE technologies can also entail some legal challenges. Pursuant to UNCLOS, conciliation is the first step in case of disputes. However, if no settlement is reached, the dispute shall be submitted to the court or tribunal with jurisdiction over the matter. In the case of the Area, all questions of liability can be submitted to the Seabed Disputes Chamber of the International Tribunal for the Law of the Sea (ITLOS), whose decision is binding.<sup>67</sup> The disputes are centralized in this Chamber. However, this is different for the disputes on the high seas, since the States are free to choose the various means for the settlement of disputes provided by UNCLOS,<sup>68</sup> which can be the ITLOS, the ICJ, an arbitral tribunal, or a special tribunal in accordance with UNCLOS. In this regard, UNCLOS does not establish how to proceed in case there is a conflict in the exercise of the freedoms by two or various States such as could happen with the potential conflict for the use of space in the development of MRE technologies. This is a weakness that the International Union for Conservation of Nature (IUCN) remarked in its ten principles for high seas governance, warning that access to common ocean resources must be twinned with comprehensive and effective governance that includes monitoring, sanctions and enforcement.<sup>69</sup>

In the light of the foregoing, it can be inferred that the deployment of MRE technologies on the high seas can generate a number of issues or challenges in the exercise of the freedoms that remain unclear and can potentially create security conflicts among two or more States. Against this backdrop, specific regulation for the deployment of MRE technologies on the high seas as well as governing structures are necessary to avoid conflicts and ensure the compliance of UNCLOS and the freedoms of the high seas. The analysis of UNCLOS in the context of MRE installations and related potential conflicts shows that the regulatory framework provided by this instrument is insufficient to guarantee the secure development of this industry in ABNJ. While UNCLOS enables the

65. The production of energy from renewable sources should be included in the plans for the development of maritime spatial planning pursuant to Article 8.2 of Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning [2014] OJ L 257/135.

66. Frank Maes, 'The International Legal Framework for Marine Spatial Planning' (2008) 32 *Marine Policy* 797, 799.

67. UNCLOS art 187.

68. *Ibid* art 287.

69. International Union for Conservation of Nature (IUCN), '10 Principles for High Seas Governance' (IUCN, 23 October 2008) <[https://www.iucn.org/downloads/10\\_principles\\_for\\_high\\_seas\\_governance\\_\\_\\_final.pdf](https://www.iucn.org/downloads/10_principles_for_high_seas_governance___final.pdf)> accessed 5 September 2022.

development of MRE technologies in ABNJ, it does not establish sufficient regulation to manage these technologies or how to coordinate with other activities.

### 3.4 The regime for the protection of the environment in UNCLOS and its application to the development of MRE technologies

Regarding the environmental challenge associated with the deployment of MRE technologies in ABNJ (see Section 2), UNCLOS provides in its Part XII a legal regime for the protection and preservation of the marine environment, including the general obligation to prevent, reduce and control pollution of the marine environment, which is applicable to the development of MRE in any maritime space. As mentioned above, the environmental threats can arise as a result of the installation, maintenance, operation and decommissioning of the different MRE devices in addition to the energy transmission to the grid.

A previous in-depth study by Soria-Rodríguez on the application of Part XII of UNCLOS to MRE technologies indicates that it does not provide sufficient specificity to guarantee protection.<sup>70</sup> The study furthermore highlights that UNCLOS includes the general obligation to protect and preserve the environment (Article 192) and relevant measures to this end. These are specified in Article 194 and are notably also applicable to MRE technologies.<sup>71</sup> Moreover, the study highlights the relevance of the environmental impact assessment (EIA) requirement in Article 206. In this regard, the Convention requires that where States have reasonable grounds to believe that planned activities under their jurisdiction or control may cause substantial pollution or significant and harmful changes to the marine environment, they have the obligation to assess the potential effects of such activities.<sup>72</sup> The EIA contributes to determining where, when and whether the deployment of MRE technologies should be allowed in a specific location. The EIA requires that planned activities with potential damaging effects may be effectively controlled and that other States are kept informed of their potential risks.<sup>73</sup> The EIA system generally includes the following aspects: a construction plan; environmental conditions of the construction site; the likely impact on the natural and social environment after the implementation of the plan; and feasible economic and technical opinions and measures for the prevention of environmental pollution and destruction.<sup>74</sup> However, although the EIA has been widely recognized under international law, the methods of assessments and applicability to MRE remain vague and undefined.<sup>75</sup> The EIA requirement under UNCLOS, which can be classified as an ‘obligation of conduct’, requires to be developed by other instruments at regional and/or national level. Therefore, it can be concluded that this regulation is insufficient to face the environmental challenge highlighted in Section 2.

70. Soria-Rodríguez (n 15) 49–50.

71. Ibid.

72. UNCLOS art 206.

73. *South China Sea Arbitration (The Republic of Philippines v The People’s Republic of China)* (Award of 12 July 2016) PCA Case No 2013-19, 377–378 [948].

74. Chang (n 16) 33.

75. Galea (n 23) 124.

#### 4 EXPLORING REGULATORY ALTERNATIVES AND FORMS OF GOVERNANCE TO ENHANCE THE SUSTAINABLE AND SECURE DEVELOPMENT OF MRE TECHNOLOGIES IN ABNJ

The analysis of UNCLOS of the regimes for the Area, the high seas, and the protection and conservation of the marine environment in the context of MRE technologies provided in Section 3 shows important limitations to guarantee the secure and sustainable development of this industry in ABNJ and in particular on the high seas. Against this backdrop, this section explores various alternatives to strengthen the international governance of MRE technologies in ABNJ. More specifically, it briefly explores how the foreseen Biodiversity Beyond National Jurisdiction (BBNJ) treaty, the Regional Sea Conventions (RSCs) with mandate in ABNJ, and the energy agencies could provide alternatives to strengthen the sustainable and secure governance of MRE technologies in ABNJ.

##### 4.1 Regulating MRE technologies under the foreseen BBNJ treaty

The United Nations General Assembly (UNGA) adopted in December 2017 a resolution to begin negotiations on an international legally binding instrument for the conservation and sustainable use of marine biodiversity in ABNJ under UNCLOS.<sup>76</sup> The negotiations of the foreseen BBNJ treaty addresses four topics: marine genetic resources, including questions on the sharing of benefits; measures such as area-based management tools (ABMTs), including marine protected areas (MPAs); the EIA; and capacity-building and the transfer of marine technology. This creates the opportunity to strengthen the existing framework provided by UNCLOS not just for the protection of marine biodiversity in ABNJ but also for the sustainable and secure development of other activities in these spaces.

Regarding the impact of the foreseen BBNJ treaty in the development of MRE in ABNJ, the regulation on ABMTs and the EIA can potentially strengthen the regulatory and governing framework and provide solutions to the identified challenges.

The development of ABMTs, and specifically the possibility of developing MSP, provides the possibility of organizing and coordinating activities in ABNJ, which can result in a more secure development of the MRE industry. However, it is still to be decided how and whether MSP is included and how this is developed and controlled as well as to which activities it is applied. The latest draft of the BBNJ agreement of 1 June 2022<sup>77</sup> dedicates Part III to the regulation of ABMTs, including MPAs, and includes various essential elements such as the objectives of the ABMTs, the process for the designation of ABMTs, the identification of areas, and the consultation on and assessment of proposals for the designation of ABMTs as well as provisions for international cooperation and coordination. This can potentially result in a higher level of protection for the development of MRE technologies in ABNJ as the identification and the development of a system for designation of MPAs in ABNJ can contribute to

76. UNGA, 'International Legally Binding Instrument Under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction' (24 December 2017) A/RES/72/249.

77. UNGA, 'Further Revised Draft Text of an Agreement Under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction' (1 June 2022) A/CONF.232/2022/5.

identify vulnerable and ecologically sensitive areas which require protection and where activities that can pose threats on them are prohibited or limited.

As for the regulation of the EIA, the draft of the BBNJ treaty shows that it provides more specific and detailed regulation in relation to what is already included in Article 206 of UNCLOS. The negotiating elements directly or indirectly regulating the EIA contained in the draft text include: the definition and objectives of the EIA; the content of the obligation to conduct an EIA; the relationship of the EIA processes under relevant instruments, frameworks and bodies; the consideration of activities for which the EIA is required; thresholds and criteria for the EIA; cumulative effects, transboundary effects and areas defined as ecologically or biologically vulnerable; the listing of activities requiring or not requiring the EIA; preliminary screening; preparation and content of EIA reports; decision-making; monitoring, reporting and review; and the consideration of strategic environmental assessment. An in-depth analysis should be made to evaluate the impact of the EIA under the BBNJ treaty for MRE technologies. However, an initial analysis shows that the inclusion of the previously mentioned elements can potentially contribute to providing more effective protection in the development of activities in ABNJ and can also be key to establishing with more clarity what is meant by the EIA, who is responsible for carrying it out, what activities are subject to the EIA, what impacts must be taken into account in the assessment, and who makes decisions after the assessment has been carried out. That being said, the development of MRE projects is not specifically considered as an activity subject to the EIA under the analysed version of the BBNJ treaty. Accordingly, it could be beneficial to specifically list the deployment of MRE technologies as an activity subject to the EIA under the foreseen BBNJ agreement.

Although it is not the objective to address whether any trade-offs between climate mitigation and environmental protection are justified, this is an important question to consider in the development of MRE technologies in ABNJ. The potential global environmental benefit of scaling up MRE technologies should justify any localized environmental cost. In this regard, the regulation on the EIA under the foreseen BBNJ agreement can have a key role in determining this. In addition, the regulation of ABMTs and the development of MPAs in ABNJ under the new instrument can contribute to identifying the most suitable spaces where MRE technologies should be developed.

In summary, the foreseen BBNJ treaty offers the possibility of strengthening the framework for the governance of MRE technologies in ABNJ and provide alternatives to overcome the challenges highlighted in this paper.

## **4.2 Regulating MRE technologies under the Regional Sea Conventions with a mandate in ABNJ**

The overarching framework provided by UNCLOS establishes that States shall not only have the obligation to protect and preserve the environment,<sup>78</sup> but shall moreover cooperate on a global and regional basis for its protection and preservation.<sup>79</sup> Article 197 of UNCLOS indicates that

States shall cooperate on a global basis and, as appropriate, on a regional basis, directly or through competent international organizations, in formulating and elaborating international

78. UNCLOS art 192.

79. Ibid art 197.

rules, standards and recommended practices and procedures consistent with this Convention, for the protection and preservation of the marine environment, taking into account characteristic regional features.

In this regard, there are regional law instruments which are applicable in ABNJ, which can also have an impact on the regulation of MRE technologies in ABNJ. There are 18 Regional Seas programmes across the world. These are important for the implementation of Part XII of UNCLOS<sup>80</sup> and some of them have a mandate in ABNJ. Some examples in the European context are the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention)<sup>81</sup> or the Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention).<sup>82</sup> A previous in-depth analysis of the application of these European Regional Sea Conventions (RSCs) to MRE<sup>83</sup> shows that they offer generic protection against the environmental effects associated with MRE technologies. However, they require the EIA to MRE projects to be performed under certain conditions.<sup>84</sup> In addition, they include various recommendations, assessments and guidelines to provide more specific protection. Some examples are the assessment of the environmental impact of offshore wind farms<sup>85</sup> and the environmental impact of underwater noise,<sup>86</sup> both developed under the OSPAR Commission. The study points out that these recommendations, assessments and guidelines are soft-law instruments, which are not legally binding, but could be upgraded into firmer legal obligations.<sup>87</sup> This adds an extra layer for the protection of the environment in the development of MRE technologies in ABNJ where the RSCs have a mandate. This overview indicates that the RSCs complement UNCLOS and provide more detailed obligations which can allow the provision of more specific environmental protection in the development of MRE technologies in ABNJ. That being said, this protection is geographically restricted to maritime spaces where these instruments are applicable. For instance, the OSPAR and Barcelona Conventions are respectively restricted to the North-East Atlantic and Mediterranean regions. However, the mandate of the RSCs could be geographically expanded to cover additional ABNJ. Another important limitation is that the RSCs are only applicable to the parties of the respective treaties.

80. United Nations Environment Programme, 'Regional Seas Programmes Covering Areas Beyond National Jurisdictions' (2017) <[https://www.un.org/Depts/los/biodiversityworkinggroup/Regional\\_seas\\_programmes\\_ABNJ.pdf](https://www.un.org/Depts/los/biodiversityworkinggroup/Regional_seas_programmes_ABNJ.pdf)> accessed 5 September 2022.

81. Convention for the Protection of the Marine Environment of the North-East Atlantic (adopted 22 September 1992, entered into force 25 March 1998) 2354 UNTS 67 (OSPAR Convention).

82. Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean, Since 1995 (amended 10 June 1995, entered into force 9 July 2004) 2102 UNTS 201. Originally called 'The Convention for the Protection of the Mediterranean Sea Against Pollution' (adopted 16 February 1976, entered into force 12 February 1978).

83. Soria-Rodríguez (n 15) 314.

84. Ibid 328–329.

85. OSPAR Commission, 'Assessment of the Environmental Impact of Offshore Windfarms' (2008) <<https://www.ospar.org/documents?v=7114>> accessed 5 September 2022.

86. OSPAR Commission, 'Assessment of the Environmental Impact of Underwater Noise' (2009) <[https://qsr2010.ospar.org/media/assessments/p00436\\_JAMP\\_Assessment\\_Noise.pdf](https://qsr2010.ospar.org/media/assessments/p00436_JAMP_Assessment_Noise.pdf)> accessed 5 September 2022.

87. Soria-Rodríguez (n 15) 334.

### 4.3 Regulating MRE technologies in ABNJ through energy agencies

According to Judge Treves, a form of governance of the high seas acceptable to the international community would have ‘some form of restriction of the freedom of the high seas, based on cooperation and the acceptance of new obligations by flag States and port States, as well as rights to be exercised collectively by States, perhaps through international organizations’.<sup>88</sup> In this context, the ISA, which is governed according to the principle of common heritage of mankind, already has structures and is regulated under Part XI of UNCLOS. However, the ISA only covers the Area, and its mandate does not include MRE technologies. As previously noted, the deployment of MRE technologies does not fall under the concept of ‘activities in the Area’ and therefore under the mandate of the ISA. Nevertheless, the ISA could extend its powers to include the management of MRE technologies in the Area, as suggested by Abad-Castelos.<sup>89</sup>

That said, the main global energy agencies, ie the International Renewable Energy Agency (IRENA) and the International Energy Agency, which notably include among their objectives the promotion of the sustainable use of renewable energy and the coordination of the energy policies of their Member States,<sup>90</sup> could function as a crucial platform to enhance intergovernmental and interregional collaboration to govern and provide environmental protection in the development of MRE technologies in ABNJ in a global context. Both agencies include in their organization established structures that support countries to coordinate actions in the use of renewable energy and this could be used to foster and organize the development of MRE technologies in ABNJ. IRENA could be a suitable forum to this end. This energy agency is an intergovernmental organization established in 2009 that counts with 168 members and has the main objective to ‘promote the widespread and increased adoption and the sustainable use of all forms of renewable energy’,<sup>91</sup> including MRE.<sup>92</sup> It has an institutional structure in place and its work has already focused on MRE. In this regard, it has published various reports on several types of MRE technologies, including offshore wind energy and the main types of ocean energy.<sup>93</sup> However, the competences of IRENA are limited<sup>94</sup> and the governance of MRE technologies in ABNJ is not among the listed activities outlined in Article IV of its Statute that can be performed by the agency.

## 5 CONCLUSIONS

The development of MRE technologies in ABNJ have the potential to contribute to provide energy security and competitiveness to the States and in the fight against

88. Tullio Treves, ‘Principles and Objectives of the Legal Regime Governing Areas Beyond National Jurisdiction’ in Erik Molenaar and Alex Oude Elferink (eds), *The International Legal Regime of Areas Beyond National Jurisdiction: Current and Future Developments* (Brill Nijhoff, Leiden 2010) 5, 22.

89. Montserrat Abad-Castelos, ‘Marine Renewable Energies: Opportunities, Law and Management’ (2014) 45 *Ocean Development and International Law* 221, 231.

90. See IRENA, ‘About IRENA’ <<https://www.irena.org/aboutirena>> accessed 5 September 2022; IEA, ‘About’ <<https://www.iea.org/about>> accessed 5 September 2022.

91. Statute of the International Renewable Energy Agency (adopted 26 January 2009, entered into force 8 July 2010) 2700 UNTS 45, art 2.

92. *Ibid* art 3.

93. See reports at the website of IRENA, ‘Publications’ <<https://www.irena.org/publications>> accessed 17 August 2022.

94. See Abad-Castelos (n 89) 228–229.



climate change. However, there are regulatory and governing challenges that need to be considered and addressed in advance. This paper highlights two main challenges as well as briefly exploring some alternatives that could prove effective to strengthen the governance of MRE technologies in ABNJ. Some of the key messages and conclusions based on the analysis of this paper are the following:

1. The problems associated with security and the protection of the environment are two central challenges for the development of MRE technologies in ABNJ. The former can mainly arise because of potential conflicts for the use of space, while the latter can arise as the development of this industry could compromise the protection of the environment. In addition, UNCLOS, the main global framework regulating activities and the protection of the environment in ABNJ, shows limitations to guarantee a secure and sustainable development of the MRE industry in ABNJ.
2. The analysis of the regime for the Area under UNCLOS shows that this is insufficient to regulate MRE technologies, as this activity cannot be categorized under 'activities in the Area' and therefore the regime of the Area is not applicable to MRE technologies, and the ISA cannot adopt rules, regulations or procedures for governing these technologies. An opportunity in this regard is that the ISA extends its mandate to MRE technologies. However, this would be restricted to the Area and not the high seas.
3. The deployment of MRE technologies is compatible with the freedoms of the high seas. However, the regime for the high seas shows important insufficiencies related to the management of MRE technologies on the high seas as well as in the mechanisms for the resolution of possible disputes in the exercise of the freedoms of the high seas.
4. The regime for the protection of the environment under UNCLOS does not provide sufficient specificity to guarantee protection. That said, it includes the EIA requirement under Article 206 UNCLOS, which can contribute to identifying and controlling the negative environmental effects associated with the development of MRE technologies. However, the lack of specificity of the EIA under UNCLOS can be an important obstacle to controlling the possible damages associated with the development of the MRE industry in ABNJ.
5. Considering the challenges for the regulation and governance of MRE in ABNJ, the paper briefly explores three alternatives or opportunities to strengthen the secure and sustainable international governance of MRE technologies in ABNJ:
  - (a) Regulating MRE technologies under the foreseen BBNJ treaty. The regulation on ABMTs and the EIA under this instrument can potentially strengthen the regulatory and governing framework. In this regard, various actions could be taken to improve the ability of the foreseen BBNJ treaty to govern MRE technologies in ABNJ, namely: specifically considering MSP to coordinate activities in ABNJ, which can contribute to avoiding conflicts for the use of space; listing MRE technologies as activities subject to EIA; or developing the system for designation of MPAs in order to further protect fragile or vulnerable areas where damaging activities should be banned or permitted only with certain restrictions.
  - (b) Using the RSCs with mandate in ABNJ as a framework to improve the regulation of MRE technologies in ABNJ. These are existing frameworks that further develop the obligations for the protection of the environment at the regional level. These instruments are geographically limited to the ABNJ

where the respective RSC has a mandate. However, this could be expanded to cover larger areas. In addition, they are only applicable to the parties of the respective RSCs.

- (c) Regulating MRE technologies through existing energy agencies. These international organizations could provide a platform to enhance intergovernmental and interregional collaboration to govern and provide environmental protection in the development of MRE technologies in ABNJ. In this regard, IRENA could provide a suitable forum. However, this organization does not currently have among its competences to manage MRE technologies in ABNJ.

Considering the above analysis, it can be concluded that specific regulations for the deployment of MRE technologies on the high seas as well as governing structures are necessary. Otherwise, the deployment of MRE technologies on the high seas could pose a significant challenge to the exercise of the freedoms of the high seas, which might entail international security and environmental concerns if not tackled in advance. This work identified various possible alternatives that could provide partial solutions to the identified challenges. However, effective solutions will highly depend on the level of ambition of States for the regulation of this industry in ABNJ.