

# The Ecosystem Approach in International Marine Environmental Law and Governance



Sarah Ryan Enright and Ben Boteler

**Abstract** An ecosystem approach to the management of human activities in the marine environment began to feature as a normative concept in international instruments in the 1980s, beginning with the pioneering Convention on the Conservation of Antarctic Marine Living Resources. While an implicit basis for the ecosystem approach can be found in the 1982 Law of the Sea Convention, much of the additional conceptual development at the global level has occurred within the framework of the 1992 Convention on Biological Diversity. The subsequent widespread acceptance of the ecosystem approach has been described as a response to the failure of reactive and fragmented sectoral and zonal approaches to environmental protection and management. A consensus has emerged that a paradigm shift in thinking is needed, whereby traditional modalities of governance are replaced by proactive, integrative and holistic approaches involving adaptive management and greater cooperation between States, international institutions and other stakeholders in order to achieve effective and long-term, coherent implementation of policies across sectors. This chapter will discuss the origins and evolution of the ecosystem approach in international law, which can now be found in a wide range of international and regional instruments, including the regional seas conventions, fisheries management agreements, as well as the ongoing negotiations to develop an internationally legally binding instrument for the conservation and sustainable use of marine biodiversity beyond national jurisdiction. Finally, challenges to the operationalization of the concept in practice will be discussed.

---

S. R. Enright (✉)

School of Law, University College Cork, Cork, Ireland

Centre for Marine and Renewable Energy Ireland (MaREI), Cork, Ireland

e-mail: [sarah.ryanenright@ucc.ie](mailto:sarah.ryanenright@ucc.ie)

B. Boteler

Institute for Advanced Sustainability Studies (IASS), Potsdam, Germany

© The Author(s) 2020

T. G. O'Higgins et al. (eds.), *Ecosystem-Based Management, Ecosystem Services and Aquatic Biodiversity*, [https://doi.org/10.1007/978-3-030-45843-0\\_17](https://doi.org/10.1007/978-3-030-45843-0_17)

333

### Lessons Learned

- There is no universally agreed definition of the Ecosystem Approach (EA) in international law.
- The Ecosystem Approach has thus far been developed largely as a set of non-binding soft law principles; therefore, its normative content remains weak and unclear in terms of its practical application and obligations on States.
- The Ecosystem Approach and adaptive management (AM) have received little legal scholarly attention in comparison to the closely associated precautionary principle.
- The Convention on Biological Diversity is a leader in the adoption of the Ecosystem Approach and has done significant work to elaborate its interpretation and application. The Malawi Principles and Operational Guidance remain relevant as a framework for action.
- It continues to be a challenge to operationalize the Ecosystem Approach in law and practice due to the uncertainties surrounding its meaning and potential approaches for implementation.

### Needs to Advance EBM

- More practical guidance is needed on how the Ecosystem Approach is to be implemented in practice at global, regional and national levels.
- Adaptive Management has been deemed essential for the operation of the Ecosystem Approach, yet it remains controversial from a legal perspective. More practical guidance is needed on operationalising Adaptive Management.
- Cooperation and coordination are critical to the success of the Ecosystem Approach, yet they remain difficult to achieve. More political will is needed in order to make progress here.

## 1 Introduction

Despite the importance of biological diversity for life, it is now rapidly declining at alarming rates and marine biodiversity is no exception (IPBES 2019; Grooten and Almond 2018). The 2019 Global Assessment Report on Biodiversity and Ecosystem Services revealed *inter alia* that natural ecosystems had lost half their area, two thirds of the marine environment had been ‘severely altered’ by human activity and approximately one third of reef forming corals, sharks, and marine mammals are threatened with extinction. The ongoing degradation of ecosystems has forced an acknowledgement of the limitations of previous sectoral and species specific approaches to resource management and environmental protection, leading to the emergence of holistic governance alternatives, which emphasize connectivity and integration (Harrison 2017). The 2016 United Nations (UN) World Ocean Assessment (p. 9) emphasized that “the ocean is a complex set of systems that are all interconnected” and recognized that the development of ocean management had progressed from “no regulation to the regulation of specific impacts, to the regulation of sector-wide impacts and, finally, to regulation taking account of aspects of all relevant sectors.” Out of an increased scientific understanding of the importance of

ecosystems and ocean connectivity, the ‘ecosystem approach’ has emerged as a dominant paradigm in international ocean governance.

This chapter will trace the development of the ecosystem approach in international environmental law, from its origins in soft law instruments to becoming endorsed as the main framework for action under the Convention on Biological Diversity (CBD), and its subsequent widespread application in a marine governance context. Finally, challenges to the operation of the concept in practice will be discussed.

## 2 The Core Elements of the Ecosystem Approach

There is no universally agreed definition of the ecosystem approach in international law (UNGA 2006). The Secretariat of the CBD<sup>1</sup> has described it as being difficult to define in a simple manner (CBD 2004, p. 3), while de Lucia goes further calling it an “elusive, unstable and contested” concept (2015, p. 93) whose various articulations render the task of finding a meaningful common denominator challenging (De Lucia 2018). The ecosystem approach has been interpreted differently by various environmental institutions and regimes (Platjouw 2016), and is referred to interchangeably as ‘Ecosystem-Based Management’<sup>2</sup> in international discourse (on definitions see further Delacámara et al. 2020). It is likely that the evolving nature of the ecosystem approach has been a contributing factor to the lack of clarity surrounding its meaning. It is a concept which continues to develop in parallel with scientific understanding of the nature of ecosystems and their core principles (Long 2012).<sup>3</sup> In fact, Morgera (2017, p. 71) has suggested that the translation of the scientific notion of the ecosystem into a legal construct has provided the basis for the normative development of the ecosystem approach, thereby having a “law-making effect”.

Although it remains underdeveloped in comparison to related approaches such as the precautionary principle (Morgera 2017), an increasing amount of doctrine (see references for a comprehensive list) and technical guidance (e.g. FAO 2003; CBD 2004) has helped clarify the meaning and application of the ecosystem approach, as well as its core elements. Connectivity and integration are central to the idea. An early study by Brunnée and Toope (1994, p. 55) describe it as requiring:

*consideration of the whole system rather than individual components. Living species and their physical environments must be recognized as interconnected, and the focus must be on the interaction between different sub-systems and their responses to stresses resulting from human activity.*

<sup>1</sup>Convention on Biological Diversity, June 5, 1992, 1760 UNTS 79.

<sup>2</sup>On Ecosystem Based Management, see *inter alia*, R Grumbine (1994), RD Long et al. (2015), SD Langhans et al. (2019).

<sup>3</sup>See *inter alia*, D Tarlock (2007, pp. 577–579), D Diz (2012, pp. 1–3), RD Long et al. (2015, pp. 54–56) for a brief history of the ecosystem concept.

Amidst the confusion surrounding its meaning, Trouwborst (2009) reminds us that the purpose of the ecosystem approach is the preservation and/or restoration of ecosystem health or integrity. He goes on to extract three strands of generic agreement (p. 28):

*(1) The holistic management of human activities, (2) based on the best available knowledge on the components, structure and dynamics of ecosystems, (3) and aimed at satisfying human needs in a way that does not compromise the integrity, or health, of ecosystems.*

The work of the UN General Assembly has also been helpful in generating consensus on key components of the ecosystem approach. At the seventh session of the Open-ended Informal Consultative Process on Oceans and the Law of the Sea (UNICPOLOS) in 2006, the resulting report (ICP-7) provided a comprehensive list of elements including *inter alia*:

- (a) *Emphasize **conservation** of ecosystem structures and their functioning and key processes in order to maintain ecosystem goods and services;*
- (b) *Be applied within **geographically specific areas based on ecological criteria**;*
- (c) *Emphasize the **interactions** between human activities and the ecosystem and among the components of the ecosystem and among ecosystems;*
- (d) *Take into account **factors originating outside the boundaries** of the defined management area that may influence marine ecosystems in the management area;*
- (e) *Be inclusive, with **stakeholder and local communities' participation** in planning, implementation and management;*
- (f) *Be based on **best available knowledge**, including traditional, indigenous and scientific information and be **adaptable** to new knowledge and experience;*
- (g) *Assess risks and apply the **precautionary approach**;*
- (h) *Use **integrated** decision-making processes and management related to multiple activities and sectors.* (UNGA 2006, para. 6. Emphasis added)

Given that scientific understanding of ecosystems is incomplete, the ecosystem approach has been closely associated with the precautionary principle and adaptive management (Morgera 2017). The precautionary principle<sup>4</sup> entails taking early, preventative action in response to environmental threats, even in the absence of scientific certainty (Trouwborst 2009), and has been described as an “integral component” of the ecosystem approach.<sup>5</sup> Adaptive management offers a practical tool for dealing with law’s apparent incompatibility with uncertainty. It provides a “flexible decision-making process that can be adjusted in the face of uncertainties as outcomes from management actions and other events become more understood through careful monitoring of these outcomes” (Williams et al. 2009).<sup>6</sup> It is often described as an iterative or ongoing learning process (Morgera 2017). The CBD has explained that the ecosystem approach requires adaptive management “to deal with

<sup>4</sup>Rio Declaration on Environment and Development (13 June 1992) 31 ILM 874, Principle 15.

<sup>5</sup>Declaration of the First Joint Ministerial Meeting of the Helsinki and OSPAR Commissions (Bremen, 26 June 2003) (OSPAR/HELCOM statement), Annex 5 (‘Towards an Ecosystem Approach to the Management of Human Activities’), para 5.

<sup>6</sup>Referred to in Le Lievre (2019, p. 496), as the most recognized definition of adaptive management in the literature.

the complex and dynamic nature of ecosystems and the absence of complete knowledge or understanding of their functioning.”<sup>7</sup>

Several international organizations have adopted working definitions of the ecosystem approach and attempted to make progress on elaborating its meaning and operation. The Conference of Parties (COP) to the CBD have defined it in light of the objectives of the Convention (Platjouw 2016)<sup>8</sup>:

*a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way.*<sup>9</sup>

This definition is concerned with integration<sup>10</sup> and equity,<sup>11</sup> recognizing that humans are an integral component of many ecosystems.<sup>12</sup> Moynihan (2020) describes integration in the context of the ecosystem approach as meaning integration across sectors, between governance levels, between modern science and traditional methods and between different legal and management strategies. It is noteworthy that no particular spatial unit of scale is included in the CBD definition, rather the scale of analysis and action is to be determined by the problem being addressed.<sup>13</sup> The International Council for the Exploration of the Seas (ICES) adopted the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)<sup>14</sup> definition (de Lucia 2018), which focuses on the management of human activities<sup>15</sup>:

*The comprehensive integrated management of human activities based on the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity.*<sup>16</sup>

---

<sup>7</sup>CBD-COP 5 Decision V/6 ‘Ecosystem Approach’ Doc UNEP/COP/5/23, (2000), A (4).

<sup>8</sup>CBD-COP 5 Decision V/6, A (1) states that the application of the ecosystem approach will help to reach a balance of the three objectives of the Convention: conservation, sustainable use, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

<sup>9</sup>CBD-COP 5 Decision V/6 (2000), A (1).

<sup>10</sup>CBD-COP 7, Decision VII/11 ‘Ecosystem Approach’ Doc UNEP/CBD/COP/7/21 (13 April 2004), para. A.3 referred to the ecosystem approach as providing an integrating framework for the implementation of the Convention’s objectives.

<sup>11</sup>CBD-COP 5 Decision V/6 (2000), para. 6. Principle 1 states that ecosystems should be managed for their intrinsic values and for the tangible or intangible benefits for humans, in a fair and equitable way. The operational guidance contained in the same Decision at para. 9 promotes the fair and equitable sharing of benefits with the stakeholders responsible for managing ecosystems and supporting ecosystem services. See M Ntona and E Morgera (2018, p. 218).

<sup>12</sup>CBD-COP 5 Decision V/6 (2000), A (2). See E Morgera (2017, p. 72).

<sup>13</sup>OSPAR/HELCOM statement (2003), para 3.

<sup>14</sup>OSPAR is a regional mechanism by which 15 Governments and the EU cooperate to protect the marine environment of the North-East Atlantic. <https://www.ospar.org/about>

<sup>15</sup>Guidance on the Application of the Ecosystem Approach to Management of Human Activities in the European Marine Environment (2005) ICES Cooperative Research Report no. 273, 4.

<sup>16</sup>OSPAR/HELCOM statement (2003), para. 5.

The OSPAR Commission has stated that “the essence of the ecosystem approach is to allow sustainable exploitation of natural resources while maintaining the quality, structure and functioning of marine ecosystems.”<sup>17</sup> Long (2012) observes that the rationale for adopting such an anthropogenic approach is that while the ecosystem itself may not be managed, the human activities that interact with and impact upon the ecosystem may be managed with a view to conserving biodiversity. The UN General Assembly has also made it clear that ecosystem approaches “should be focused on managing human activities in order to maintain, and, where needed, restore ecosystem health.”<sup>18</sup> The anthropocentric focus is also illustrated via the deployment of the ecosystem approach in connection with the conceptual framework of ecosystem services (see further O’Hagan 2020),<sup>19</sup> seen by many as one of the core elements of the ecosystem approach (de Lucia 2015). Indeed, several definitions of the ecosystem approach refer explicitly to the ecosystem services they provide.<sup>20</sup>

### 3 Emergence and Development of the Ecosystem Approach in International Law

The ‘ecosystem approach’ as a normative framework is a relatively recent development. The first inklings of the ecosystem approach and of ecosystems becoming an object of conservation and protection in international law can be traced back to the 1970s (see further Long 2012; Platjouw 2016). Several non-binding soft-law instruments,<sup>21</sup> beginning with the 1972 Stockholm Declaration on the Human Environment, contained formative elements of what would become the ecosystem approach.<sup>22</sup> The adoption of the 1971 Ramsar Convention on Wetlands of

<sup>17</sup>OSPAR Commission Quality Status Report 2010, 9.

<sup>18</sup>Resolution 61/222 on Oceans and the Law of the Sea (20 December 2006), para. 119 (b); Resolution 62/215 (22 December 2007), para 99(b); Resolution 63/111 (5 December 2008), para 117(b). Cited in A Trouwborst (2009, p. 28).

<sup>19</sup>In simple terms, ecosystem services are the benefits humans obtain from ecosystems such as clean air, water, food, fuel, climate regulation, and recreation. See further the *Millennium Ecosystem Assessment 2005*, which provides a typology of four categories of ecosystem services: supporting, provisioning, regulating, and cultural services.

<sup>20</sup>For example, the definition adopted by the UN Environment Programme (UNEP) is similar to the CBD but replaces ‘conservation’ with ‘sustainable delivery of ecosystem services’. See UNEP (2016, p. 8).

<sup>21</sup>The use of the adjective ‘soft’ to describe the legal status of an instrument is intended to indicate that the instrument is not legally binding, regardless of its content. However, soft law instruments and the conferences and institutions that they create are very influential in international environmental law and have an important normative function. See further PM Dupuy and JE Viñuales (2015, p. 35).

<sup>22</sup>Principle 2 of the Stockholm Declaration states that “the natural resources of the earth. . .especially representative samples of natural ecosystems, must be safeguarded for the benefit of present and future generations through careful planning or management. . .” 10 years later, the

International Importance was also an important environmental milestone of this era.<sup>23</sup> The notion of ‘wise use’ is at the heart of the Convention and has been explicitly linked to the ecosystem approach.<sup>24</sup> The focus of the Convention has shifted over time from an original treaty on waterfowl habitat, to the protection of wetlands as an ecosystem, to the ecosystem services provided by wetlands (Dupuy and Viñuales 2015), illustrating the normative evolution of ecosystem protection. The 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)<sup>25</sup> and the 1979 Convention on Migratory Species (CMS)<sup>26</sup> also warrant a brief mention: while they are focused on the protection of species, they also refer to the importance of these species within their ecosystems (Platjouw 2016), which has an indirect effect of promoting habitat conservation and thus the conservation of ecosystems (Tarlock 2007). The ecosystem approach is currently taken into account in CITES practice.<sup>27</sup>

Beginning in the early 1980s, specific reference to the ecosystem approach began to appear in a number of international treaties concerning the marine environment (Long 2012). The 1980 Convention on the Conservation of Antarctic Marine Living Resources (CAMLR)<sup>28</sup> was one of the first instruments to utilize the ecosystem approach as a primary normative framework (Sands et al. 2018) and is generally regarded as a leader in its implementation (Fabra and Gascon 2008).<sup>29</sup> The CAMLR

---

UN General Assembly, in principle 4 of the World Charter for Nature (28 October 1982) A/RES/37/7 called upon States to manage ecosystems and organisms in such a way as not to endanger the integrity of those other ecosystems or species with which they coexist. For a more detailed overview, see A Trouwborst (2009, p. 29).

<sup>23</sup>Convention on Wetlands of International Importance especially as Waterfowl Habitat 996 UNTS 245.

<sup>24</sup>The definition of ‘wise use’ was updated in 2005, taking into account the widespread acceptance of the ecosystem approach: “Wise use of wetlands is the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development”. Ramsar, Conference of the Parties 9 ‘A Conceptual Framework for the wise use of wetlands and the maintenance of their ecological character’ (November 2005) Resolution IX.1 Annex A (2005), para. 22. The definition explicitly cites the ecosystem approach as developed by the CBD (COP5 Decision V/6) and that applied by HELCOM and OSPAR in their Joint Statement in 2003. See further, CM Finlayson et al. (2011, p. 191), E Morgera (2017) highlights an interesting circular evolution here whereby the ecosystem approach elaborated under the CBD built upon the earlier notion of ‘wise use’ contained in the Ramsar Convention.

<sup>25</sup>Convention on International Trade in Endangered Species of Wild Fauna and Flora 983 UNTS 243.

<sup>26</sup>Convention on the Conservation of Migratory Species of Wild Animals 1651 UNTS 333.

<sup>27</sup>CITES, Fifty-third meeting of the Standing Committee, Synergy between CITES and the Convention on Biological Diversity (CBD) (June 2005) SC53 Doc.8 (rev. 1). Cited in FM Platjouw (2016, p. 30).

<sup>28</sup>Convention on the Conservation of Antarctic Marine Living Resources, Canberra, 20 May 1980, 19 ILM 841.

<sup>29</sup>See pp. 575–581 for a detailed discussion of the implementation of the ecosystem approach in the CAMLR regime.

covers the entire Antarctic marine system<sup>30</sup> and has a broad mandate to conserve Antarctic marine living resources, which includes their ‘rational use’ (Arts. II (1) and (2)). This means that ‘harvesting and associated activities’ are permitted in the CAMLR area as long as such exploitation does not endanger the population levels of the harvested species or the ecological relationship as a whole between the marine living resources in the area (Art. II(3)).<sup>31</sup> Furthermore, the CAMLR prohibits changes to the marine ecosystem which are not potentially reversible over two or three decades (Art. II(3)(c)). The CAMLR is a good illustration of the ecosystem approach in action via its incorporation of basic principles of ecosystem ecology, its recognition of the importance of ecosystem interrelationships and its focus on the various components of the marine ecosystem (de Lucia 2015).

1982 heralded the adoption of the United Nations Convention on the Law of the Sea (UNCLOS),<sup>32</sup> which provides the overarching legal framework for the governance of the oceans. In contrast to the CAMLR, the ecosystem approach manifests itself in a more implicit manner in UNCLOS (Platjouw 2016). While it does recognize that “the problems of ocean space are closely interrelated and need to be considered as a whole”,<sup>33</sup> and contains some elements of integrated decision making,<sup>34</sup> UNCLOS contains few explicit references to the concept of the ecosystem,<sup>35</sup> and promotes a zonal and sectoral approach to ocean governance (Scott 2015). A critical turning point was the adoption of Agenda 21 at the 1992 United Nations Conference on Environment and Development (UNCED)<sup>36</sup> which, via its explicit promotion of a holistic approach to oceans management, became a catalyst for

---

<sup>30</sup>Which it describes as ‘the complex of relationships of Antarctic marine living resources with each other and with their physical environment’ in Article I (3) CAMLR.

<sup>31</sup>See also R Long (2012, pp. 433–434), V de Lucia (2015, pp. 107–108), D Langlet and R Rayfuse (2018, p. 2).

<sup>32</sup>Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397.

<sup>33</sup>Third Recital to Preamble of UNCLOS.

<sup>34</sup>See Articles 61 and 119 UNCLOS which in the context of fisheries require decisions to consider environmental, scientific, economic, and social factors and to consider the impact on associated or dependent species when establishing conservation measures. See further E Kirk (2015, p. 40).

<sup>35</sup>See Article 194(5) UNCLOS which requires parties to protect rare or fragile ecosystems and Article 145(a) which calls upon States to prevent interference with the “ecological balance of the marine effects of fishing on dependent or associated species”.

<sup>36</sup>UNCED, Agenda 21: Programme of Action for Sustainable Development (1992) UN Doc A/Conf. 151/26. The 1992 Rio Declaration, *op cit*, also adopted at UNCED, recognised the “integral and interdependent nature of the Earth” in its Preamble. An important precursor to UNCED was the 1987 Brundtland Commission Report ‘Our Common Future’, which introduced the concept of sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” and linked it to conservation of ecosystems. See Report of the World Commission on Environment and Development, ‘Our Common Future’ 10 March 1987, Chapter 2.



further development of the ecosystem approach (Trouwborst 2009). Chapter 17 (para.1) of Agenda 21 underlined the importance of new approaches to marine management, at national, regional, and global levels, “that are integrated in content and are precautionary and anticipatory in ambit”.

The parties to the CBD subsequently approved the ecosystem approach as the primary framework for implementation of its objectives in 1995,<sup>37</sup> making it the first international treaty to take a holistic, ecosystem-based approach to biodiversity conservation and sustainable use (CBD 2004). The CBD is considered a leader in the adoption of the ecosystem approach and has done more to elaborate the concept than any other regime (de Lucia 2018), capitalizing on previous legal developments in international environmental law such as sustainable forest management.<sup>38</sup> While the CBD contains a definition of an ‘ecosystem’ as “a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit” (Art. 2), there is no explicit basis for the ecosystem approach in the text of the CBD.<sup>39</sup> Due to the lack of development of the notion at an international level, the CBD parties recognized the need to elaborate on its interpretation and application.<sup>40</sup> Thus, at their fifth meeting in Nairobi, Kenya in 2000, the COP agreed upon a definition (discussed in Sect. 2 above), recommended the implementation of 12 interlinked and complementary principles of the ecosystem approach, known as the Malawi Principles,<sup>41</sup> and also issued five points of Operational Guidance for their application.<sup>42</sup> At their seventh meeting in 2004, the COP confirmed that the establishment and maintenance of systems of protected areas play an essential part in implementing the ecosystem approach and achieving the objectives of the Convention.<sup>43</sup>

---

<sup>37</sup>CBD-COP 2 Decision II/8 (November 1995), para 1. CBD-COP 7, Decision VII/11, para. A.3.

<sup>38</sup>CBD-COP 7 Decision VII/11 (2004), para. 7 and Annex II; CBD Guidelines (2004), Annex III. See E Morgera (2017, p. 71).

<sup>39</sup>However, Platjouw points out that both the protection of ecosystems as well as the rehabilitation and restoration of degraded ecosystems are promoted in Articles 8(d) and 8(f) of the Convention. See FM Platjouw (2016, p. 32).

<sup>40</sup>In CBD-COP 4 Decision IV/1, B (1998), the need for a workable description and further elaboration of the ecosystem approach was acknowledged. See E Morgera (2017, p. 71).

<sup>41</sup>CBD-COP 5 Decision V/6 (2000), Section B.

<sup>42</sup>Ibid., Section C. See CBD-COP 7 Decision VII/11 (2004 and CBD Guidelines (2004) for detailed guidance on the rationale behind the Malawi Principles and their implementation.

<sup>43</sup>CBD-COP 7 Decision VII/28 (2004) UNEP/CBD/COP/DEC/7/28, para. 1.

**Malawi Principles**

1. The objectives of management of land, water and living resources are a matter of societal choice.
2. Management should be decentralised to the lowest appropriate level.
3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
4. Recognising potential gains from management there is a need to understand the ecosystem in an economic context.
5. Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.
6. Ecosystems must be managed within the limits of their functioning.
7. The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.
8. Recognising the varying temporal scales and lag effects that characterise ecosystem processes, objectives for ecosystem management should be set for the long term.
9. Management must recognise that change is inevitable.
10. The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
11. The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
12. The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

**CBD Operational Guidance for Application of the Ecosystem Approach**

1. Focus on relationships and processes within ecosystems.
2. Enhance benefit-sharing.
3. Use adaptive management practices.
4. Carry out management actions at the scale appropriate for the issue being addressed with decentralization to the lowest level, as appropriate.
5. Ensure inter-sectoral cooperation.<sup>44</sup>

---

<sup>44</sup>CBD guidance describes inter-sectoral cooperation as a need to integrate the ecosystem approach into different sectors that impact biodiversity, including agriculture, fisheries and forestry and calls for increased communication and cooperation at a range of levels to achieve this e.g. through inter-ministerial bodies or information sharing networks. See CBD-COP 5 Decision V/6 (2000), para. 12 and CBD Guidelines (2004), Annex I.

After the ecosystem approach was endorsed by the parties to the CBD, it gained widespread recognition,<sup>45</sup> particularly in a fisheries management context,<sup>46</sup> where it has been termed the ‘ecosystem approach to fisheries’ (EAF) (UNEP 2016).<sup>47</sup> The Food and Agriculture Organization of the United Nations (FAO) has promoted the ecosystem approach as best practice.<sup>48</sup> For example, the 1995 FAO Code of Conduct for Responsible Fisheries recognizes the transboundary nature of aquatic ecosystems (Art. 6(4)) and its provisions have a broad scope to protect target and non-target species as well as the ecosystems associated with those species (Platjouw 2016). The ecosystem approach also became a key feature of the 1995 United Nations Fish Stocks Agreement (UNFSA),<sup>49</sup> which was designed to apply to fish stocks, regardless of their geographic location and therefore requires States to take into account the transboundary impacts of their decisions.<sup>50</sup> The precautionary approach is explicitly mentioned in UNFSA and is considered to be an essential component of the EAF.<sup>51</sup> UNFSA also created an obligation for States to cooperate through Regional Fisheries Management Organizations (RFMOs),<sup>52</sup> several of which also adopted the ecosystem approach (Sands et al. 2018). However, the actualization of the EAF in this context has been hampered by the fact that RFMOs do not cover the world’s oceans and fishing resources in a comprehensive manner. RFMOs generally manage stocks either on a species specific or geographic basis, thus leaving many areas unregulated and many stocks and species unmanaged (Rayfuse 2016).

---

<sup>45</sup>E.g. The UN Convention on the Law of Non-Navigational Uses of International Watercourses (21 May 1997, entered into force 17 August 2014) created an obligation for States to “protect and preserve the ecosystems of international watercourses”, Arts. 20, 22 and 23. On the ecosystem approach and international water law, see further O McIntyre (2014, 2018), R Moynihan (2017, 2020). It was also endorsed in soft law by the 2002 World Summit on Sustainable Development in its Plan of Implementation, which emphasized the need to “develop and facilitate the use of diverse approaches and tools, including the ecosystem approach” in accordance with Chapter 17 of Agenda 21. See the Johannesburg Plan of Implementation of the World Summit on Sustainable Development (2002), UN Doc. A/CONF.199/20, para. 31 c.

<sup>46</sup>For example, the 2001 Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem recognized the importance of interactions between fishery resources and all components of the ecosystem, and the need to conserve marine environments and called upon States to develop best practice guidelines for introducing ecosystem considerations into fisheries management. See further EJ Molenaar (2002) and M Barange (2003).

<sup>47</sup>On the EAF, see generally, D Diz (2012) and FAO (2003).

<sup>48</sup>See e.g. FAO Code of Conduct for Responsible Fisheries 1995 and FAO International Guidelines for the Management of Deep-Sea Fisheries in the High Seas 2008.

<sup>49</sup>Agreement for the Implementation of the Provisions of the UN Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, 4 August 1995 (into force 11 December 2001) 2167 UNTS 3. UNFSA supplements UNCLOS and obliges coastal States and States fishing on the high seas to *inter alia* protect biodiversity in the marine environment and apply the precautionary and ecosystem approaches, with a view to conserving straddling and highly migratory fish stocks.

<sup>50</sup>Arts. 5 and 6 UNFSA. See E Kirk (2015, p. 40).

<sup>51</sup>Art. 5 (c) and Art. 6 UNFSA. See D Diz (2017, p. 131).

<sup>52</sup>Arts. 10, 11 and 12. On RFMOs, see generally R Rayfuse (2015).

Regional seas conventions (RSCs) are generally viewed as being more consistent with an ecosystem approach given that they have geographical as opposed to sectoral scope (Barritt and Viñuales 2016). However in practice they have not been as effective as hoped (Wang 2004); they have limited mandates, which only apply to States which are parties to the relevant treaty, and exclude many relevant human activities from their scope of application (Rochette et al. 2015). Also, most RSCs do not cover the high seas.<sup>53</sup> Different RSCs tend to emphasize different aspects of the ecosystem approach depending on the regional context (Langlet and Rayfuse 2018; Kirk 2015), however elements such as the precautionary principle,<sup>54</sup> recognizing the impact of transboundary activities,<sup>55</sup> the best use of scientific knowledge and advice,<sup>56</sup> and the involvement of stakeholders<sup>57</sup> can be found in several. The ecosystem approach has been explicitly endorsed by the parties to the Helsinki<sup>58</sup> and OSPAR<sup>59</sup> Conventions, with a recognition that the marine environment is both an ecosystem and interlocking network of ecosystems,<sup>60</sup> and it has been described as the ‘overarching principle’ in the OSPAR Commission’s work.<sup>61</sup> The OSPAR scheme for implementing the ecosystem approach has been described as one of the most highly developed in international environmental law (Long 2012). It embraces an adaptive management approach via its use of a ‘continuous cycle of steps’ which involve setting and coordinating ecological objectives and associated targets and indicators, ongoing management, and regular updating of ecosystem knowledge, research, and advice.<sup>62</sup>

At the global level, the ecosystem approach has featured in the draft text of a new internationally legally binding instrument (ILBI) under UNCLOS on the conservation and sustainable use of marine biodiversity beyond national jurisdiction (BBNJ),<sup>63</sup> negotiations for which began in September 2018.<sup>64</sup> The BBNJ

---

<sup>53</sup>With the exception of OSPAR, Barcelona Convention, Noumea Convention, Lima Convention and CAMLR. See UN Environment (2017).

<sup>54</sup>E.g. Art. 3(2) Helsinki Convention; Art. 2(2)(a) OSPAR Convention.

<sup>55</sup>E.g. Art. 3 (6) Helsinki Convention; Art. 11 Barcelona Convention.

<sup>56</sup>E.g. Art. 13 Barcelona Convention.

<sup>57</sup>E.g. Art. 17 Helsinki Convention; Art. 15 Barcelona Convention.

<sup>58</sup>Convention on the Protection of the Marine Environment of the Baltic Sea Area, 1992 1507 UNTS 167.

<sup>59</sup>Convention for the Protection of the Marine Environment of the North-East Atlantic 1992 2354 UNTS 67.

<sup>60</sup>OSPAR/HELCOM statement (2003), para. 3.

<sup>61</sup>Preamble to Strategy of the OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic 2010–2020, OSPAR Agreement 2010–3.

<sup>62</sup>OSPAR Strategy 2010–2020, para 4.3.

<sup>63</sup>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. Note by the President. Advance unedited version, 25 June 2019.

<sup>64</sup>Resolution 72/249 adopted by the United Nations General Assembly on 24 December 2017. The package of issues for negotiation is limited to: marine genetic resources, including benefit-sharing,

negotiations represent a recognition that measures by individual States or regional bodies are not sufficient to conserve the high seas due to the transboundary nature of the ocean. Furthermore, significant regulatory gaps in the existing international governance framework have prevented progress on addressing the increasing threats to high seas biodiversity.<sup>65</sup> Thus, the development of the ILBI can be viewed as a response to the previously sector specific and uncoordinated approach taken to govern the ocean, thereby demonstrating an endorsement of the ecosystem approach.

## 4 Operational Challenges

As can be seen from the above discussion, the ecosystem approach has been included in a wide range of ocean instruments. However, its application varies from treaty to treaty with none incorporating all aspects of the approach, likely a result of piecemeal and sectoral development to date (Kirk 2015). The CBD Secretariat has pointed out that there is no single way to implement the ecosystem approach as application will vary depending on the specific context, including local, national, regional, or global conditions (CBD 2004). Therefore, in practical terms, the ecosystem approach is a normative framework, which needs to be tailored to specific circumstances.<sup>66</sup> This results in a ‘plurality of approaches’ rather than a single ‘true’ version of the ecosystem approach (de Lucia 2015). In 2004, at COP 7, additional rationale and implementation guidelines for the Malawi principles were provided, whereby a mainstreaming of the ecosystem approach into national and regional biodiversity strategies, action plans, policy instruments, planning processes, and sectoral plans was promoted.<sup>67</sup> Despite these efforts, the principles have not been applied widely in practice as they are viewed as too complex or vague (Langlet 2018; Platjouw 2016).<sup>68</sup> They also allow much to be decided at a later stage, thus enabling action to be deferred (Kirk 2015).

---

area-based management tools, including marine protected areas; environmental impact assessments; and capacity-building and marine technology transfer.

<sup>65</sup>For a detailed discussion on identified gaps in high seas governance, see further KM Gjerde et al. (2019).

<sup>66</sup>CBD COP Decision IX/7, Ecosystem Approach (2008), UNEP/CBD/COP/DEC/IX/7, Preamble, para (a).

<sup>67</sup>CBD-COP 7, Decision VII/11 (2004), Annex 1, para 5.

<sup>68</sup>The EU, which is a party to the CBD, has embraced the ecosystem approach as a central theme in its marine governance legislation, including the Water Framework Directive 2000/60/EC, the Marine Strategy Framework Directive 2008/56/EC and the Maritime Spatial Planning Directive 2014/89/EU. However, challenges remain at the implementation level, especially in a fisheries context. See further, J Wakefield (2018), N Soinen and FM Platjouw (2018), D Langlet and R Rayfuse (2018, p. 449).

## 4.1 *Scientific Uncertainty*

Reasons for such inertia include the different interpretations of the concept by various actors, as highlighted earlier, and the difficulty in translating the evolving scientific understanding of ecosystems into law (Tarlock 2007). The ecosystem approach is underpinned by a comprehensive scientific knowledge base, however gaps in knowledge, scientific uncertainty, and dynamic multiple-scale ecosystem processes make it difficult to implement in a way that ensures legal stability and predictability (de Lucia 2018). In recognition of the fact that ecosystems change, parties to the CBD stipulated that the ecosystem approach must use adaptive management to anticipate and cater for such changes.<sup>69</sup> While appearing counter-intuitive at first,<sup>70</sup> adaptive management models, which enable new knowledge to be incorporated in a tailor made fashion as it becomes available, can provide solutions to the problems of scientific and legal uncertainty (Trouwborst 2009).<sup>71</sup> In this way, the implementation of the ecosystem approach is also in a constant state of evolution (Long 2012). Despite the allegedly ‘limitless’ legal options for implementing the ecosystem approach (Belsky 1985, p. 763),<sup>72</sup> Langlet and Rayfuse (2018) point out that the variety and complexity of both natural ecosystems and the institutional, legal, and administrative systems created for their management is what makes the effective implementation of the ecosystem approach so highly challenging. Given the context specific nature of the application of the ecosystem approach, it has been suggested that it is more constructive to view the Malawi principles as an overarching framework of understanding more than an explicit strategy (Langlet and Rayfuse 2018). Kirk (2015) has suggested that the lack of precise prescription as to how the ecosystem approach is to be implemented can be viewed positively, in the sense that it allows for tailored adaptation in response to the needs of particular ecosystems.

## 4.2 *Institutional Fragmentation and Spatial Mismatch*

Spatial mismatch between ecological boundaries and governance regimes has been a challenge for the effective operation of the ecosystem approach (Tanaka 2004; Kirk 1999).<sup>73</sup> The CBD envisages an ecosystem approach whereby the appropriate scale

<sup>69</sup>CBD COP 5 Decision V/6 (2000), Principle 9.

<sup>70</sup>BA Cosens et al. (2017, p. 16), observes that although law has often been viewed as a constraint on adaptation, it has proven highly adaptive over time.

<sup>71</sup>See also CBD-COP 5 Decision V/6 (2000), Section C. On adaptive management, see *inter alia*, JB Ruhl (2006), AJ Garmestani et al. (2008), DA Keith et al. (2011), E Raitanen (2017), Le Lievre (2019).

<sup>72</sup>Cited by R Long, 426. See the list of implementation options suggested by the UNGA (2006) at para. 7 as an example.

<sup>73</sup>On socio-ecological scale mismatch, see GS Cumming and others (2006).

of management action is to be determined by the problem to be addressed.<sup>74</sup> This is difficult to achieve on a global scale as the ocean is divided into areas under national State jurisdiction and the high seas, also known as areas beyond national jurisdiction (ABNJ), over which no State exercises unilateral control (Harrison 2017). The CBD is focused on the protection of marine biodiversity within the limits of national State jurisdiction,<sup>75</sup> thus leaving the high seas under the purview of the UNCLOS legal framework and other international and regional agreements.<sup>76</sup> This has resulted in major governance gaps, which the BBNJ negotiations are now seeking to redress. The challenges which arise due to the lack of spatial fit have been aggravated by the absence of a single overarching global body with the authority to adopt management measures for marine biodiversity conservation that apply to the entire ecosystem (Harrison 2017; Long 2012). As a solution, increased procedural cooperation and linkages between the various existing ocean regulatory regimes have been proposed (Tanaka 2004; Kirk 1999). Successful examples of inter sectoral cooperation on a global level include the work of the International Maritime Organization (IMO) and FAO on tackling Illegal, Unregulated and Unreported (IUU) Fishing<sup>77</sup> and in a biodiversity context, the close cooperation and coordination between the COPs of the CBD, CITES and CMS.<sup>78</sup> Regionally, institutional cooperation is taking place to coordinate fisheries activities in the North East Atlantic,<sup>79</sup> in relation to the identification and designation of marine protected areas (MPAs),<sup>80</sup> ecologically and

---

<sup>74</sup>Malawi Principle 7. CBD Guidelines (2004, pp. 20–21).

<sup>75</sup>In ABNJ the CBD only applies to processes and activities carried out under the jurisdiction and control of the Parties. CBD Art. 4 (b).

<sup>76</sup>These include regional seas agreements such as the Barcelona Convention, OSPAR, the Noumea Convention, CAMLR and the Antarctic Treaty, as well as RFMOs, CMS and the International Whaling Convention 1946.

<sup>77</sup>See e.g. Report of the Joint FAO/IMO Ad Hoc Working Group on Illegal, Unreported and Unregulated (IUU) Fishing and Related Matters, Document FIRO/R1124 (July 2007). A cooperation agreement between the IMO and FAO was entered into in 1965. See further J Harrison (2017, p. 279).

<sup>78</sup>See e.g. 1996 CITES-CBD MOU, 1996 CBD-CMS MOU and 2002 CITES-CMS MOU. J Harrison (2017, p. 278), Tanaka (2004, pp. 505–506). On the challenges of institutional linkage in a biodiversity context, see E Raitanen (2017, pp. 91–92).

<sup>79</sup>Memorandum of Understanding Between the North East Atlantic Fisheries Commission and the OSPAR Commission, 2008.

<sup>80</sup>E.g. the Parties to the Antarctic Treaty can only designate protected areas in consultation with the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) as the relevant RFMO in the region and vice versa. In the Mediterranean, cooperation between a regional seas body and a regional fisheries body is illustrated via the Memorandum of Understanding between the UNEP MAP-Barcelona Convention and FAO-GFCM (2012), Annex which includes collaboration on criteria to identify MPAs. See further J Harrison (2017, pp. 281–286).

biologically significant areas (EBSAs),<sup>81</sup> and large marine ecosystems (LMEs).<sup>82</sup> However, most examples of inter-sectoral and institutional cooperation tend to occur on an ad hoc basis without overarching coordination. These shortcomings have been recognised within the BBNJ process, and there is agreement on the need to address cooperation and collaboration among different institutions (Harrison 2017), however no clear consensus has yet emerged regarding modalities to achieve this. It also remains to be determined whether there will be a Conference of Parties with global authority as part of the new instrument, however it looks increasingly likely.<sup>83</sup>

## 5 Conclusion

Despite the challenges associated with the operation of the ecosystem approach, it has increasingly become a staple feature of modern marine management. However, given that most of the work done to flesh out how it can be implemented and applied has occurred on a soft law basis, the normative content of the ecosystem approach has been described as weak and unclear in terms of its obligations on States (Tanaka 2015). It is clear that a more holistic form of governance is a necessary corollary of the ecosystem approach, which will naturally require greater cooperation between States and international and regional institutions, integrated management across sectors, and planning on a variety of levels, including across boundaries (IPBES 2019; UNGA 2006).<sup>84</sup> Integrated management, with a long-term time frame (CBD 2004), is considered to be essential in order to ensure efficient coordination between organizations and compatibility between policies and activities.<sup>85</sup> However, its implementation has been hampered by the existing fragmented and decentralised institutional architecture of global ocean governance (Harrison 2017), as well as political and financial challenges (Scott 2015). Its meaning also remains obscure in

---

<sup>81</sup>The EBSA process, established under the CBD, has potential to play a useful role in facilitating cooperation in relation to the establishment of MPAs. It is not constrained by boundaries and works via regional workshops involving diverse stakeholder groups representing regional jurisdictions, intergovernmental bodies, non-governmental organizations and indigenous representatives. To date 279 EBSAs have been recognized, encompassing areas of the ocean both within and beyond national jurisdictions. See further DE Johnson et al. (2018).

<sup>82</sup>The LME concept was developed by the United States National Oceanic and Atmospheric Administration (NOAA) as a model to implement ecosystem approaches to assessing, managing, recovering, and sustaining LME resources and environments. Thus far, 64 LMEs have been defined globally. See further <https://www.st.nmfs.noaa.gov/ecosystems/lme/>; UNEP (2016), H Wang (2004), L Juda (1999). For critique, see J Rochette et al. (2015).

<sup>83</sup>See IISD *Summary of the Third Session of the Intergovernmental Conference on the Conservation and Sustainable Use of Marine Biodiversity of Areas Beyond National Jurisdiction: 19–30 August 2019* Earth Negotiations Bulletin Vol. 25 No. 218, available at <http://enb.iisd.org/oceans/bbnj/figc3/>

<sup>84</sup>UNGA (2006), para 7.

<sup>85</sup>Agenda 21, Chapter 17, para. 17.5(a). For a deeper discussion on integrated oceans management, see generally K Scott (2015) and J Harrison (2017), Chapter 10.



international law (Scott 2015; Tanaka 2004). Parties to the CBD have acknowledged that the full application of the ecosystem approach remains a ‘formidable task’, especially on a larger scale.<sup>86</sup> Nevertheless, the soft law developed by CBD parties, including the Malawi Principles and Operational Guidance, continue to remain relevant and applicable. Indeed, Morgera attributes the transformation of the ecosystem approach into a “fully-fledged system of soft law principles and guidelines” to this consensus based normative activity of the CBD parties (2017, p. 71). The BBNJ process represents a timely opportunity for States to tackle many of the challenges discussed in this chapter. While negotiations remain ongoing as of 2019, the design of the instrument and mode by which it provides or creates space for enabling elements (e.g. institutions, guidelines) will have a significant bearing on how the ecosystem approach is translated into practice in the future.

**Acknowledgements** The author would like to thank Professor Owen McIntyre and Dr Anne Marie O Hagan for comments on an earlier draft of this chapter. The author’s PhD research is funded by the Irish Marine Institute as part of the Navigate project on Ocean Law and Marine Governance (Grant-Aid Agreement No. PBA/IPG/17/01).

## References

- Barange, M. (2003). Ecosystem science and the sustainable management of marine resources: From Rio to Johannesburg. *Frontiers in Ecology and the Environment*, 1(4), 190–196.
- Barritt, E., & Viñuales, J. E. (2016). *Legal scan: A conservation agenda for biodiversity beyond national jurisdiction* (pp. 1–89). Cambridge Centre for Environment, Energy and Natural Resource Governance, University of Cambridge.
- Belsky, M. (1985). Management of large marine ecosystems: Developing a new rule of customary international law. *San Diego Law Review*, 22, 733–763.
- Brunnée, J., & Toope, S. (1994). Environmental security and freshwater resources: A case for international ecosystem law. *Yearbook of International Environmental Law*, 5, 41.
- Cosens, B. A., & others. (2017). The role of law in adaptive governance. *Ecology and Society*, 22, 1.
- Cumming, G. S., & others. (2006). Scale mismatches in socio-ecological systems: Causes, consequences, and solutions. *Ecology and Society*, 11(1), 14.
- De Lucia, V. (2015). Competing narratives and complex genealogies: The ecosystem approach in international environmental law. *Journal of Environmental Law*, 27, 91.
- De Lucia, V. (2018). A critical interrogation of the relation between the ecosystem approach and ecosystem services. *Review of European, Comparative and International Environmental Law*, 27, 104–114.
- Delacámara, G., O’Higgins, T., Lago, M., & Langhans, S. (2020). Ecosystem-based management: moving from concept to practice. In T. O’Higgins, M. Lago, & T. H. DeWitt (Eds.), *Ecosystem-based management, ecosystem services and aquatic biodiversity: Theory, tools and applications* (pp. 39–60). Amsterdam: Springer.
- Diz, D. (2012). *Fisheries management in areas beyond national jurisdiction: The impact of ecosystem based law-making*. Martinus Nijhoff Publishers.

---

<sup>86</sup>CBD-COP Decision IX/7 (2008), Preamble, para (f).

- Diz, D. (2017). Marine biodiversity: Unravelling the intricacies of global frameworks and applicable concepts. In J. Razzaque & E. Morgera (Eds.), *Encyclopedia of environmental law: Biodiversity and nature protection*. Edward Elgar Publishing.
- Dupuy, P. M., & Viñuales, J. E. (2015). *International environmental law*. Cambridge University Press.
- Fabra, A., & Gascon, V. (2008). The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) and the ecosystem approach. *International Journal of Marine and Coastal Law*, 23, 567.
- Finlayson, C. M., & others. (2011). The Ramsar Convention and ecosystem-based approaches to the wise use and sustainable development of wetlands. *Journal of International Wildlife Law & Policy*, 14, 176.
- Food and Agriculture Organization of the United Nations (FAO). (2003). Fisheries management. The ecosystem approach to fisheries. FAO technical guidelines for responsible fisheries. No 4, Supplement 2. FAO.
- Garmestani, A. J., & others. (2008). Panarchy, adaptive management and governance: Policy options for building resilience. *Nebraska Law Review*, 87, 1036.
- Gjerde, K. M., & others. (2019). Building a platform for the future: The relationship of the expected new agreement for marine biodiversity in areas beyond national jurisdiction and the UN Convention on the Law of the Sea. *Ocean Yearbook Online*, 33(1), 1–44.
- Grooten, M., & Almond, R. E. A (Eds.) (2018) Living planet report—2018: Aiming higher. Gland, Switzerland: WWF.
- Grumbine, E. G. (1994). What is ecosystem management? *Conservation Biology*, 8, 27.
- Harrison, J. (2017). *Saving the oceans through law: The international legal framework for the protection of the marine environment* (1st ed.). Oxford: Oxford University Press.
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). (2019). *Global assessment report on biodiversity and ecosystem services*. Bonn, Germany: IPBES Secretariat.
- Johnson, D. E., & others. (2018). Reviewing the EBSA process: Improving on success. *Marine Policy*, 88, 75.
- Juda, L. (1999). Considerations in developing a functional approach to the governance of large marine ecosystems. *Ocean Development & International Law*, 30, 89.
- Keith, D. A., & others. (2011). Uncertainty and adaptive management for biodiversity conservation. *Biological Conservation*, 114, 1175.
- Kirk, E. A. (1999). Maritime zones and the ecosystem approach: A mismatch? *Review of European, Comparative and International Environmental Law*, 8, 1.
- Kirk, E. A. (2015). The ecosystem approach and the search for an objective and content for the concept of holistic ocean governance. *Ocean Development & International Law*, 46, 33–49.
- Langhans, S. D., & others. (2019). The potential of ecosystem-based management to integrate biodiversity conservation and ecosystem service provision in aquatic ecosystems. *Science of the Total Environment*, 672, 1017.
- Langlet, D. (2018) *Operationalizing the ecosystem approach in maritime spatial planning*. Paper presented at INTRA law centre workshop, tendencies in legal approaches and instruments for the protection of ecological systems, Aarhus University, Denmark, October 25.
- Langlet, D., & Rayfuse, R. (Eds.). (2018). *The ecosystem approach in ocean planning and governance: Perspectives from Europe and beyond*. Leiden, The Netherlands: Brill Nijhoff.
- Le Lievre, C. (2019). Sustainably reconciling offshore renewable energy developments with Natura 2000 sites: An interim adaptive management framework. *Energy Policy*, 129, 491.
- Long, R. (2012). Legal aspects of ecosystem-based marine management in Europe. In A. Chircop, M. L. McConnell, & S. Coffen-Smou (Eds.), *Ocean yearbook*. The Hague: Hijhoff.
- Long, R. D., et al. (2015). Key principles of eco-system based management. *Marine Policy*, 57, 53–60.

- McIntyre, O. (2014). The protection of freshwater ecosystems revisited: Towards a common understanding of the “ecosystem approach” to the protection of transboundary water resources. *Review of European Community and International Environmental Law*, 23, 88.
- McIntyre, O. (2018). Environmental protection and the ecosystem approach. In S. C. McCaffrey & others (Eds.), *Handbook of international water law research*. Edward Elgar Publishing.
- Molenaar, E. A. (2002). Ecosystem-based fisheries management, commercial fisheries, marine mammals and the 2001 Reykjavik Declaration in the context of international law. *International Journal of Marine and Coastal Law*, 17, 4.
- Morgera, E. (2017). The ecosystem approach and the precautionary principle. In J. Razzaque & E. Morgera (Eds.), *Encyclopedia of environmental law: Biodiversity and nature protection*. Cheltenham: Edward Elgar.
- Moynihan, R. (2017). International law on protection of transboundary freshwater ecosystems and biodiversity. In J. Razzaque & E. Morgera (Eds.), *Encyclopedia of environmental law: Biodiversity and nature protection law*. Cheltenham: Edward Elgar.
- Moynihan, R. (2020) *Transboundary freshwater ecosystems in international law: The role and impact of the UNECE environmental regime*. Cambridge University Press, Forthcoming.
- Ntona, M., & Morgera, E. (2018). Connecting SDG 14 with the other sustainable development goals through marine spatial planning. *Marine Policy*, 93, 214–222.
- O’Hagan, A. M. (2020). Ecosystem-based management (EBM) and ecosystem services in EU law, policy and governance. In T. O’Higgins, M. Lago, & T. H. DeWitt (Eds.), *Ecosystem-based management, ecosystem services and aquatic biodiversity: Theory, tools and applications* (pp. 353–372). Amsterdam: Springer.
- Platjouw, F. M. (2016). *Environmental law and the ecosystem approach: Maintaining ecological integrity through consistency in law*. New York: Routledge.
- Raitanen, E. (2017). Legal weaknesses and windows of opportunity in transnational biodiversity protection: As seen through the lens of an ecosystem approach based paradigm. In S. Maljean Du Bois (Ed.), *The effectiveness of environmental law*. Intersentia.
- Rayfuse, R. (2015). Regional fisheries management organizations. In D. Rothwell & others (Eds.), *The Oxford handbook of the law of the sea*. Oxford University Press.
- Rayfuse, R. (2016). Climate change, marine biodiversity and international law. In M. Bowman & others (Eds.), *Research handbook on biodiversity and law*. Edward Elgar Publishing.
- Rochette, J., & others. (2015). Regional oceans governance mechanisms: A review. *Marine Policy*, 60, 9.
- Ruhl, J. B. (2006). Regulation by adaptive management; is it possible? *Minnesota Journal of Law Science and Technology*, 7, 21–57.
- Sands, P., & others. (2018). *Principles of international environmental law*. Cambridge University Press.
- Scott, K. (2015). Integrated oceans management. A new frontier in marine environmental protection. In D. Rothwell & others (Eds.), *The Oxford handbook of the law of the sea*. Oxford University Press.
- Secretariat of the Convention on Biological Diversity. (2004). *The ecosystem approach (CBD Guidelines)*. Montreal: Secretariat of the Convention on Biological Diversity.
- Soininen, N., & Platjouw, F. M. (2018). Resilience and adaptive capacity of aquatic environmental law in the EU: An evaluation and comparison of the WFD, MSFD, and MSPD. In D. Langlet & R. Rayfuse (Eds.), *The ecosystem approach in ocean planning and governance perspectives from Europe and beyond*. Leiden, The Netherlands: Brill Nijhoff.
- Tanaka, Y. (2004). Zonal and integrated management approaches to ocean governance: Reflections on a dual approach in international law of the sea. *International Journal of Marine and Coastal Law*, 19, 483.
- Tanaka, Y. (2015). *The international law of the sea*. Cambridge University Press.
- Tarlock, D. (2007). Ecosystems. In D. Bodansky & others (Eds.), *The Oxford handbook of international environmental law*. Oxford University Press.

- Trouwborst, A. (2009). The precautionary principle and the ecosystem approach in international law: Differences, similarities and linkages. *Review of European Community and International Environmental Law*, 18, 26.
- UN Environment. (2017), *Regional seas programmes covering areas beyond national jurisdictions*. Regional Seas Reports and Studies, No.202.
- UNEP. (2016). *Regional oceans governance. Making regional seas programmes, regional fishery bodies and large marine ecosystem mechanisms work better together*.
- United Nations. (2016). First global integrated marine assessment (United Nations World Ocean Assessment I), UN Doc. A/70/112.
- United Nations General Assembly. (2006). Report on the work of the United Nations open-ended informal consultative process on oceans and the law of the sea at its seventh meeting (17 July 2006), A/61/156.
- Wakefield, J. (2018). The ecosystem approach and the common fisheries policy. In D. Langlet & R. Rayfuse (Eds.), *The ecosystem approach in ocean planning and governance perspectives from Europe and beyond*. Leiden, The Netherlands: Brill Nijhoff.
- Wang, H. (2004). Ecosystem management and its application to large marine ecosystems: Science, law, and politics. *Ocean Development & International Law*, 35(1), 41.
- Williams, B. K., Szaro, R. C., & Shapiro, C. D. (2009). *Adaptive management: The US Department of the Interior technical guide*. US Department of the Interior.

**Open Access** This chapter is licensed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

