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1 Introduction

Shipping is often described as the backbone of international trade.[[1]](#footnote-1) Compared to land-based modes of transport, shipping has many advantages, not least its ability to move huge volumes of goods between distant locations at a fair speed and with a limited use of energy. By using the sea rather than land, practical as well as legal challenges associated with crossing international borders can also be avoided. And even without considering the environmental aspect, air transport is just not practically or economically feasible for much of the goods that is being moved between distant locations on global markets.

Notwithstanding its obvious benefits, it has become increasingly recognised that shipping is also associated with significant pressures on many aspects of the natural environment as well as on human health.[[2]](#footnote-2) These pressures go beyond issues like oil spills and toxic antifouling, which have been discussed in relation to shipping for a long time. The dramatic expansion of shipping in recent decades has brought its contribution to problems like underwater noise pollution and climate change to the fore. In these and other areas shipping adds to the cumulative anthropogenic pressures on the marine environment as well as on many terrestrial ecosystems and human health,[[3]](#footnote-3) entailing risks for environmental harm, degradation of ecosystem services and human suffering.

The environmental effects of shipping are quite diverse and while some – typically those that reach the headlines – are the result of disasters, others are more chronic in nature. The intensity of these pressures is often very unevenly distributed. While a few pressures are global and some regional in character, many are predominantly concentrated to the vicinity of straits, bays, canals or other areas with intense shipping activities.[[4]](#footnote-4) The vulnerability of species and ecosystems to the different pressures varies considerably. Factors such as water depth, temperature and turnover time in a specific body of water also contribute to making the effects of pressures place specific. The UN Convention on the Law of the Sea (unclos)[[5]](#footnote-5) recognizes the need for measures taken to protect and preserve the marine environment to ‘include those necessary to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life’.[[6]](#footnote-6) Doing this often requires that the combined anthropogenic pressures of shipping and other human activities in each area be considered, and that measures can be tailored to the specific features and vulnerabilities of such areas and ecosystems.

Despite this, environmental management of ocean-based activities, including shipping, has developed within a system characterised by zonal and sectoral approaches with little capacity for handling cumulative impacts or tailoring responses to local ecological conditions. This has hampered effective measures to deal with the degradation of the marine environment.[[7]](#footnote-7) In response to this insight – and in tandem with a similar development in environmental management in general – the last few decades have seen a shift in marine management approaches towards management models focused on the interconnected logic of ecosystems.[[8]](#footnote-8) This is reflected, inter alia, in the emergence of maritime spatial planning (msp) as a major instrument for the comprehensive management of marine activities.[[9]](#footnote-9)

The shift towards integrative and place specific management approaches is strongly linked to the emergence of the ecosystem approach as a general framework for the management of human use of and impacts on ecosystems and is also reflected in the increasing calls for and political endorsement of integrated ocean management. While remaining a bit elusive in its details, the concept of integrated ocean management comprises mechanisms that support the simultaneous consideration and control of all or most relevant pressures affecting a certain area or ecosystem, enabling informed trade-offs between different objectives. Such mechanisms or components include ecosystem-based management, environmental impact assessment and spatial planning.[[10]](#footnote-10) Impact assessments and spatial-based planning are also essentially inherent to the concept of ecosystem approach. In fact, marine spatial planning is often seen as a tool for implementing the ecosystem approach.[[11]](#footnote-11) This makes it appropriate to use the ecosystem approach as an analytical framework for this analysis.

Since shipping is a strongly international activity and one that has, as will be seen in the following, been granted a privileged status compared to most other ocean uses and interests, the inclusion of shipping in adaptive planning and regulation at a local or regional level conducive to ecosystem specific considerations is challenging. The calls for more inclusive and adaptive forms of governance pose a risk to the values protected by internationally harmonized regulation of shipping, i.e. the expediency and efficiency of shipping as a global mode of transport. On the other hand, the harmonized nature of marine environmental regulation risks undermining the pursuit of effective protection and management of vital environmental and health objectives at a local scale.

Against this backdrop, the present text inquires to what extent the regulation of the environmental effects of shipping allows for regional and local conditions to be considered and enables relevant management responses to be put in place to address local needs. It is also asked what potential there is for improving this ability, thereby making the management of international shipping more consistent with core tenets of the ecosystem approach, while also recognizing the importance of international shipping for the pursuit of other societal objectives.

By way of delimitation, the analysis does not deal with the specific conditions and processes that pertain to the high seas, i.e. areas beyond the jurisdiction of any coastal state.[[12]](#footnote-12) Instead, it focuses on areas within 200 nautical miles from the nearest coast that are subject to coastal state jurisdiction. Also, despite being an integral part of the concept of ecosystem approach, the preconditions for participation in different forms of ocean governance and the inclusion of diverse forms of knowledge in such governance are not addressed.[[13]](#footnote-13) Instead, the analysis focuses on the spatial elements of the ecosystem approach, emphasising the need for managing environmental pressures in an integrated fashion and at ecologically meaningful scales. As will be seen in the following, this is also an area where the regulation of shipping stands out from that of most other maritime activities.

After this brief introduction, the chapter continues with an introduction to the notion of ecosystem approach or ecosystem-based management, with a particular focus on its spatial dimensions. That is followed by a brief overview, or rather exemplification of environmental pressures associated with shipping. Once more the focus is on the spatial dimensions of such pressures. After that, the room for regulatory measures that consider the specific needs and characteristics of particular areas or ecosystems is assessed. The analysis starts by looking at the ability of individual coastal States to take such measures. Coastal States are vested with sovereignty or functional jurisdiction over large sea areas adjacent to the coasts and also have corresponding obligations both to generally protect and preserve the marine environment,[[14]](#footnote-14) and to take ‘all measures necessary to ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other States and their environment’.[[15]](#footnote-15) As already mentioned, there is also an obligation on all States to take measures necessary to protect and preserve rare or fragile ecosystems and habitats of endangered species and other forms of marine life.[[16]](#footnote-16) It must also be assumed that coastal States, typically, have the best knowledge of local conditions, ecological as well as social, that could prompt specific protective measures and also have a strong interest in the design of any such measures. This is followed by a look at what measures or instruments are available at the international level, typically in the form of decisions by the International Maritime Organization (imo) based on international conventions such as the International Convention for the Prevention of Pollution from Ships (marpol)[[17]](#footnote-17) or the International Convention for the Safety of Life at Sea (solas)[[18]](#footnote-18) to extend extra protection to specific areas or otherwise adjust the environmental regulation of shipping to the conditions and needs of specific geographic areas.

2 Ecosystem Based Management

Over the past few decades, natural science as well as policy-making has gradually shifted from, or at least expressed the intent to shift, from focusing on specific activities and associated environmental problems to more comprehensive approaches that try to capture the complexity of the natural environment and how it is affected by cumulative human impacts.[[19]](#footnote-19) This is reflected in the emergence of the ecosystem approach as a fundamental concept for integrated environmental management. In the scientific literature, ‘ecosystem approach’ has been used since the mid-20th century but its use has increased rapidly since the 1980s.[[20]](#footnote-20) Related concepts such as ‘ecosystem-based management’ and ‘ecosystem management’ have also become very frequent in recent decades. These concepts are sometimes used interchangeably, while at other times they are intentionally invoked as having distinct connotations.[[21]](#footnote-21)

As discussed in the introduction, the present analysis is primarily concerned with the spatial dimension of these concepts, for which reason a closer look at that dimension is more fruitful than attempting to pinpoint any specific differences between the general concepts. While all the concepts are also themselves subject to varying definitions there are core features common to pretty much all formulations of the ecosystem approach or ecosystem-based management. Among these is that it entails management that is place- or area-based, either in as strictly geographic sense or in terms of relating to defined processes that comprise ecosystem functioning. The latter understanding places less emphasis on distinct geographical boundaries but still relates to somehow delineated ecological systems.[[22]](#footnote-22) This focus on the importance of place and the features of natural systems has resulted in an increasing emphasis on structuring the regulation of human activities to fit the scale and other features of relevant natural systems.[[23]](#footnote-23) Other features that are generally associated with ecosystem approaches to management include that it is incremental and adaptive to new knowledge or changing circumstances, cognizant of uncertainties and the existence of multiple factors – both internal and external to the ecosystem as such – influencing management outcomes.[[24]](#footnote-24) Many influential definitions of the ecosystem approach also more or less explicitly hold that ecosystem-based management should result in human activities that affect ecosystems staying within ecological boundaries.[[25]](#footnote-25)

The most influential definition of the ecosystem approach in a legal or policy context is found in a ‘common understanding’ adopted by the parties to the Convention on Biological Diversity (cbd). According to this, the approach ‘is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way …’. It also ‘requires adaptive management to deal with the complex and dynamic nature of ecosystems and the absence of complete knowledge or understanding of their functioning’.[[26]](#footnote-26)

In terms of law, an ecosystem approach was mandated already in 1980 through the adoption of the Convention on the Conservation of Antarctic Marine Living Resources.[[27]](#footnote-27) However, it was in 1995 that it gained general recognition as a policy concept when the parties to the cbd agreed that it ‘should be the primary framework of action to be taken under the Convention’. The approach features particularly strongly in relation to the marine environment with clear endorsements *inter alia* within the frameworks of the regional Helsinki and ospar Conventions,[[28]](#footnote-28) as well as the United Nations Fish Stocks Agreement.[[29]](#footnote-29)

For the purpose of the present analysis, the most important message of the ecosystem approach is the need to get away from single sector approaches to the regulation of human activities or at least make the regulation of sectors cognizant of the sectors’ embeddedness in and effects on larger social and not least ecological systems. The approach entails a need for management of human activities that is flexible so that it can effectively deal with local conditions and requirements and adequately respond to change. However, despite having many potential effects on marine and other ecosystems, shipping has only to a very limited extent been discussed in relation to the ecosystem approach.[[30]](#footnote-30)

3 Environmental Pressures Associated with Shipping

Although good progress has been made over the past 40 years in reducing some forms of pollution from ships, the sector is still associated with considerable pressures on many aspects of the environment, as well a human health – pressures that may increase due to the continued growth of shipping.[[31]](#footnote-31) Before discussing the regulatory framework for international shipping, and its compatibility with core features of the ecosystem approach, this section gives a brief overview of some of the main environmental pressures associated with shipping. The focus is on the spatial characteristics of these pressures, as well as on other features of particular relevance for ecosystem-based management.

Among the pollutants not discussed in the following, but which may still represent a significant environmental pressure partly as a consequence of international shipping are particles, volatile organic compounds (voc s), marine waste and sewage.[[32]](#footnote-32) (On emissions from ships, see also the chapter by Hassellöv in this volume).

3.1 Oil and Other Hazardous Substances

Probably the most well-known environmental problem associated with shipping is that of oil being introduced into the marine environment. Most public attention is generated by oil pollution resulting from disastrous maritime accidents, but there is also significant chronic oil pollution caused by the normal operation of ships, as well as smaller intentional discharges. Whereas enormous oil spills from accidents involving oil tankers have decreased, large amounts of oil still enter the ocean, not least in the form of operational spills from the shipping sector.[[33]](#footnote-33)

The ecological consequences of oil spills are highly place dependent. Although ecosystems in many instances can recover fairly swiftly from an oil spill, the local effects can be dramatic with extensive mortality of birds, marine mammals and also benthic biota, particularly when the spill occurs in the vicinity of beading or nursery areas or important migration routes.[[34]](#footnote-34) If a spill occurs in an area with threatened or endemic species they may be severely diminished or even wiped out. Ambient temperature is a circumstance that is very significant for the duration of and recovery from an oil spill.[[35]](#footnote-35) Low temperature reduces the rate of natural weathering processes such as evaporation and biodegradation, thereby making the spill more persistent. An additional problem with oil spills in arctic and other ice-covered waters is that the oil gets mixed into or below the ice, making oil remediation much more difficult.[[36]](#footnote-36)

There are also many other hazardous substances apart from oil that are transported by ships in considerable volumes. However, the large number of such substances and the great variety of environmental risks with which they are associated make it hard to say much in general about their characteristics or the demands they place on the regulatory system. What is clear is that also here the effects of spills depend on a combination of the nature and the volume of the substance in question that enters the environment and the characteristics of the location where the spill occurs.[[37]](#footnote-37) It is notable that also non-toxic substances like vegetable oil have been reported to have a very negative impact on marine biota when released in large quantities.[[38]](#footnote-38)

3.2 Air Pollution

Shipping is associated with various forms of air pollution. Emissions of sulphur oxides (sox) and nitrogen oxides (nox) have a long history of debate and regulation. For at least 30 years it has been known that emissions of nox and sox from ships constitute a serious element in air pollution in coastal areas with heavy shipping.[[39]](#footnote-39) Many air emissions that originate from ships can be transported hundreds of kilometres from the point of emission. The fact that about 70 percent of the emissions from maritime transport are emitted within 400 km of land contributes to making shipping a very significant source of air pollution in many coastal areas.[[40]](#footnote-40)

Emissions of sulphur dioxide cause acid rain and combine with other pollutants, such as sulphur, to generate fine particles. Global emissions of small particles from shipping are linked to thousands of cases of lung cancer and other diseases of the heart and lungs.[[41]](#footnote-41) nox released into the atmosphere can have a number of deleterious effects of both local, regional and global reach. Among them are formation of ground level ozone and secondary particulate matter, eutrophication and acidification.[[42]](#footnote-42)

Both nox and sox result from the burning of marine fuels. Essentially, the level of nox and sox emissions depend on the type of fuel, engine, and engine efficiency.[[43]](#footnote-43) Traditionally, marine fuels have contained extremely high levels of sulphur compared to fuels for land transport and marine transportation has been estimated to account for 10–15 percent of the world’s anthropogenic sox and nox emissions.[[44]](#footnote-44) In port cities, emissions from shipping have in many cases been identified as the major source of urban air pollution.[[45]](#footnote-45) Some impacts, like the acidification resulting from sulphur depositions are also dependent on local natural conditions like the natural buffering capacity associated with different geological characteristics.[[46]](#footnote-46)

3.3 Climate Change and Ocean Acidification

A study by the imo found that international shipping accounted for approximately 2.2 percent of global emissions of carbon dioxide in 2012.[[47]](#footnote-47) However, maritime co2 emissions are projected to increase significantly and could, depending on future economic and energy developments, increase by 50 to 250 percent in the period to 2050.[[48]](#footnote-48) Since the atmosphere is an almost perfect mix of its constituent gases, the location of greenhouse gas emission sources is, however, of little or no significance for climate change or ocean acidification, both caused primarily by the increase of carbon dioxide levels in the atmosphere. This makes an ecosystem-based approach to climate change and ocean acidification mitigation superfluous. The consequences of climate change on the other hand can be very different and reach different levels of severity in different regions of the world. The effects of climate change as well as those of ocean acidification also tend to be linked to the prevalence of other pressures in a particular area.[[49]](#footnote-49) In this sense, climate change and ocean acidification also have a place specific dimension.

3.4 Noise

Anthropogenic noise in the oceans has increased in recent decades with commercial shipping as the main source.[[50]](#footnote-50) Although there is still a lack of knowledge about the specific effects of marine noise, it is known that the noise generated by ships is often in frequency bands used by marine mammals for communication.[[51]](#footnote-51) Anthropogenic noise has also been linked to a variety of detrimental effects on various forms of marine life.[[52]](#footnote-52) Sensitivity to noise varies between marine species.[[53]](#footnote-53) In general, however, the impacts of underwater noise depend on duration and intensity with long-term low-intensity noise, like that from marine vessels, potentially having greater negative effects than short-term bursts of noise.[[54]](#footnote-54) In the longer term, technical amendments to hulls and propellers can decrease noise, but the most effective measures to mitigate the effects of underwater noise on marine species tend to be geographic and seasonal shipping restrictions.[[55]](#footnote-55)

3.5 Antifouling

Minutes after a clean surface, like a ship’s hull is introduced into the marine environment various organisms start attaching to it.[[56]](#footnote-56) On ships, so-called fouling increase the frictional resistance resulting in, among other things, lower speed, impaired manoeuvrability, and greater fuel consumption. The problem has been known since antiquity, and different materials and substances have been used to limit fouling on ships. Today, antifouling paints are applied to the hulls of ships as well as to many other submerged structures to prevent the growth of fouling organisms. A wide range of chemicals, with different physico-chemical properties and differing environmental effects are used for antifouling purposes. Since the toxic substance tributyltin (tbt) was widely prohibited in the early 2000s, copper has become the primary active ingredient in antifouling paints. The copper is often supplemented by so-called booster biocides like Irgarol 1051 and Diuron to make the paints more effective on algae.[[57]](#footnote-57)

Since the antifouling effect is typically due to the slow leaching of biocides from the painted surface, elevated concentrations of antifouling agents are most significant in semi-enclosed marine systems, such as harbours, marinas and estuaries. In addition to leaching, these chemicals can also spread for example in the form of antifouling paint particles generated during boat maintenance and cleaning.[[58]](#footnote-58) Waters with intense marine traffic and areas used for maintenance of ships and smaller boats are thus particularly affected by the environmental consequences of antifouling.

3.6 Ship Strikes

In some areas, collisions between ships and marine animals, so-called ship strikes, is a considerable environmental problem. Species involved in such collisions include sea turtles, manatees, sharks as well as various small and large whales. The effect of lethal collisions with whales has attracted particular attention due to the potentially large effects on the survival of endangered whale species.[[59]](#footnote-59) The probability of ship strikes is generally linked to vessel speed,[[60]](#footnote-60) but is also particularly accentuated in certain areas where large marine fauna coexists with maritime routes.[[61]](#footnote-61)

4 The General Approach to the Regulation of Shipping

As the brief overview above confirms, the environmental pressures associated with shipping are diverse and the intensity as well as consequences of different pressures are often place specific. This would seem to make shipping an obvious case for place-based management of environmental pressures in an integrated manner, comprising not only the pressures associated with different kinds of shipping but also placing these in a wider context of anthropogenic pressures on relevant ecosystems. In reality, however, the regulation of the environmental effects of international shipping can appear as the antithesis to the ecosystem approach. Rather than being susceptible to local conditions, the regulatory system is premised on far-reaching international harmonisation and the avoidance of local requirements that may impede the freedom and expediency of maritime transport. In the words of Ringbom, ‘the governance of shipping remains heavily centralised and rigid in both institutional and substantive terms’.[[62]](#footnote-62) This relative rigidity results from the privileged role granted to shipping in the unclos as well as from the strong position of the imo in the elaboration of environmental standards for international shipping.[[63]](#footnote-63)

However, as for any complex legal structure there are exceptions and modifications to this general rule. There may also be ways to deal with at least some of the relevant pressures that do not necessarily require great local variability of the applicable standards. Against this backdrop, a closer look will be had at the extent to which different aspects of the regulatory structure can be reconciled with the logic of the ecosystem approach. The intention is not to provide a detailed account of the ways in which the various environmental pressures resulting from shipping have been regulated.[[64]](#footnote-64) The focus is instead on assessing to what extent existing regulatory mechanisms in general have been premised on local and regional needs and conditions and whether the regulatory framework enables responses tailored to meet such needs, or when, perhaps, such tailoring is superfluous.

5 Area-Based Measures by Coastal States

As will be well known to most readers, the oceans are divided into zones characterised by different conditions for the exercise of jurisdiction by, primarily, coastal States – both in terms of the right to legislate and to take enforcement measures. In all of these zones, except for internal waters, significant restrictions apply with respect to the ability of the coastal State to set or enforce measures in relation to ships not flying its own flag.

Whereas internal waters, i.e. marine waters on the landward side of the baseline,[[65]](#footnote-65) are subject to extensive coastal state jurisdiction such waters are typically only found in harbours, smaller bays and archipelagos.[[66]](#footnote-66) So called archipelagic States[[67]](#footnote-67) can have more extensive sea areas on the landward side of their straight archipelagic baselines. However, these archipelagic waters are subject to a right of passage by foreign ships that is similar to the regime of innocent passage applicable in the territorial sea (see below), and even more extensive in relation to so-called archipelagic sea lanes.[[68]](#footnote-68)

Starting from the baseline and stretching out to 12 nm seaward from it is the territorial sea. Although the sovereignty of the coastal State extends here,[[69]](#footnote-69) granting it extensive control over this area, the existence of a right to innocent passage entails a significant restriction on the ability of coastal States to regulate shipping. The right of innocent passage, enjoyed by all foreign ships, means that the coastal State is normally prevented from interfering with the passage of ships through its territorial sea as long as the passage is continuous and expeditious and not prejudicial to the peace, good order or security of the coastal State.[[70]](#footnote-70) The right of innocent passage can be suspended in specified areas, but only temporarily and only if it is essential for the protection of the security of the coastal State.[[71]](#footnote-71) Coastal States may adopt laws and regulations relating to innocent passage through the territorial sea. Such laws and regulations may concern the conservation of the living resources of the sea and the preservation of the environment of the coastal State and the prevention, reduction and control of pollution thereof. However, the rules and regulations must conform to the unclos and other relevant rules of international law. More importantly, they may not apply to the construction, design, equipment, or manning (cdem) of foreign ships unless they are giving effect to generally accepted international rules or standards.[[72]](#footnote-72) They must also not hamper the innocent passage of foreign vessels.[[73]](#footnote-73)

Of significant importance to the present discussion is, however, the existence of a right for coastal States to require foreign ships engaged in innocent passage through the territorial sea to use such sea lanes and traffic separation schemes as the coastal State may designate or prescribe for the regulation of the passage of ships.[[74]](#footnote-74) When designating or prescribing them, the coastal State must have regard to the safety of navigation and is also required to take into account, inter alia, any recommendations of the imo.[[75]](#footnote-75) However, it still leaves the coastal State some freedom to direct ships away from particularly sensitive areas. It also enables coastal States to establish marine protected areas in their territorial seas, as long as they do not hamper the right of innocent passage. For States bordering so-called straits used for international navigation the competence is more limited since the consent of the imo is required for the designation of sea lanes in such straits.[[76]](#footnote-76)

Although the above leaves individual coastal States some authority to design specific environmental measures applicable to ships exercising innocent passage, the preferred regulatory model mandated by the unclos is clearly the elaboration within the imo or in other international fora of general rules and standards or the adoption of routeing systems by the imo.[[77]](#footnote-77)

If an eez has been established – and most coastal States have done that – it stretches from the outer limit of the territorial sea to a maximum of 200 nm from the baseline.[[78]](#footnote-78) In the eez the coastal State enjoys sovereign rights for the purpose of exploring and exploiting, conserving and managing the living as well as non-living natural resources as well as with regard to other activities for the economic exploration and exploitation of the zone.[[79]](#footnote-79) It also has jurisdiction with regard to the protection and preservation of the marine environment. However, that jurisdiction is only ‘as provided for in the relevant provisions’ of the unclos.[[80]](#footnote-80) With regard to shipping, no specific rights are granted coastal States in the eez corresponding to their (limited) rights in the territorial sea. In the eez all States, and indirectly their citizens, enjoy, with some exceptions and subject to the unclos, the freedom of the high seas including the freedom of navigation.[[81]](#footnote-81) This entails a right to navigate in the eez that is not restricted by the coastal State beyond what is necessary for its economic exploration and exploitation of the zone. Overall, the environmental competence of coastal States in the eez is restricted to adopting laws and regulations that conform to and give effect to generally accepted international rules and standards for the prevention, reduction, and control of pollution from vessels.[[82]](#footnote-82)

There is a basis in the unclos for additional measures to be taken by a coastal State in respect of a clearly defined area of its eez if international rules and standards are inadequate to meet special circumstances. To do that, the coastal State must have reasonable grounds for believing that the adoption of special mandatory measures for the prevention of pollution from vessels is required in such area for recognized technical reasons in relation to oceanographical and ecological conditions, as well as its utilization or the protection of its resources and the particular character of its traffic.[[83]](#footnote-83) This should seemingly make it possible to prescribe the use of additional navigational aids and even to adopt rules relating to construction, design, equipment and manning (cdem).[[84]](#footnote-84) However, the particular character of the area must be determined by the imo based on scientific and technical evidence submitted by the coastal State.[[85]](#footnote-85) Since approval by the imo is required, this is not a right for coastal States to take unliteral measures within a defined mandate, but rather a possibility to initiate a multilateral decision process.

There is also a possibility for a coastal State to adopt additional pollution-related laws and regulations for the same area, in addition to those that may have been mandated by the imo. Such additional rules must also be notified to the imo. They may relate to discharges or navigational practices but shall not require foreign vessels to observe cdem standards other than generally accepted international rules and standards.[[86]](#footnote-86) Unfortunately, the relevant provision, unclos Article 211(6) lit c, is formulated in a way that leaves the exact nature of the coastal State’s additional regulatory competence rather ambiguous.[[87]](#footnote-87) The procedure for adopting additional measures seems never to have been used. This may indicate that States see a limited need for the additional measures that could be enabled this way. But equally or more likely is that the complexity of the provision and the high demands it places on a coastal State to convince the imo of authorising measures have made it an impractical instrument for area-based environmental protection.[[88]](#footnote-88)

Finally, it should be noted that the principle of so-called port state jurisdiction, i.e. the right of States to exercise prescriptive and enforcement jurisdiction in relation to ships that voluntarily enter their ports, can be used for adopting additional requirements pertaining to foreign ships and their conduct. However, while it is widely recognized that States may impose conditions for access to their ports,[[89]](#footnote-89) they can only enforce measures through port state jurisdiction which they are allowed under international law to prescribe in the first place.[[90]](#footnote-90) A basis for prescriptive jurisdiction may exist, inter alia, if the rule that is to be enforced has a clear link to the port as such – for example to provide certain information regarding the vessel and its activities upon arrival at port – or follows from an international agreement.[[91]](#footnote-91) If a State establishes particular requirements for the prevention, reduction and control of pollution of the marine environment as a condition for the entry of foreign vessels into its ports or internal waters, it must give due publicity to such requirements and communicate them to the imo.[[92]](#footnote-92)

Before proceeding to the next section, mention should also be made of the concept of ‘enclosed or semi-enclosed seas’ which the unclos defines as ‘a gulf, basin or sea surrounded by two or more States and connected to another sea or the ocean by a narrow outlet or consisting entirely or primarily of the territorial seas and exclusive economic zones of two or more coastal States’.[[93]](#footnote-93) For such areas, like the Black Sea, the Baltic Sea and the Mediterranean, the coastal States are instructed to cooperate with each other in the exercise of their rights and in the performance of their duties under the unclos.[[94]](#footnote-94) However, that this provision would entail a binding obligation of any level of substance is disputed,[[95]](#footnote-95) and there are no additional jurisdictional rights for coastal States linked to such enhanced cooperation.[[96]](#footnote-96)

6 Multilateral Area-Based Instruments

Having concluded that there is very limited room, particularly beyond the territorial sea, for individual coastal States to take measures that can strengthen the environmental protection for vulnerable areas, it is appropriate to also look for multilateral mechanisms that can be used for adjusting the regulation of shipping to the needs of specific areas. ‘Multilateral’ is here used to denote any measure that needs to be approved or adopted by an international body, typically the imo, and cannot be decided unilaterally by an individual State. It should be noted, though, that with this definition some measures already discussed above, notably the procedure for mandating a coastal State to take ‘additional measures’ in respect of a clearly defined area of the eez, would also fall under this category.

6.1 Special Areas and Emission Control Areas

In the previous section, much attention was given to the restrictive approach to requirements concerning cdem, which with few exceptions must adhere to internationally recognized standards. With respect to environmental protection, ‘international standards’ are primarily understood as a reference to marpol, which lays down cdem standards for vessels, as well as discharge and emission restrictions.[[97]](#footnote-97) While general rules are found in marpol and its protocols, much of the concrete standards are found in the six annexes to that Convention. These deal with prevention of pollution by oil (Annex i), by noxious liquid substances in bulk (Annex ii), by harmful substances carried by sea in packaged form (Annex iii), by sewage (Annex iv), by garbage from ships (Annex v), and by air pollution from ships (Annex vi). Although each annex has its own regulatory approach, a feature common to most of them is the concept of special areas intended to grant a higher level of protection to specific vulnerable parts of the oceans.[[98]](#footnote-98)

What may be called traditional special areas are provided for by Annex i, ii and v with respect to oil, noxious liquid substances in bulk, and garbage. Guidelines for the designation of such areas have been adopted by the imo.[[99]](#footnote-99) With respect to all these annexes, a special area is defined as ‘a sea area where for recognised technical reasons in relation to its oceanographical and ecological conditions and to the particular character of its traffic, the adoption of special mandatory methods for the prevention of sea pollution by oil, noxious liquid substances, or garbage, as applicable, is required’.[[100]](#footnote-100)

The guidelines set out criteria which must be satisfied for an area to be given Special Area status. They are divided into three different categories: oceanographic conditions; ecological conditions; and vessel traffic characteristics. The criteria concerning vessel traffic characteristics include that the sea area must be ‘used by ships to an extent that the discharge of harmful substances by ships when operating in accordance with the requirements of marpol 73/78 for areas other than Special Areas would be unacceptable in the light of the existing oceanographic and ecological conditions in the area’.[[101]](#footnote-101) The requirements that apply with respect to special areas are binding on all States, even those that are not parties to marpol. This is an effect of the requirements being seen to reflect generally accepted international rules and standards according to the unclos Article 211(5).[[102]](#footnote-102)

The designated special areas tend to be quite large, such as the Mediterranean Sea, the Baltic Sea, the Black Sea Area, or the Gulf Area.[[103]](#footnote-103) Clearly, the extra restrictions that apply in special areas can contribute to the protection of particularly sensitive ecosystems. However, the very large-scale approach and the need for approval by the imo makes this a rather blunt instrument for achieving the objectives envisioned by the ecosystem approach. But if special area requirements are stringent enough, they can effectively make the addition of more local requirements redundant.

In addition to these special areas, there are ‘emission control areas’ (eca s) established under marpol Annex vi, which can relate to emission of nox or sox, and particulate matter, or all three types of emissions. Compared to the special areas, the establishment of an emission control area entails a more holistic approach.[[104]](#footnote-104) When assessing an application for the establishment of such an area the imo is to consider, inter alia, the impacts of the relevant emissions on human health and the environment, such as adverse impacts to terrestrial and aquatic ecosystems, areas of natural productivity, and critical habitats. The focus is thus not only on the marine environment but on all areas that are affected by emissions from international shipping. Clearly, this reflects the nature of air pollution, which easily crosses the land-sea divide.

The imo will also assess the control measures taken by the proposing States addressing land-based sources of the relevant emissions that affect the human populations and environmental areas at risk. This requires proposing States to have in place measures that effectively reduce terrestrial emissions.[[105]](#footnote-105) The relative costs of reducing emissions from ships compared with reductions from land-based sources, and the economic impacts on shipping engaged in international trade are also considered by the imo.[[106]](#footnote-106)

Currently there are four large control areas for sox where the maximum sulphur content of ships’ fuel is 0.1 precent: the Baltic Sea area; the North Sea area; the North American area (covering designated coastal areas off the United States and Canada); and the United States Caribbean Sea area (around Puerto Rico and the United States Virgin Islands).[[107]](#footnote-107) This should be compared to the generally allowed sulphur content that used to be 3.5 percent, but has been lowered to 0.5 percent as from 2020, thus making the difference between the control areas and other areas significantly smaller. Stricter technical requirements relating to nox emissions also apply in these eca s. However, they only apply in relation to ships built after January 1, 2016 in the North American and U.S. Caribbean eca s, and to ships built after January 1, 2021 in the Baltic and North Sea eca s.

The ‘special area’ and ‘emission control area’ mechanisms can be seen as a way to allow for differentiation between sea areas – on a large scale – without challenging the centralized nature of the regulatory regime for ship source emissions, since they are adopted at the global level and with participation of virtually all affected States.[[108]](#footnote-108) At the same time, this makes them a fairly unspecific instrument and one that is not easily adjusted to changing circumstances. It should also be noted that for road vehicles, the allowed amount of sulphur is generally much lower than for ships. The 0.1 percent limit in eca s is still approximately 100 times higher than the sulphur content allowed for car fuel in the European Union.[[109]](#footnote-109)

6.2 Routeing and Areas to Be Avoided

Whereas there are a number of instruments that can provide the basis for various restrictions on the conduct of ships or even the establishment of compulsory technical standards, the solas Convention stands out as the legal instrument providing the imo with the authority to adopt and implement ships’ routeing measures, thereby directing ships to specific areas (sea lanes) or away from areas, so-called ‘areas to be avoided’ (atba).[[110]](#footnote-110) Beyond the territorial sea, mandatory measures of that kind can be implemented only with the approval of the imo and based on the relevant parts of solas. Among the routeing measures available to the imo are recommended tracks, atba, no-anchoring areas, and deep-water routes. For the present analysis, atba are particularly relevant since they can keep vessels away from specific areas even when conditions such as sea ice make vessels leave shipping lanes or where such lanes have not been designated.

According to solas, ships’ routeing systems shall contribute to safety of life at sea, safety and efficiency of navigation and/or protection of the marine environment. When adopted by the imo, such measures can be recommended for use by, and may be made mandatory for, all ships, certain categories of ships or ships carrying certain cargoes.[[111]](#footnote-111) Guiding vessel traffic at a safe distance from environmentally sensitive areas has been accepted as a legitimate purpose of a routeing system.[[112]](#footnote-112) atba s are flexible in the sense that they can be tailored to address specific concerns in specific geographic locations and can apply either to all ships or just to ships with certain properties.[[113]](#footnote-113) atba s that adapt in real time to environmental or biological changes are conceivable, although they are yet to be adopted by the imo.[[114]](#footnote-114)

The adoption of mandatory routeing measures, rather than recommendatory ones, has only been possible since 1997 and has meet with significant resistance as a potential threat to the right of innocent passage and freedom of navigation.[[115]](#footnote-115) The threshold for adoption of mandatory routeing measures by the imo remains rather high and to be adopted it must be clear that the measures do not impose unnecessary constraints on shipping. The globally unique ecosystems of the Baltic Sea were not considered sufficient for the adoption of mandatory atba s in the area, despite the Baltic Sea’s status as a pssa, when balancing the need for environmental protection against navigational interests.[[116]](#footnote-116) Fortunately, there seems to be high compliance also with recommendatory atba.[[117]](#footnote-117)

Although coastal States have the sovereign right to establish routeing measures within their territorial seas as long as they don´t impede innocent passage, there are advantages to having such measures adopted by the imo. Measures adopted by the imo are likely to be better known and possibly also more complied with.[[118]](#footnote-118) Beyond the territorial sea, it is only with imo approval that such measures can be adopted.

6.3 Particularly Sensitive Sea Areas

The most flexible area-based mechanism used by the imo is the designation of so-called Particularly Sensitive Sea Areas (pssas). A pssa is defined as ´an area that needs special protection through action by imo because of its significance for recognized ecological, socio-economic, or scientific attributes where such attributes may be vulnerable to damage by international shipping activities´.[[119]](#footnote-119) The designation of pssas has been described as a way of overcoming the limitations on coastal State jurisdiction for the protection of the marine environment from vessel source pollution that follow from the right of innocent passage in the territorial sea, and freedom of navigation in the eez.[[120]](#footnote-120) In itself, however, the designation of a pssa does not entail any increased jurisdictional powers, nor any new obligations on the shipping sector.

What particularly sets pssas apart from the other mechanism discussed above is that it is not based on a specific legal mandate or provision in any binding instrument. Instead, it is for the relevant committees within the imo to choose appropriate measures among the ones available in different legal instruments in order to fill any particular pssa designation with substantive content. Such so-called ‘associated protective measures’ (apm s) can take the form of designation of an area as a special area or emission control area under marpol, or application of special discharge restrictions to vessels operating in the pssa, adoption under solas of ships’ routeing and reporting systems near or in the area, or any other measures aimed at protecting specific sea areas against environmental damage from ships, provided that they have an identified legal basis.[[121]](#footnote-121) To be adopted, any apm must meet the requirements of the appropriate legal instrument establishing such measure.[[122]](#footnote-122)

Any State that is a member of the imo,[[123]](#footnote-123) or group of such States, can apply to have an area identified as a pssa. The guidelines for the identification and designation of pssas set out 17 criteria, falling into three categories: ecological criteria; social, cultural, and economic criteria; and scientific and educational criteria. At least one of the criteria must be met for identification as a pssa. The ecological criteria comprise such features as an ecosystem being unique; that it is an outstanding example of specific biodiversity, ecosystems or other natural characteristics; that it has an exceptional variety of species or genetic diversity; or that it has a particularly high rate of natural biological production.[[124]](#footnote-124) For designation as a pssa, it must also be shown that the recognized attributes of the area are at risk from international shipping activities.[[125]](#footnote-125) What may be deemed an ecologically progressive feature is that a pssa may include a buffer zone, i.e. an area contiguous to the site-specific feature for which specific protection from the impacts of shipping is sought.[[126]](#footnote-126)

As of 2021, there are 17 areas that have been designated as pssas. Among these are The Great Barrier Reef (Australia), The Wadden Sea (Denmark, Germany, Netherlands), The Galapagos Archipelago (Ecuador), and The Jomard Entrance (Papua New Guinea).[[127]](#footnote-127) In order to understand the regulatory significance of these designations, the apm s applicable to each area must be analysed. pssas are predominantly covering waters that have the status of eez or archipelagic waters, but some pssas overlap at least in part with the territorial seas of the concerned coastal States.[[128]](#footnote-128)

In practise, States have generally been reluctant to accept far-reaching and mandatory measures as apm s and the list of decided routeing measures under pssas is modest. Among other examples, proposals for mandatory areas to be avoided in the Baltic pssa as well as for mandatory use of pilot in the Torres Strait have failed to attract sufficient support to be adopted.[[129]](#footnote-129) The Baltic Sea pssa also illustrates the problem with an instrument that requires the consent of all effected States. Since Russia did not support the request for designation of the Baltic Sea as a pssa its part of the sea is excluded from the pssa status.[[130]](#footnote-130) Unfortunately, the Russian part is among those with the most intense ship traffic.

Although it can be argued that the designation of a pssa has a value in its own right by drawing attention to the fact that an area is sensitive and warrants extra caution from anyone engaged in an activity that could harm it,[[131]](#footnote-131) the fact remains that it is the apm s that can establish concrete obligations. And the apm s available to the imo are associated with the limitations discussed above in relation to the respective measure. In practise, the implementation of many apm s relies to a large extent on flag States, and effective implementation may be thwarted by lax maritime enforcement by certain such States.[[132]](#footnote-132)

6.4 The Polar Code

Last among the ‘multilateral area-based instruments’, mention must be made of the so-called Polar Code, which is a recently adopted instrument that has been developed to supplement existing imo instruments in order to increase the safety of ships’ operation and mitigate the impact on the people and environment specifically in polar waters.[[133]](#footnote-133) It consists of the Code for Ships Operating in Polar Waters and related amendments to solas and marpol. More specifically, the Code consists of a number of decisions adopted within the imo in 2014 and 2015 which became effective in 2017.

The Code has been described as ‘a unique instrument for regional application under the authority of the key solas and marpol conventions’ and as constituting a ‘paradigm shift’ in the protection of Arctic waters.[[134]](#footnote-134) It applies to both Arctic waters and the Antarctic area, but some rules are specific to Arctic waters.[[135]](#footnote-135) The Code includes requirements on ships’ design and operation, manning and training. There are also specific rules on, among other things, prevention of pollution by oil and by sewage and garbage from ships. (On the management of Arctic waters and Arctic sea ice, see further the chapter by Argüello and Johansson in this volume).

The Polar Code can thus be seen as an area-specific adjustment of the general regulatory framework to better address the specific needs and conditions of the polar regions. It is, however, still an instrument that applies at a very large scale. In line with this, it has been noted that although it would be preferable for polar shipping regulation to continue to be developed in a harmonised fashion, there may be areas, such as those with especially sensitive marine ecosystems, where the coastal States concerned will need to consider additional, area-based measures to address the environmental impacts of the growth of shipping in such waters.[[136]](#footnote-136)

6.5 Regional Marine Environmental Agreements

It should also be noted that there are many regional agreements, applying to a certain geographic area, that aim to provide relevant protection based on local or at least regional considerations. Among these are the Barcelona Convention for the Mediterranean,[[137]](#footnote-137) the Bucharest Convention for the Black Sea,[[138]](#footnote-138) the Helsinki Convention for the Baltic Sea,[[139]](#footnote-139) and the ospar Convention for the North Sea.[[140]](#footnote-140)

However, these regional agreements cannot impose obligations on international shipping that go beyond the competence of the coastal State parties to the agreement, at least not in relation to ships flying the flag of States not parties to such an agreement. And considering the global nature of shipping, few areas are predominantly used by ships flying the flags of local coastal States. All regional instruments for marine environmental protection have also been found to contain collision clauses confirming the supremacy of freedom of navigation in conflicts between regional environmental protection and shipping interests.[[141]](#footnote-141)

7 Conclusions and Outlook

The regulation of the environmental effects of shipping has come far since such effects started to gain attention in the 1960s and 70s. Still, however, the shipping sector is associated with many pressures on the environment, some of which may increase due to the overall growth of international shipping. While the regulatory framework has developed, imposing increased environmental requirements on shipping, it has done so in a way that leaves limited room for tailoring regulatory responses to local conditions. This entails clear risks for depletion of ecosystems, degradation of ecosystem services and harm to human health occurring at local or regional scales without the law being able to provide remedies or even preventing relevant action by individual States. In comparison to almost all other maritime activities, international shipping has been granted a very privileged position in terms of being shielded from much national and local regulatory action. This is not easily reconcilable with the ecosystem approach, premised as it is on the recognition that ecosystems are diverse and complex and require adaptive management able to respond effectively to pressures and changing circumstance also at a local scale. Turning this understanding into a basis for regulatory action in relation to shipping is potentially disruptive for the established order. The conflict is particularly evident beyond the territorial sea, in which coastal States have some, although carefully delineated powers, to set and enforce requirements that go beyond international standards.

To some extent the regulatory structure has become more accommodating to the needs of specific areas or regions. The special areas and emission control areas adopted under marpol are obvious examples, as is the recent adoption of the Polar Code to better meet the environmental challenges of Arctic and Antarctic waters. Although such measures can have good environmental effects when the standards are stringent enough, they still tend to apply at quite large scales. That limits not only the scope for regulatory measures tailored to more local conditions but also has repercussions for the ability to take local knowledge into account or to allow for participation in the elaboration of rules and the associated trade-offs between effected interests. The multilateral processes available for adopting additional measures also tend to be onerous and it can be quite challenging to reach agreement among the members of the imo.

There are ways to increase the compatibility between the regulation of shipping and fundamental tenets of ecosystem-based management. One way is to facilitate use of the existing mechanisms for areas-based management. The procedure under unclos Article 211(6) for designating areas in the eez where additional protective measures can be taken by the coastal State should be clarified and streamlined so as to make it a useful instrument. The sovereign rights of costal States for conserving and managing natural resources and with regard to other activities for the economic exploitation of their eezs open for creative ways of conducting such management and exploitation so that it also provides some protection for specific areas.

Many coastal States can also make more use of the regulatory powers they have to direct shipping away from sensitive areas in internal waters and, to a somewhat more limited extent, in the territorial sea. In doing that, they must be aware of the environmental trade-offs that may be associated with different routes, where one may, for example, reduce noise pollution in a sensitive area but at the same time increase exposure of another area to air pollution, or cause more emissions overall of greenhouse gases. In some respects, the balance struck between environmental protection and the expedience of shipping in the territorial sea is dated. Not least the fact that pollution must be both wilful and serious to disqualify the passage of a ship from being considered innocent. With few exceptions, intentional pollution should not be considered innocent in the often busy and sensitive coastal areas covered by the territorial sea.

States can use port state jurisdiction to set and enforce more stringent standards in relation to ships that voluntarily enter their ports, at least in relation to matters that have clear links to the port. This includes, for example, restrictions on emissions of polluting substances to the air or the water while in the vicinity of the port, even if this entails prescribing cdem standards that go beyond what is internationally accepted. Such requirements may come at a cost, since they can prevent ships that do not easily meet the requirements from using the port, thus pushing trade flows to other ports or driving up the cost of ship transport. Such issues can at least partly be addressed by regional cooperation between neighbouring States so that the additional standards are the same in all ports in a region, thereby creating stronger incentives for modifying ships and enabling the costs to be borne by larger volumes of trade.

The emergence of marine (or maritime) spatial planning (msp) as a widespread instrument for marine management can enhance the practical conditions for integrated management of environmental pressures and for making informed trade-offs. msp can also strengthen the role of sub-national entities like ports or municipalities that play a significant role in such processes.[[142]](#footnote-142) It does not, however, create any new competences for national or local actors to regulate shipping not previously available to coastal and port States.

The many virtues of having global standards for the regulation of shipping, or regional rules that have the explicit support of the global community as represented by the imo, must not be forgotten. There are good reasons for protecting shipping from many of the impediments that may result from a fragmented regulatory landscape. Area-based management of environmental pressures should not be pursued unless it fills an important environmental function. And even when it does, such measures should be devised so as not to cause unnecessary or disproportionate obstacles to international shipping.

It must also be remembered that local abatement is not relevant for all environmental pressures. The location of co2 emissions is largely immaterial to the environmental consequences in the form of climate change and ocean acidification. There is hence little purpose in calling for a more area-specific regulation of such emissions. Although special measures against air pollution in ports or straits can be needed in some cases, the fact that such pollution readily spreads hundreds of kilometres typically makes it suited for more general or large-scale responses. It can also be particularly challenging to achieve compliance with local standards and restrictions.

The best option from an environmental perspective is obviously when pressures can be eliminated, as is the intention with, for example, the global ban on tbt. The interest of the freedom of shipping and the current largely harmonized regulatory system put pressure on the shipping sector to accept and comply with general standards that are stringent enough to render local measures superfluous in most cases. In that way, a largely harmonised system and a level playing field for all actors can coexist with the vulnerable ecosystems and natural processes that make the oceans so valuable.

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9. On marine or maritime spatial planning as an instrument for area based marine management, see eg Stelios Katsanevakis and others, ‘Ecosystem-based marine spatial management: Review of concepts, policies, tools, and critical issues’ (2011) 54 Ocean & Coastal Management 807. [↑](#footnote-ref-9)
10. Scott (n 7) 466–7. On different conceptions of integrated ocean management, see also Lena Schøning, ‘More or Less Integrated Ocean Management: Multiple Integrated Approaches and Two Norms’ (2020) 51:2 Ocean Development & International Law 95–115, 106. [↑](#footnote-ref-10)
11. See, eg, Frank Maes, ‘The international legal framework for marine spatial planning’ (2008) 32 Marine Policy 797. [↑](#footnote-ref-11)
12. See instead, inter alia, Siân Prior, Aldo Chircop, and Julian Roberts, ‘Area-based Management on the High Seas: Possible Application of the imo’s Particularly Sensitive Sea Area Concept’ (2010) 25 The International Journal of Marine and Coastal Law 483; Vito De Lucia, ‘The Ecosystem Approach and the negotiations towards a new Agreement on Marine Biodiversity in Areas beyond National Jurisdiction’ (2019) Nordic Environmental Law Journal7. [↑](#footnote-ref-12)
13. See instead eg Antonia Zervaki, ‘The Ecosystem Approach and Public Engagement in Ocean Governance: The Case of Maritime Spatial Planning’, in David Langlet and Rosemary Rayfuse (eds), *The Ecosystem Approach in Ocean Planning and Governance* (Brill 2018) 223; Jason S Link and others, ‘Keeping Humans in the Ecosystem’ (2017) 74 ices Journal of Marine Science1947 with further references. [↑](#footnote-ref-13)
14. unclos art 192. [↑](#footnote-ref-14)
15. unclos art 194 (2). [↑](#footnote-ref-15)
16. unclos art 194 (5). [↑](#footnote-ref-16)
17. International Convention for the Prevention of Pollution from Ships (2 November 1973) 1340 unts 184, as amended by the Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships (London, 17 February 1978, in force 2 October 1983) 1340 unts 61 [marpol]. [↑](#footnote-ref-17)
18. International Convention for the Safety of Life at Sea (London, 1 November 1974, in force 25 May 1980) 1184 unts 2 [solas]. [↑](#footnote-ref-18)
19. An important expression of this is the development of the dpsir (*Drivers*–*Pressures*–*State Change*–*Impact*–*Response*) framework as an attempt to capture key relationships between society and the environment and enabling assessment of the causes, consequences and responses to change in socio-ecological systems in a holistic way. Atkins and others (n 8). [↑](#footnote-ref-19)
20. In Google scholar the search string ‘ecosystem approach’ and ‘environmental management’ generate around 17 600 hits, of which 15 900 are from 1990 or later. [↑](#footnote-ref-20)
21. KA Waylen, ‘The Need to Disentangle Key Concepts from Ecosystem-Approach Jargon’ (2014) 28 Conservation biology 1215–1224, 1216; Trine Skovgaard Kirkfeldt, ‘An ocean of concepts: Why choosing between ecosystem-based management, ecosystem-based approach and ecosystem approach makes a difference’ (2019) 106 Marine Policy 103541. [↑](#footnote-ref-21)
22. Cecilia Engler, ‘Review: Beyond Rhetoric: Navigating the Conceptual Tangle Towards Effective Implementation of the Ecosystem Approach to Oceans Management’ (2015) 23 Environmental Review 288, 291. [↑](#footnote-ref-22)
23. David Langlet, ‘Scale, Space and Delimitation in Marine Legal Governance– Perspectives from the Baltic Sea’ (2018) 98 Marine Policy 278–285. [↑](#footnote-ref-23)
24. See eg. Steven A Murawski, ‘Ten myths concerning ecosystem approaches to marine resource management’ (2007) 31 Marine Policy 681, 682. [↑](#footnote-ref-24)
25. R Edward Grumbine, ‘What Is Ecosystem Management?’ (1994) 8 Conservation Biology 27, 31; Record 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’). [↑](#footnote-ref-25)
26. cbd, cop Decision v/6 Ecosystem Approach (Nairobi, 26 May 2000). [↑](#footnote-ref-26)
27. Convention on the Conservation of Antarctic Marine Living Resources, Canberra, 20 May 1980 (into force 7 April 1982) (1982)19 ilm841. [↑](#footnote-ref-27)
28. First Joint Ministerial Meeting of the Helsinki and ospar Commissions (n 25). [↑](#footnote-ref-28)
29. 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. [↑](#footnote-ref-29)
30. According to the multidisciplinary database of scientific publications Scopus, there are >1100 publications with ‘ecosystem approach’ and ‘fisheries’ in the title, abstract or key words, but only 17 with ‘ecosystem approach’ and ‘shipping’. Scopus search conducted 3 March 2022. [↑](#footnote-ref-30)
31. Simcock and Kamara (n 1) 38. [↑](#footnote-ref-31)
32. On these, see eg Karin Andersson and others (eds), *Shipping and the Environment – Improving Environmental Performance in Marine Transportation* (Springer 2016). [↑](#footnote-ref-32)
33. Selma Brynolf and others, ‘Improving Environmental Performance in Shipping’ in Andersson and others (n 32) 399, 402. [↑](#footnote-ref-33)
34. Simcock and Kamara (n 1) 24. [↑](#footnote-ref-34)
35. ibid. [↑](#footnote-ref-35)
36. Brynolf and others (n 33) 408. [↑](#footnote-ref-36)
37. Walker and others (n 2) 513. [↑](#footnote-ref-37)
38. ibid. [↑](#footnote-ref-38)
39. Alan Simcock, ‘Shipping’ in Markus Salomon and Till Markus (eds), *Handbook on Marine Environment Protection* (Springer 2018) 115, 123. [↑](#footnote-ref-39)
40. Kent Salo and others, ‘Emissions to the Air’ in Andersson and others (n 32) 169, 170. [↑](#footnote-ref-40)
41. Walker and others (n 2) 507. [↑](#footnote-ref-41)
42. Salo and others (n 40) 192. [↑](#footnote-ref-42)
43. Walker and others (n 2) 2. [↑](#footnote-ref-43)
44. Walker and others (n 2) 4. [↑](#footnote-ref-44)
45. Salo and others (n 40) 171. [↑](#footnote-ref-45)
46. ibid 189. [↑](#footnote-ref-46)
47. imo, Third imo ghg Study 2014, Executive Summary and Final Report (International maritime organization 2015) 1. [↑](#footnote-ref-47)
48. ibid 5. [↑](#footnote-ref-48)
49. See eg Jonathan N Havenhand and others, ‘Ecological & functional consequences of coastal ocean acidification: perspectives from the Baltic-Skagerrak system’ (2018) 48:8 Ambio 831. [↑](#footnote-ref-49)
50. Simcock and Kamara (n 1) 18. [↑](#footnote-ref-50)
51. Ibid. [↑](#footnote-ref-51)
52. For a comprehensive overview, see Arthur N Popper and Anthony Hawkins (eds), *The Effects of Noise on Aquatic Life* (Springer 2012). [↑](#footnote-ref-52)
53. Walker and others (n 2) 518. [↑](#footnote-ref-53)
54. ibid. [↑](#footnote-ref-54)
55. Walker and others (n 2) 519 and Rob Williams and others, ‘Approaches to reduce noise from ships operating in important killer whale habitats’ (2019) 139 Marine Pollution Bulletin 459. [↑](#footnote-ref-55)
56. J Fredrik Lindgren and others, ‘Discharges to the Sea’, in Andersson and others (n 32) 125, 145. [↑](#footnote-ref-56)
57. ibid 151. [↑](#footnote-ref-57)
58. Andrew Turner, ‘Marine pollution from antifouling paint particles’ (2010) 60 Marine Pollution Bulletin 159. [↑](#footnote-ref-58)
59. Jägerbrand and others (n 2) 8. [↑](#footnote-ref-59)
60. Walker and others (n 2) 520. [↑](#footnote-ref-60)
61. Jägerbrand and others (n 2) 7. [↑](#footnote-ref-61)
62. Henrik Ringbom, ‘Regulation of ship-source pollution in the Baltic Sea’ (2018) 98 Marine Policy 246, 253. [↑](#footnote-ref-62)
63. On the role of the imo, see Aldo Chircop, ‘The International Maritime Organization’, in Donald Rothwell and others (n 7) 416, 432; Erik Røsæg, ‘The Role of the International Maritime Organization in Defining and Altering the Jurisdiction of Flag, Coastal, and Port States’ in H Ringbom (ed), *Jurisdiction over ships: post-UNCLOS developments in the law of the sea* (Brill Nijhoff 2015) 363, 371. [↑](#footnote-ref-63)
64. For more in-depth discussions, see instead Andersson and others (n 32). [↑](#footnote-ref-64)
65. On the definition of normal and straight baselines, see unclos arts 5 and 7. [↑](#footnote-ref-65)
66. However, where the establishment of a straight baseline results in the enclosing as internal waters of areas which had not previously been considered as such, a right of innocent passage, as described below in the main text, applies in those waters. unclos, art 8. [↑](#footnote-ref-66)
67. An archipelagic State is a State constituted wholly by one or more archipelagos but may also include other islands. unclos art 46. [↑](#footnote-ref-67)
68. unclos art 53. [↑](#footnote-ref-68)
69. unclos art 2. [↑](#footnote-ref-69)
70. unclos arts. 17–19. A list of activities that make passage qualify as prejudicial to the peace, good order or security of the coastal State is found in article 19. [↑](#footnote-ref-70)
71. unclos art 25(3). [↑](#footnote-ref-71)
72. unclos art 21. [↑](#footnote-ref-72)
73. unclos art 211(4). [↑](#footnote-ref-73)
74. Any such lanes schemes must be clearly indicated on official charts. unclos art 22(4). [↑](#footnote-ref-74)
75. unclos art 22. To be precise, the article refers not to the imo but to ‘the competent international organization’. That, however, is generally understood as a reference to the imo. Røsæg (n 63) 365. [↑](#footnote-ref-75)
76. unclos art 41. On the concept of ‘straits used for international navigation’, or international traits, see unclos arts 34–37. For a further discussion on coastal states’ competence to regulate shipping in such straits, see Nilüfer Oral, ‘Navigating the Oceans: Old and New Challenges for the Law of the Sea for Straits Used for International Navigation’ (2019) 46 Ecology Law Quarterly 163. [↑](#footnote-ref-76)
77. unclos art 211(1). [↑](#footnote-ref-77)
78. unclos, arts 55 and 57. [↑](#footnote-ref-78)
79. ibid, art 56(1)(a). [↑](#footnote-ref-79)
80. ibid, art 56(1)(b). [↑](#footnote-ref-80)
81. unclos art 58(1). [↑](#footnote-ref-81)
82. unclos art 211(5). [↑](#footnote-ref-82)
83. unclos art 211(6). [↑](#footnote-ref-83)
84. Markus J Kachel, *Particularly Sensitive Sea Areas – The IMO’s Role in Protecting Vulnerable Marine Areas* (Springer 2008) 83. [↑](#footnote-ref-84)
85. unclos art 211(6) lit. (a). [↑](#footnote-ref-85)
86. unclos art 211(6) lit. (c). [↑](#footnote-ref-86)
87. See further discussion in Kachel (n 84) 84, and Ingvild Ulrikke Jakobsen, *Marine Protected Areas in International Law: An Arctic Perspective* (Brill 2016) 379. [↑](#footnote-ref-87)
88. Jacobsen (n 87) 379. [↑](#footnote-ref-88)
89. Sophia Kopela, ‘Port-State Jurisdiction, Extraterritoriality, and the Protection of Global Commons’ (2016) 47 Ocean Development & International Law 89, 94; Bevan Marten, ‘Port State Jurisdiction, International Conventions, and Extraterritoriality: An Expansive Interpretation’ in H Ringbom (ed), *Jurisdiction over Ships: Post-UNCLOS Developments in the Law of the Sea* (Brill, Leiden, 2015) 103, 115. [↑](#footnote-ref-89)
90. Cedric Ryngaert and Henrik Ringbom, ‘Introduction: Port State Jurisdiction: Challenges and Potential’ (2016) 31 The International Journal of Marine and Coastal Law 379, 383.; Kopela (n 89) 94. [↑](#footnote-ref-90)
91. Kopela (n 89) 92. [↑](#footnote-ref-91)
92. unclos art 211(3). [↑](#footnote-ref-92)
93. unclos art 122. [↑](#footnote-ref-93)
94. unclos art 123. [↑](#footnote-ref-94)
95. Erik Franckx and Marco Benatar, ‘The “Duty” to Co-Operate for States Bordering Enclosed or Semi-Enclosed Seas’ (2013) 31 *Chinese (Taiwan) Yearbook of International Law and Affair*s 66. [↑](#footnote-ref-95)
96. Ringbom (62) 247. [↑](#footnote-ref-96)
97. There are also cdem standards in, inter alia, the solas Convention. [↑](#footnote-ref-97)
98. Kachel (n 84) 97. [↑](#footnote-ref-98)
99. imo Res. A.927(22), Guidelines for the Designation of Special Areas under marpol 73/78 and Guidelines for the Identification and Designation of Particularly Sensitive Sea Areas, adopted 29 November 2001, Annex 1. [↑](#footnote-ref-99)
100. ibid. [↑](#footnote-ref-100)
101. ibid, para. 2.6. [↑](#footnote-ref-101)
102. Jakobsen (n 87) 388. [↑](#footnote-ref-102)
103. For an overview of the special areas, see < https://www.imo.org/en/OurWork/Environment/Pages/Special-Areas-Marpol.aspx > accessed 1 April 2022. [↑](#footnote-ref-103)
104. Kachel (n 84) 102. [↑](#footnote-ref-104)
105. Kachel (n 84) 103. [↑](#footnote-ref-105)
106. marpol Annex vi, Appendix iii. [↑](#footnote-ref-106)
107. <www.imo.org/en/MediaCentre/HotTopics/Pages/Sulphur-2020.aspx> last accessed 4 March 2022. [↑](#footnote-ref-107)
108. Ringbom (n 62) 248. [↑](#footnote-ref-108)
109. Magda Wilewska-Bien and others, ‘Measures to Reduce Discharges and Emissions’ in Andersson and others (n 32) 341, 371. [↑](#footnote-ref-109)
110. Henry P Huntington and others, ‘The role of areas to be avoided in the governance of shipping in the greater Bering Strait region’ (2019) 110 Marine Policy 103564, 3. [↑](#footnote-ref-110)
111. solas, chapter v, regulation 10. [↑](#footnote-ref-111)
112. Huntington and others (n 110) 3. [↑](#footnote-ref-112)
113. ibid 5. [↑](#footnote-ref-113)
114. ibid 6. [↑](#footnote-ref-114)
115. Julian Roberts, ‘Protecting Sensitive Marine Environments: The Role and Application of Ships’ Routeing Measures’ (2005) 20 The International Journal of Marine and Coastal Law 135, 150. [↑](#footnote-ref-115)
116. Jacobsen (n 87) 399. [↑](#footnote-ref-116)
117. Huntington (n 110) 3. [↑](#footnote-ref-117)
118. Roberts (n 115) 151. [↑](#footnote-ref-118)
119. imo Res. A.927(22) (n 99), para. 1.2. [↑](#footnote-ref-119)
120. Edward Goodwin, ‘Threatened Species and Vulnerable Marine Ecosystems’ in Rothwell and others (n 7) 799, 804. [↑](#footnote-ref-120)
121. imo. (2006). Res. A.982(24), Revised guidelines for the identification and designation of particularly sensitive sea areas (Doc. A24/Res.982), Annex, s. 6. [↑](#footnote-ref-121)
122. ibid, s. 1.2. [↑](#footnote-ref-122)
123. As of March 2022, the imo has 174 Member States. <www.imo.org/en/About/Membership/Pages/MemberStates.aspx> accessed 4 March 2022. [↑](#footnote-ref-123)
124. imo Res. A.982(24) (n 125) Annex, s 4.4. [↑](#footnote-ref-124)
125. ibid s 5. [↑](#footnote-ref-125)
126. ibid s 6. [↑](#footnote-ref-126)
127. <https://www.imo.org/en/OurWork/Environment/Pages/PSSAs.aspx> last accessed 4 March 2022. [↑](#footnote-ref-127)
128. John Noyes, ‘The Territorial Sea and Contiguous Zone’ in Donald Rothwell and others (n 7) 91, 106. [↑](#footnote-ref-128)
129. Jakobsen (n 87) 399. [↑](#footnote-ref-129)
130. Alina Prylipko, ‘PSSA In The Baltic Sea: Protection On Paper Or Potential Progress?’, World Maritime University, 2014, <https://commons.wmu.se/wwf/1> last accessed 4 March 2022, 16. [↑](#footnote-ref-130)
131. Roberts (n 115) 145. [↑](#footnote-ref-131)
132. Prylipko (130) 13. [↑](#footnote-ref-132)
133. International Code for Ships Operating in Polar Waters (Polar Code)​, mepc 68/21/Add.1 Annex 10, 5. [↑](#footnote-ref-133)
134. Aldo Chircop, ‘The Polar Code and the Arctic Marine Environment: Assessing the Regulation of the Environmental Risks of Shipping’ (2020) 3 The International Journal of Marine and Coastal Law 533, 543. [↑](#footnote-ref-134)
135. On the delineation of the Arctic and Antarctic waters to which the code applies, see the Polar Code (n 133) 8–9. [↑](#footnote-ref-135)
136. Chircop (n 134) 568–9. [↑](#footnote-ref-136)
137. Convention for the Protection of the Mediterranean Sea against Pollution (Barcelona, 16 February 1976, into force 12 February 1978) 1102 unts 27. [↑](#footnote-ref-137)
138. Convention on the Protection of the Black Sea against Pollution (Bucharest, 21 April 1992, into force 15 January 1994) 1764 unts 3. [↑](#footnote-ref-138)
139. Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki, 9 April 1992, into force 17 January 2000) 2099 unts 195. [↑](#footnote-ref-139)
140. Convention for the Protection of the Marine Environment of the North-East Atlantic (Paris, 22 September 1992, into force 25 March 1998) 2354 unts 67. [↑](#footnote-ref-140)
141. Kachel (n 84) 132. [↑](#footnote-ref-141)
142. Ringbom (n 62) 250. [↑](#footnote-ref-142)